UNITED NATIONS **E/CONF.102/CRP.2**

ECONOMIC AND SOCIAL COUNCIL

Nineteenth United Nations Regional Cartographic Conference for Asia and the Pacific
Bangkok, 29 October – 1 November 2012
Item 6(a) of the provisional agenda
Conference papers: Country reports

National Report of Geomatics in Islamic Republic of IRAN *

* Prepared by Peyman Baktash, General Manager, GIS & SDI, Department of National Cartographic Center of Iran

National Report of the Islamic Republic of IRAN related to Geomatics

19th UNRCC-AP,

Thailand, Bangkok, UN Conference Center

29 Oct. – 1 Nov. 2012

National Cartographic Center
P.O.BOX 13185-1684 Azadi Sq. Tehran Iran
Tel: +9821 6000031-8 Fax: +9821 6001972
WWW.NCC.ORG.IR

Wherever maps communicate with international language; books and libraries keep silence with respect.

Late Mohammad Pourkamal

Introduction

Iran is a country with the area of approximately 1,650,000 square kilometers that contains a great topographic diversity and 2500 km coastline. The National Cartographic Center of Iran (NCC) is the main authority for production of maps and spatial information. It is affiliated to the President Deputy of Planning and Strategic Supervision It has more than half a century of experience in this respect.

The latest technologies for mapping and spatial information production are utilized by NCC experts. This organization undertakes supervision and technical control of mapping and spatial information projects based on the ISO 9001-2000 quality management system. These projects are carried out by NCC and other public and private mapping sectors. Production of base maps at 1:25,000 scale, marine charts at both 1:25,000 and 1:100,000 scales, design and establishment of National Geodetic Control Points as well as Geodynamical Networks, establishment of national, regional, and urban spatial information databases, production of small scale base maps at 1:50,000, 1:100,000 and 1:250,000 scales and production of National Atlases are some of NCC accomplishments.

The development of surveying and mapping in the last half century in Iran has faced considerable challenges in different aspects. This was not possible without great efforts of spatial data producers and users as well as

people in research and education area. The issues such as growing demands for cartographic products, great interests in GI Sciences education, revolutionary movement towards digital technology, standardization efforts in this field and popularity of GIS and remote sensing applications have accelerated the development of GI Sciences in Iran.

In the field of mapping and geographic information which are needed by decision makers and general users, mostly governmental organizations concentrate their efforts on small-scale base maps of the whole country. Other governmental surveying offices and private sectors are mostly involved in high resolution geographic information productions needed for national and provincial projects.

Also, most of researches in the fields of photogrammetry, remote sensing, GIS and digital mapping have been carried out by national organizations, institutions and universities; However, a few private companies have also made remarkable researches on the commercial products and services.

Topographic Maps

Topographic maps are one of the most important tools for decision making and planning in a vast country like Iran. This is a vital issue during the time that the country is confronting with a large, disperse population. On the other hand, topographic maps are necessary to exploit rich natural resources in Iran. Also the globalization trend has increased the level of life expectancy, life style and rate of developments. All of these requirements have caused government to pay more attention to the improvement of infrastructures required for sustainable development.

It is important to note that topographic mapping is an endless, time consuming, labor intensive and cost effective task. The current situation of topographic map production shows a dramatic change in maps available to the users. The change is not only in terms of number of map sheets, but also in the laws of independent user access to geographic information which have been revised.

Topographic mapping are produced in two different approaches. The most common approach is using digital photogrammetry techniques, and the second is generalization from available maps. Large to medium scale (1/2000, 1/10000, 1/25000) topographic maps are produced by using the first approach and smaller scale maps (1/50000, 1/100000, 1/250000, 1/750000) are produced by generalization.

The following map series have already been available to the users:

- 1/2000 map series of cities and towns:

Due to the privatization policy of government, the compilation of these map series has been assigned to private sector. Therefore NCC has been responsible for management, aerial photography, triangulation, and supervision of this task. Currently, about 4000 sheets from more than 800 cities and towns have been completed.

- 1/25,000 scale base map series:

In 1991, The Iranian Parliament assigned National Cartographic Center (NCC) of Iran to produce base map series at the scale of 1:25000. The purpose of these map series was to fulfill the need for rebuilding the country in the post war era.

- The1:50,000, 1:100,000, 1:250,000 scale base map series;

These map series are produced by generalization of 1:25000 scale map series.

Atlases

Atlases are one of the essential tools for researchers and decision makers for studying specific subjects. In June 1992, the government officially assigned the National Atlas Project to NCC. The project began with a number of meetings at NCC for the purpose of consultation between experts working in different fields. At the beginning, as the uncertainty of other organizations about the aim of national atlas, its information

characteristics and their responsibility towards it, were of major concerns, project divided in to two phases:

- In the first phase the aim was production of one volume including all available subjects as General Atlas. This phase was named as assessment in which not only NCC examined its own abilities and needs, but also other organizations were familiarized with the atlas and its advantages.
- In the second phase, more detailed information was provided for policy makers, scientific, academic and research centers, by producing specific-purpose atlases in 19 volumes. In order to increase the clarity of data; these atlases were a combination of maps, graphic, diagrams, and texts; contrary to the General Atlas which consisted of maps and diagrams alone. The subjects which are covered by these atlases are indicated in their titles as: Population, Health, General Education, Higher Education, Geology, Agriculture, Communication, Industry, Animal Husbandry, Energy, Transportation, Handicrafts, Tourism, Cities, Environment, Workers, Commerce, History and Maps.

The project was completed in 2002 and since then, continuous updating of these atlases has been a part of NCC's responsibility because of great demand by users. The atlases updated so far are as followings:
Population, Agriculture, Health, General Education, Higher Education, Geology, Industry, Animal Husbandry, Energy, Transportation and Labor.

With the movement towards digital production and digital usage, published paper atlases do not fulfill current user needs. Therefore PDF versions were immediately produced. Currently, the atlases are prepared to be delivered more interactively through the World Wide Web.

Thematic Maps

Thematic maps produced by GIScience community facilitate interrelated different disciplines. They present derived information from different sources, and combine different topics with spatial reference in an understandable and meaningful manner for different users. Due to the wide

spectrum of map users and interests, thematic maps can play an important role in sustainable development.

One of the main target groups for thematic mapping activities are tourists who need specific information for their own purpose based on locations. In the past, the low state of tourism and limited number of visitors caused a few private companies be interested to produce thematic maps. At present, private sector cannot meet users' requirements because of great growth in tourism industry and continuous increase in the number of tourists. NCC as the main organization responsible for mapping activities has undertaken this task to produce high quality up-to-date maps for the whole country, including provinces, cities and … , as:

- General Map of Iran in 1:1000000 Scale,
- General maps of provinces, at different scales ranging from 1/300,000 to 1/600,000,
- Strip maps of important transit routes,
- Iranian road map at 1:2500000 scale,
- City Guide Maps of important cities,
- Atlas of Tehran at 1:15000 scale,
- Seismic hazard map,
- Strategic statistical maps for different purposes,
- 3D models of provinces and different parts of Iran.

Charts

Charts are known as one of the oldest cartographic products. Regarding the geopolitical characteristics of Iran, charts have been considered as a remarkable tool for development. Firstly, due to Iran’s long coastline along the Persian Gulf and Oman Sea, and secondly, as Iran's air space is the most crowded route for flights from east to west and vice versa, two types of charts are being produced:

- **Hydrographical Maps & Navigational Charts;**

Due to the fact that both Persian Gulf and Caspian Sea are high potential areas for oil & gas production; hydrographic maps are essential for navigation, research, exploration and extraction.

- **Aeronautical & Obstacle Charts;**

Since 1997, a joint project between NCC and CAO has been defined for production of Iranian Aeronautical Charts at 1:2200000 scale. Then, production of obstacle charts has been added to this project.

Image Maps

Although image maps are new products, their history goes back to the invention of aerial photography. In the past, such image maps produced using conventional aerial photography and analogue photo rectification techniques, were called photomaps. About two decades ago, with commercialization of high resolution satellite imagery, map production using these images brought forth products including natural visible objects, infra-red and ultra violet information of earth features. These products were mostly small scale image maps which were suitable for general environmental studies. Today, accessibility to high resolution remotely

sensed data, has caused revolutionary increase in demand for different types of image maps in Iran.
Due to the characteristics of image maps and high initial investment needed for obtaining these products, projects are prepared on request, considering the coverage which is not nationwide.

Cadastral Maps

Cadastral maps, known as land registry maps, deal with ownership. These maps are large scale, with a considerable amount of attribute data. Since the land titling or land registration does not fulfill current requirements of today's complexity of ownership, having a fully digital information system is inevitable. Dramatic increase of population and urbanization has caused unbelievable increase in parcel value. This raise the importance of sophisticated cadastral systems and a comprehensive mapping project, even at larger scale than for base map projects. In order to prepare such a system, a comprehensive cadastral project with the following details has been developed:

Geological Maps

Geological maps provide necessary fundamental information for any constructional and development activity. Geological science has been used by ancient Iranian engineers.

Geodetic Works

Geodetic works are a base for all mapping activities. Iran is comparatively a large country and consequently, a great effort is needed to cover the whole area with necessary horizontal and vertical reference points. NCC provides the following data in this respect:

- Iranian Permanent GPS Network (IPGN)
  - Local Geodetic Networks
  - National Geodetic network
  - Campaign GPS networks for geodynamics studies
  - National DGPS Network is an enhancement to GPS
  - National Leveling Networks
  - Gravimetric networks

NATIONAL SPATIAL DATA INFRASTRUCTURE (NSDI)

The implementation of NSDI has been entrusted to “National Cartographic Center” based on the Fifth Development Program of I. R. Iran in June 2010. In this way, NCC has established National SDI Cooperating Committee in order to pursue related duties, continually. To achieve the goal of a National SDI, Cooperating Committee is to pave the way for governmental organizations to participate, collaborate and also facilitate inter-organizational cooperation to implement NSDI. The committee is chaired by NCC. Its members are ministries undersecretaries or general directors/ national organizations which are administrators or the main users of spatial data. At present, members of the committee are Ministry of Interior, Ministry of Roads and Urban Development, Ministry of Agriculture JAHAD, Ministry of Energy, Ministry of Petroleum, Ministry of Industry, Mine and Trade, Ministry of Information and Communications Technology, Iran Department of Environment, Geological Survey of Iran, National Geographical Organization, National Cartographic Center, Iranian Space Agency, State Organization for Registration of Deeds and Properties, and Statistic Center of Iran. Other ministries and organizations would be invited in case.

Considering NSDI implementation has been entrusted to NCC in June 2010, NCC is responsible for pursuing, steering and cooperating of SDI implementation in all local to national levels. Furthermore, NCC as the stakeholder of producing basic spatial data in the country has produced coverage maps of whole country in medium scales. On the other hand, NCC has established SDI section under its GIS department in August 2010

in order to pursuing related duties, continually. The establishment goal of SDI section is to create an official institute in order to establish relationship between different SDI levels in country and to pursue the designed strategic plan in different SDI levels. Since 2005, a comprehensive study in field of national SDI has been performed that its results are in compilation of national SDI strategic plan. This study is the base of national SDI implementation. The phases of the designed strategic plan would be executing based on the 7 years schedule.

The important outlines of the strategic plan are as following:

- Developing the general pattern for provincial and local SDIs
- Study and establishment of Organizational SDIs
- Study and establishment of disaster management SDI
- Technical, policy making and outreaching workgroups
- Training , promoting and improving the level of awareness
- Designing and establishing the national spatial data clearinghouse
- Compiling required standards and instructions
- Performing Cost-Benefit analysis for SDI and compiling initial financial model
- Providing, completing and organizing of topographic based maps and organizing spatial data of other organizations

The national spatial data clearinghouse network has been designed according to architecture of 2nd generation of the clearinghouse networks, which is based on spatial web services. This generation of clearinghouse is on the basis of the geo-portals, the catalogue services and the spatial services. This generation provided the users with the more appropriate methods to search and access to standardized spatial data. The popular clearinghouses in the world belong to the second generation. NCC has designed and implemented national geo-portal based on this architecture. National geo-portal as the input clearinghouse network port has been

designed and established in order to create proper tools for search, retrieve, access and share of spatial data. This portal prepares search possibility in distributed spatial data sources using catalogue services of participatory organizations in SDI platform.

In order to improve the implementation of SDI, NCC has established international technical cooperation.

- NCC is an executive member of PCGIAP and has undertaken the chairmanship of the 2nd workgroup of PCGIAP called Geospatial Data Management and Service. Likewise, NCC is a member of the1st workgroup of PCGIAP called Geodesy Technologies and Applications.

- NCC is one of the main permanent members of International Steering committee for Global Mapping (ISCGM). One of the main responsibilities of the committee is to provide small scale maps of the world with the participation of all countries. Some countries like Iran, have completely presented their data which is available, while some other countries are in revising or developing phases.

- Another international task of NCC is communicating with Global Spatial Data Infrastructure (GSDI) and attending in GSDI conferences. GSDI association is the first SDI global institute which pursues vast goals like promotion and increases the outreaching, information and standards exchanging in the field of infrastructural subjects in all levels of SDI from local to global.

Digital Elevation Model

Projection of land topography is one of the key elements of any topographic mapping activity and also many other products which need elevation data. Digital Elevation Model or the digital methods of storage and representation of relief and its applications to a large extent have merged with decision making support systems since computerization of those disciplines and fields. Most probably, DEM is one of the most commonly required data by the Geoinformation user community. Nowadays, suitable actions and proper decisions in any construction activity, even underground, cannot be made without relevant elevation information. DEM is a multi-purpose product, for example, the same set of data may be used for finding the best location for telecommunication antenna and mobile network analysis, and those same set of data can also be used for water shed management. DSM (Digital Surface Model) is another type of DEM which also presents height of buildings in urban area. It is utilized mostly for telecommunication applications. Hill-shading is a sophisticated cartographic presentation of DEM which can make a better looking maps with more understandable height visualization. Some of Iran's nationwide projects in DEM & DSM generation are as follows:

- DEM generation and national coverage, using topographic information from 1:25,000 scale map series, by NCC. It began in 2001, and for the time being,

- 3D data base for mobile network design using stereo satellite images and 1:250,000 scale map series.

- Hill-shading production for different thematic maps.

Education & Training

There are B.Sc courses in cartography almost in all geography departments of state or open universities. But there are no Master or PHD courses in cartography. Even in surveying engineering universities that geospatial sciences are more on consideration, post study courses in cartography as a presentation part of geospatial data processing, attention has not been located yet.
To solve the lack of experts, NCC has its own Surveying College. This college has the duty to educate necessary technicians for mapping projects, and also provide specific short courses for the staff of NCC and other applicants. These courses are intended to upgrade the knowledge to the latest technologies.

Other Activities

NATIONAL COUNCIL OF GIS USERS

As mentioned, NCC is the coordinator organization in National GIS and activities related to NSDI. One of the necessities of its duty is to define users and their information and interaction requirements. Any information system should meet the needs of the producing organization and also the working requests of users that it supports. The interaction with users of information systems implies that the user determines the usefulness of the system. Therefore, NCC has established a National Council of GIS Users (NCGISU) to collect user needs and to interact with them. Members of NCGISU are representative of all related ministries, and the Council has provincial branches in all provinces. Each provincial committee reflects its needs to the NCGISU and soon after discussion and improvement it will be considered by NCC to provide required changes.
The NCGISU has provided a five year strategic plan for 2010-2014. Eleven committees have been defined to execute the works of the council in this

plan. Creation of spatial database for main cities is one of the main tasks of the provincial councils. The NCGISU website with
(NCGISU.ncc.org.ir) has been launched this year.

GEOMATICS CONFERENCE & EXHIBITION

One of the most important activities and comprehensive gatherings within the GI Science community in Iran is the annual Geomatics Conference & Exhibition of NCC. All active organizations, academic centers, private sectors and individual specialist in all related subjects gather together within this great event to share their knowledge and experiences with each other.

The second International Conference and Exhibition on Mapping and spatial Information (ICMSI 2012) and the 19th National Geomatics Conference was held on 7-9 May 2012 by National Cartographic Center (NCC) of Iran. More than 460 papers submitted to the conference which 117 oral papers and 154 poster papers were accepted among them. The conference topics were included Geodesy, Hydrography, RS and Photogrammetry, GIS, Cartography and Geo-visualization and Common Themes.

Spatial crowd-sourcing

With the increasing number of voluntary contributors engaging in the movement of creating geographic information and sharing them via internet, a new term coined as Volunteered Geographic Information (VGI) is emerging as a new type of open source. Volunteered geographic information, known as user generated content, is the geographic data collected and disseminated by individuals at a voluntary basis. So far, a huge amount of geographic data has been collected due to the increasing number of contributors and volunteers. So, VGI can be one of the solutions to all geospatial data updating and maintenance challenges now faced by mapping organizations. However, there is growing agreement that it potentially represents one important channel of updates. For this reason, National Cartographic Center of Iran is doing some researches on various aspects and challenges of using crowd source for completing and updating existing data.