NATIONAL REPORT OF TURKEY ON PHOTOGRAMMETRY AND REMOTE SENSING FOR 2000 - 2004

Turkish National Society for Photogrammetry and Remote Sensing

KEYWORDS: Photogrammetry, Remote Sensing, GIS, Education, Spatial Information Sciences

ABSTRACT:

This report comprises activities, organizations and important events on photogrammetry, remote sensing and geographical information in the period of 2000-2004

1. INTRODUCTION

Although photogrammetrical applications have a long history in Turkey, these were implemented only in one or two public organizations for a long time. Historical developments of photogrammetric methods have taken place in these organizations.

Depending on the amendments in mapping regulations and classifications, private sector have also taken place in various applications for at least fifteen years.

Nowadays, geographical information is a necessity for almost daily life. Beginning from the vehicle tracking system, many practical applications depend on spatial information which are acquired by imagery and data processing. As a natural consequence, interest and activities in photogrammetry, remote sensing and spatial information fields are growing up both in public and private sector.

2. TECHNICAL ACTIVITIES

General Command of Mapping (GCM) is the national mapping agency of Turkey. GCM is responsible for 1:25.000 and smaller scale map production. Two Beechcraft B-200 are used for aerial photography with kinematic GPS hardware. 1:35.000 scale black-white aerial photographs in digitized format are used for 25K map production. All steps of the production are implemented by digital methods. 1/6 rate of existing maps are produced in digital vector format and remaining parts will be completed in 6 years.

Photogrammetric vector data are converted in to ArcInfo format to complete the cartographic process for printing. These are also data sources of topographic database.

Orthophoto maps in raster format via CD-ROM's using color-negative aerial films are another production of Photogrammetry Department. A software called "Orthophoto Presentation System" developed in that department is used to present existing ortophoto mosaics to the end-users is used. Software was developed according to the user's requirements and able to monitor any place in any scale, prepares any part of mosaic as output in desired scale and has some other functions.

In February, 2000 GCM started a project, called as DIMASMAP (Digital Map Supported Map Applications), which aims to develop a software to perform all applications done on paper maps, plus 3D visualization and GIS functionalities. This project has been completed in 3 months with release of the Version 1.0 of the DIMESMAP. This software makes use of GCM produced raster maps (JPG), matrix data (DTED) and gazetteers (MDB) in a encrypted format, so as to protect them from unauthorized use. The software itself is also protected by means of a soft lock based on hardware-locked user-id, which requires authorization after the installation.

As of the date June 2004, DIMASMAP-Version 1.7 has 252 functionalities which grouped into 13 modules, namely:

- Raster Map Applications
- Vector Map Applications
- Situation Graphics Applications
- 3D Terrain Applications
- 3D Simulation Applications
- Vehicle and Personnel Tracking Applications
- Traditional Database Applications
- GIS Database Applications
- Display Applications
- Query Applications
- Measuring Applications
- Gazetteer Applications
- Tools Applications

DIMESMAP has its own on-line-help system which makes it easy to learn and use by all levels of users from an enlisted man to the army commander. As of today, DIMESMAP is for military use only. Commercialization of this software for civilian users is still going on.

General Command of Mapping (GCM), as the National Mapping Agencies of Turkey, has the majority of the Topographic Data at national level both in printed - and digital forms. These data are comprised of

- Printed maps at medium and small scales (1:25 K and smaller),
- Raster maps scanned and geo-registered in projected and geographic coordinate systems,
- Digital terrain elevation maps as vector maps in various commercial formats (e.g, DGN, ESRI-Coverage, ESRI-ArcExport, ESRI-Shape, DXF),

- Cartographic vector maps at 1:25 K (ESRI-Coverage),
- Photogrammetric Vector Maps at 1:25 K (3D-DGN),
- Gazetteers (MDB)
- Digital Terrain Elevation Data (Level 1 and Level 2)
- VMAP –Level 1 Data

As of today, for whole coverage of Turkey, all printed maps, raster maps, gazetteers, digital terrain elevations maps and data have been produced using in-house developed systems based on commercial GIS, Digital Photogrammetry & Remote Sensing and CAD Packages. VMAP –Level 1 data are about to be finished for Turkey. The percentages of the completion for cartographic maps and photogrametric maps at 1:25 K scale are 25 % and 15 %, respectively.

As the data collection activities continue, the design of the topographic vector and raster databases has already been started in 2004 after the completion of the procurement of the GIS package ArcGIS-8.3 & ArcSDE-8.3, ORACLE-9i together with the relevant software training. The early results on these GIS activities are expected by the end of 2004. The next step is supposed to be disseminating and marketing GIS data by means of Intranet & Internet within the frame of National Geographic Information System of Turkey (NGIST-TUCBS) which is a sub-project in the "e-Government Turkey Project" commenced with the Executive Order (No: 2003/48, Date: December 4, 2003) of the Turkish Prime Minister.

While the conventional map production is currently obsolete, GCM has started a project aiming to develop a digital cartographic generalization production line. The aim is to standardize and automate the production of smaller scale maps (1:50.000 and 1:100.000) from the base map at a scale of 1:25.000. The project team has started to work in early 2002.

Another project in Cartography Department was development of a cartographic vector data library. Instead of archiving 25K digital vector maps produced in ED-50 or WGS-84 datum and UTM projection on CD-ROM's as separated digital files for each sheet, a digital seamless library has been designed as a new archive. For this purpose, all sheets are undertaken to a quality inspection, transformed to geographic coordinate system in WGS-84 datum and added to library.

Second important organization in related science and technology in Turkey is General Directorate of Land Registry and Cadastre (GDLRC). GDLRC has planned to establish a Land Registry and Cadastre Information System (TAKBIS) to improve land registration and cadastre data and operations. This Project shall result in implementation of a Land Information System to improve operations of the land registration and cadastre offices, and to supply appropriate land related information to all its users, both private and public, municipalities in particular.

The main objective of TAKBIS project is to create a "Land Registry and Cadastre Information System" throughout the country.

The objectives of the TAKBIS project are summarized as follows;

- To provide accurate, valid and reliable land information required for land and land–related activities and decision makers, to keep land registry and cadastral survey maps updated, to transmit all the data to the database, to keep updated data in a computer digitally, to re–access such data under the information and communication systems technology and to offer them for use.

- To transform land registry and cadastral survey works and information into a multi – purpose land information system by the participation of external users as well and to keep such data in a secure medium and to provide access to them in a secure way.

- To plan, manage and activate the services by the GDLRC in a better, faster, more reliable and more effective way, to ensure that the data given to other institutions and organizations are used more broadly.

New expectations occurred about all kinds of infrastructure services based on land such as new settlements and industry after the great destruction of the earthquake-1999. Therefore, the general objective has become to ensure reliable**,** easy and rapid access to land registration and cadastre data, to speed up cadastre renovation, and to implement spatial information technology. Thus, the general objective of this project is to establish Marmara Earthquake Region Land Information System (MERLIS).

The MERLIS will be used as a basis for reconstruction works in the earthquake region and especially in the determination and management of appropriate land that will be less affected from earthquake and to meet all the necessary requirements needed for a modern city management like appropriate configuration and construction. MERLIS will also be used in monitoring of resources, transportation planning, monitoring of the natural events and immediate interference, utility engineering, environmental arrangement and protection, expropriation, local management automation, planning and application of reallocation plans, real estate information system, facility management which all are effective in city management.

Municipalities are very important component for a city management and they will be included into the MERLIS network as external users.

The development of the MERLIS System as an expanded TAKBIS includes:

- design and development of additional software modules,
- implementation of MERLIS in three provinces of the Marmara Earthquake Region (Sakarya, Kocaeli, Yalova),
- training of local GDLRC's staff and users' staff, and
- putting MERLIS into operation.

Additional modules required to TAKBİS for MERLIS are:

- Buildings module with vector geometry and attributes most useful in the earthquake region, such as building unique identifier, address, use, year of construction, construction type, number of floors and total floor

area,

- Geological module with parcel-related information on suitability of land for construction in the earthquake region,
- Internet module to improve availability of cadastre, land registry and other MERLIS data.

The GDLRC will implement a set of projects to renovate cadastre and land registry in the three provinces which covers an area of 9351 km^2. In this concept; Marmara Earthquake Region Geodetic Control Densification Project by GPS are completed in 2003, 1/1000 scale digital photogrammetric map production projects in urban areas will be completed around December 2004. Cadastre renovation projects that cover 93 villages will also be completed early in 2005. Conceptual design of the MERLIS System and the plan of its implementation in Sakarya, Kocaeli and Yalova provinces (5 Cadastre Offices and 25 Land Registry Offices) are already prepared.

General Directorate of Forestry have also prepared a big project in Northern Turkey. The aim of project is to complete forest cadastre in that area by using 1:5000 scales digital vector and orthophoto maps to be produced by private sector in six months.

Another photogrammetric activity in that department is to produce 1:25.000 scale forest classification maps using colour-infrared aerial photographs. Colour-infrared aerial photographs are taken by GCM in almost 50.000 square kilometres in every year and thematic maps are produced by private companies.

Some other public organizations such as General Directorate of Rural Services (GDRS) and State Institute of Statistics (SIS) deal with remote sensing and information system in their activities. For example, GDRS has installed a new unit responsible for;

- Establishment of national soil and water resources databases,
- Producing of national soil and water resources services maps to be used as base elements for development plans,
- Solution of problems related to natural resources and administration using national databases.

Four main project have been implemented for above mentioned purposes. Updating of databases and data quality established in those projects have the primary priority.

- Soil database,
- Rural and agricultural infrastructure services database,
- Updating of Turkish General Soil Map (1:1.000.000) and report according to FAO-UNESCO Soil Taxonomy,
- Updating of land cover and land usage according to CORINE methodology by means of remote sensing techniques.

SIS has initiated a project called “Determination of Land Cover of Turkey” in 2001 and will be completed at the end of this year. The aim of the project is to determine agricultural areas, vegetation cover, forest areas, land usage classifications supporting the conventional methods by means of remote sensing and geographical information system.

Role of the private sector in photogrammetry, remote sensing and spatial information applications has also important in Turkey. There is a satellite imagery ground station called Inta SpaceTurk Inc. located in Ankara. That company deals with Ikonos imagery in its province of interest.

Many monopol municipalities made contracts with some native private companies to have city information system by means of photogrammetry and remote sensing methods.

3. EDUCATION

Education on Geodesy and Photogrammetry Engineering is given as 8 semesters in universities. A semester consist of 14 weeks. Four major components of education may be distinguished:

a. Basic studies (Semester 1-4; mathematics, mechanics, computer science, basics of surveying)

b. Specialized studies (semester 5-7; physical and satellite geodesy, photogrammetry, remote sensing, land planning and consolidation, engineering surveying, (GIS)

c. External practical work (60 days at governmental institutions and private sector),

d. Seminar study and diploma thesis (semester 8).

There are also 29 vocational schools (2 years) and some technical collages on geodesy and photogrammetry.

There are some institutes such as Geodesy and Geography Information Technology (GGIT) of Middle East of Technical University and Satellite and Space Science Research Institute (SSSRI) of Anadolu University give only Master of Science and doctorate education on photogrammetry, remote sensing and geographic information systems. GGIT has been founded in the 1997-1998 academic term and 41 Master of Science students have been graduated up to January 2004.

On the other hand, universities carry out some research and collaborative works with private and public sector on national and international level. Some examples on international projects implemented by Photogrammetry and Remote Sensing Departments of Istanbul Technical University are as follows;

- Monitoring of urbanization and land use changes at the Marmara Sea Coast-B.Çekmece District by means of integration of satellite data and conventional field data (ITU, TUBITAK, Russian Science Academy, University of Bristol).
- Use of space technologies for earthquake hazard assessment and monitoring, supported by the European Space Agency (ESA).
- The use and evaluation of JERS data capability for crop identification at the Trace in Turkey, supported by ESA.

- Monitoring land use dynamics for the city Istanbul, European Commission Joint Research Center, Institute for Environmental Sustainability.

4. IMPORTANT EVENTS

Except the hosting for ISPRS XXth Congress in Istanbul, some other international events related to concerned topics are as follows:

- Second International Conference on GIS for Earth Science Applications (ICGESA), September 11-14, 2000, İzmir/Menemen.

- Second International Symposium on New Technologies for Environmental Monitoring and Agro-Applications, October 18-20, 2000, Tekirdağ.

- 97th Science and Steering Committee Meetings of OEEPE (European Organization for Experimental Photogrammetric Research) 30 October-02 November, 2000, Ankara.

- Fourth International Turkish – German Joint Geodetic Days, April 3-6, 2001, Berlin.

- Second Symposium on Remote Sensing of Urban Areas, June 22-23, 2002 Regensburg, Germany.

- Third Symposium on Remote Sensing of Urban Areas, June 11-13, 2001, İstanbul.

- Third International Symposium on New Technologies for Environmental and Agro-Applications, AgroEnviron-2002, Egypt.

- International Symposium on Geographic Information Systems, September 23-26, 2002, İstanbul.

- First Symposium on Studying Land Use Effects in Coastal Zones with Remote Sensing and GIS, August 13-16, 2003 Antalya.

- XIXth International Symposium CIPA 2003 (International Scientific Committee for Documentation of Cultural Heritage), 30 September - 04 October 2004, Antalya.

- Fourth International Symposium on New Technologies for Environmental and Agro-Applications, AgroEnviron-2004, October 20-24, 2004 Udine, Italy.

Presented or published paper in any international journal, symposium, congress etc (except XXth ISPRS Congress) number is about 170 from only one university (ITU Photogrammetry and Remote Sensing Departments) in Turkey during the last four years period.