



## Economic and Social Council

Distr.: Limited  
24 November 2000

English only

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### Seventh United Nations Regional Cartographic Conference for the Americas

New York, 22-26 January 2001

Item 5 of the provisional agenda\*

#### Country reports

### Surveying, mapping and charting in Sri Lanka

Paper submitted by Sri Lanka\*\*

#### 1. Introduction

Sri Lanka is an island situated at the southern end of the Indian subcontinent between latitudes 6 and 10 degrees and longitudes 79 and 82 degrees. The topography of the country is featured with a central region surrounded by lowlands extending up to the Indian Ocean in all directions. The population is 18 million and the total land area is 65,525 square kilometres.

Systematic surveying in the country was entrusted to a formally appointed Surveyor General in the year 1800 and the mapping of the country was started nearly a half century later under the same command. Since then, the Sri Lanka Survey Department, headed by the Surveyor General, has expanded the activities to new areas such as aerial surveys, remote sensing, global positioning systems and so forth, and remains the national agency for surveying and mapping.

#### 2. National control network

Organization of a systematic horizontal control network was started in the year 1857 from a baseline measured on the western coastal area of the island and completed only in the year 1930 by closing on a similar baseline near the eastern coast. The whole exercise involved a comprehensive triangulation and a series of traverses of different orders of accuracy that would serve the purposes of the present day.

This conventional system, which served the nation for well over a century, had to give way to the modern technology with the advent of the era of the Global Positioning Systems (GPS). Conventional computations based on the regional system of Everest spheroid had to be linked to WGS 84 of the present day, by introducing appropriate parameters for conversion from the old system to the new one. A team from the Survey Department completed this task two years ago with a very good degree of reliability.

The vertical control, likewise, was started in 1900 and completed in 1930 by establishing a network of level lines of geodetic order of accuracy distributed across the land mass of the island.

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\* E/CONF.93/1.

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### 3. Cadastral surveys

Of all the activities carried out by the surveyors in the country, cadastral surveys draws most attention from all sections of public life. These surveys are going to be the basis of the system of Registration of Title recently introduced to the country to replace the system of registration of deed practised hitherto. The Parliamentary Act No. 21 of 1997 provides the legal support for the new concept that is becoming popular all over the country.

The programme, supported by the Government of Australia and the World Bank, is already launched in several key locations in the country. The survey activities in the project are being gradually accelerated in these areas and certain programmes have achieved their objectives. Current performance figures are identified below.

Number of land parcels surveyed	64,742
Number of land parcels for which plans were sent to the Registry	43,079

Final plans prepared for the contiguous area will be held in the computer database as a land information system. In addition to the fundamental spatial data, the other attributive data also will be held in this database so that the ultimate outcome will be a multipurpose cadastre.

### 4. Topographic mapping

The first task in the long history of topographic mapping by the department was the map of the country produced to the scale of one inch to eight miles drawn during the period from 1848 to 1856 using the plane table. When the demand for large-scale maps arose, the department produced the popular one-inch map series consisting of 72 sheets, which covered the country. This series of maps, which was very useful for all subsequent development schemes, was later replaced by a metric counterpart with 92 sheets drawn to the scale of 1:50,000. Some of the other maps in popular use are:

Base map series of scale 1:10,000	1,834 sheets
Town maps of scale 1:5,000	24 towns
Land use maps of scale 1:100,000	24 sheets
City of Colombo map of scale 1:1,000	

The map production is now exclusively done using the photogrammetric method, for which the department is fully equipped with an aircraft, studio, laboratory and plotting machines. The departmental systems are also fully computerized and the department is now in a position to market some of the products as digital data to users.

### 5. National atlas and thematic mapping

The department published the national atlas for the first time in 1988 and is now awaiting statistics from the national census, scheduled to be held early next year, to issue a revised and upgraded edition. The department also expects to release a digital version.

The publication of a school atlas in two vernacular languages, Sinhalese and Tamil, as an abridged edition of the original English national atlas is yet another achievement of the department in recent years.

The thematic mapping section of the department has released a number of maps for different users in the country. Among the maps issued, the ones on the following subjects are the most in demand: vegetation, tourism, soil, education and health.

The department has a printing section with up-to-date machinery that can meet the demand in country, and a network of sales outlets housed within the office system. As a result, the departmental products are available to users throughout the country.

### 6. Photogrammetry

The only agency in the country that has full range facilities to carry out this method of data collection properly is the Survey Department. This branch was started in the 1950s and is now meeting the needs of all

groups of customers. It is very popular among the students from universities as well as the public schools. Supplying ortho-photomaps and aerial photographs to users, in addition to processing of spatial data in conventional formats, is the main task of this branch.

The aircraft in use is now 20 years old and has shown the signs that the expiry period of useful lifetime is soon approaching. Under the circumstances, the department is preparing plans to replace it with a new plane that can meet future needs.

The latest development in this field, digital photogrammetry, is now successfully practised in the department. With the introduction of this technique, the department was able to accelerate the map revision programme, which was moving very slowly because of the conventional methods used hitherto. The use of the technology is considered a breakthrough in mapping activities that only the department could carry out.

## 7. Remote sensing

The department began to use remote sensing techniques in the early 1980s and started the pioneering work to provide spatial data in new formats to the users in development planning and research activities. Since then the Centre for Remote Sensing has issued one land use map series and two more are in production. In addition, the distribution of earth observation satellite data to other government institutions is also done by the Centre.

The introduction of this new space science technology was carried out nearly two decades ago with assistance from the University of Zurich, Switzerland. At present, however, due to high costs, the department faces some difficulties in the acquisition of current and high-resolution data.

## 8. Global Positioning Systems

The department played a key role in the introduction of the GPS technology in the country. There are already several sets of GPS equipment available in the department under the charge of qualified officers. The densification of the control points is the major task in which these officers and the facilities are engaged at present. Training has been

given to the others in the state and private sectors also according to the demand.

## 9. Geographic/land information systems

It is worth mentioning some facts about the situation in Sri Lanka regarding geographic/land information systems. As the leading spatial data provider in the country, the Survey Department has become the automatic focal point for the subject. However, there are more than a couple of government, semi-government and private sector agencies that operate their own Geographic Information Systems (GIS) with the help of the spatial data acquired from the department. There are some others who incorporate the satellite data directly obtained from satellite launching agencies abroad.

As far as spatial data is concerned, the Survey Department will maintain the following data sets and supply up-to-date information to the users.

Data on the scale of 1:10,000

Data on the scale of 1:50,000

Data collected for parcel-based cadastre surveys

The last of the three sets of data has just been started. It is going to be a very big programme accommodating data for nearly 6,000,000 parcels of land. The department is planning to also incorporate the private sector into this programme as it is understood that the resources at the disposal of the department are not sufficient to handle this gigantic task, which is expected to be completed within a limited time-frame.

## 10. National Hydrographic Office

The national agency for the hydrographic activities in the country is the National Hydrographic Office. Nearly two decades ago this institution was established through a joint project launched by the National Aquatic Research and Resources Development Agency, the Navy and the Survey Department of Sri Lanka. Now, after several successful years, the agency is capable of undertaking professional tasks of required quality and standard.

To date the Surveyor General sits in the Council that governs the affairs of the National Hydrographic Office.

## **11. Training and education**

Training and education was a major responsibility of the Survey Department until a few years ago. Some technical colleges in the country conducted technician level tutorial courses a few decades ago. Now, however, there is a university in Sri Lanka that conducts a bachelor degree course in surveying sciences.

The Institute of Surveying and Mapping functioning within the Survey Department conducts several courses related to the major discipline of land surveying. Higher diploma courses in surveying, bachelor degree courses in surveying sciences, advanced diploma courses in surveying and diploma courses for cartographic, photogrammetric and remote sensing technicians are the long-term training courses conducted by the Institute in addition to the various short-term revision courses.

Any further training required by the departmental staff on any specialized subject is organized in academic institutions abroad with foreign assistance. At present there is a need to get several officers trained at the M.Sc. and Ph.D. levels in order to upgrade the status of this premier seat of learning in the country. Some time ago, there was a request from new entrants to the profession to raise the educational level of the surveyors. This request has been taken note of and arrangements have been made to initiate degree courses in surveying sciences.

In the past, the department has also undertaken responsibility for higher education because of the inadequacy of resources for such a comprehensive task in the university system. At that time graduates also faced the problem of unemployment, as opportunities in the private sector were very limited. Now that the prospects in the private sector are gradually strengthening, the university system can increase the intake of students.

## **12. Organization of the profession**

The country has a well-established State institution and private sector involved in the survey and mapping activities. The private sector has a strength of personnel almost equal to the number in the State sector. However, the quantity of the work handled in the two sectors varies, depending on the subjects of surveying and mapping. The private sector involvement in mapping is limited to the publication of several thematic maps and school atlases, but their contribution to the surveying in development and real estate sectors are substantial.

The Surveyor General is the authority for the issues of licences for surveyors in the private sector. He is also empowered to maintain the standards and the discipline in the profession within the country. These licences are issued annually and complaints on the professional conduct of the individual practitioners are investigated by the Surveyor General.

## **13. International relations**

Professionals in surveying within the country have good contacts with international surveying organizations. In this sphere too the Survey Department plays the key role. The members of the departmental staff often participate in international forums. The International Federation of Surveyors, the International Society for Photogrammetry and Remote Sensing, the International Cartographic Association, the Asian Conference on Remote Sensing, the Commonwealth Association for Surveying and Land Economy and the Royal Institution of Chartered Surveyors are some of these key institutions with which the Sri Lankan professionals and organizations maintain good contacts.

## **14. Conclusion**

The discipline of surveying and mapping in Sri Lanka has a long history. The present Survey Department itself is more than 200 years old and throughout that long period it has been possible to maintain the standards of the practice and the quality of the products at reasonable levels. However, at present, survey organizations in the country need some assistance in certain spheres in order to upgrade the

efficiency and increase productivity to viable levels. Some programmes were launched in past years through the United Nations, for example, the modernization of the departmental training school into the present Institute of Surveying and Mapping.

The Centre for Remote Sensing and the procedures of the archiving of old records and the storage of digital data are all in need of support. Possibilities are being explored to obtain the support of foreign expertise for the elevation of general standards in these vital sectors.

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