

ECONOMIC AND SOCIAL COUNCIL

**Seventeenth United Nations Regional Cartographic
Conference for Asia and the Pacific
Bangkok, 18-22 September 2006
Item 6 (b) of the provisional agenda***

COUNTRY REPORTS

SURVEYING AND MAPPING IN SRI LANKA

Submitted by Sri Lanka **

* E/CONF.97/1

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SURVEYING AND MAPPING IN SRI LANKA

The Survey Department

The Survey Department of Sri Lanka is the National Surveying and Mapping Organization and also the national focal point of GIS and Remote Sensing with representation in Global Mapping Project organized by the International Steering Committee for Global Mapping. (ISCGM)

The Survey Department is the oldest Government Department in Sri Lanka established on 2nd August 1800.

Its strength is the technically qualified and dedicated personnel in Surveying and Mapping and allied fields exceeding 5000 in number under the leadership of the Surveyor General who is the head of Surveying and Mapping profession and thereby legally appointed as the chairperson of Sri Lanka Land Survey Council

There are 8 Provincial Survey offices, 22 District Survey offices and 82 Divisional Survey offices geographically located throughout the country which coordinates and carry out the various Surveys of national interest within the country. The Department also caters for the requests for Surveys made by government, Semi-Government institutions and local authorities.

Geodetic Surveys

The Geodetic Horizontal Control Network

The triangulation of Sri Lanka commenced in 1857 with the measurement of a base (one side of a triangle) in Negombo. Subsequently angles of a scheme of triangles taken up covering most of the southern half of the island, and connected to the Indian Triangulation by a narrow chain of triangles running roughly by way of Mannar-Delft, were observed.

The triangles were adjusted and the geodetic latitudes and longitudes computed on the Everest ellipsoid. Plane coordinates were computed using the Transverse-Mercator projection, with Pidurutalagala as origin. A re-computation of this triangulation, with a few additional triangles added, was carried out in 1888. Systematic large-scale surveys commenced around 1900 in many parts of the country, and during the first few years of the 20th century a good deal of triangulation of a primary order was carried out.

In 1929 it was decided to re-compute the triangulation a second time, for which purpose the two bases were re-measured more precisely with two astronomical azimuths observed, adding greater accuracy to the scheme. This re-computation was completed in 1933.

Still the triangulation was not of a geodetic or primary order, but the results were the best possible from the existing observations made during different periods. Figure 1 shows the Triangulation Network of the country.

The above triangulation system was not accurate enough to provide the required control for surveys carried out by accurate instruments, such as electromagnetic distance measuring equipment and total stations. The increasing demand to establish a national land information system also paved the path to establish more precise geodetic control network. In order to upgrade the Triangulation Network discussions were held and it was decided to increase the accuracy of the network by establishing a base station for Global Positioning Systems (GPS), with 10 secondary base stations at different locations. This involved measuring distance between base stations and control stations using GPS as well as precise electromagnetic distance measuring equipment, and re-computing the coordinates of the control network by network adjustment.

By using these GPS receivers of geodetic order distances were measured between base stations accurately in order to establish the precise control network. The longest line measured was from Jaffna to Matara, with a distance of 417.26674 km, to an accuracy of 3 cm.

Finally the coordinates of all control points were computed and published in 1999, with the average linear accuracy of the network system being 1:790,000. This network system is known as the Sri Lanka Datum 1999 (SLD 99). The transformation parameters between this system and Global system WGS 84 has been published by the Department.

The Geodetic Vertical Control Network

Trigonometric Heights

For the purpose of the topographical survey, the heights of triangulation stations were calculated from reciprocal vertical angles, based on the determination of the mean sea level at Galle, Colombo and Trincomalee between 1884 and 1895. Heights were derived for stations all over the island, and were used for the interpolation of contours during the whole of the topographical survey.

Precise Levelling

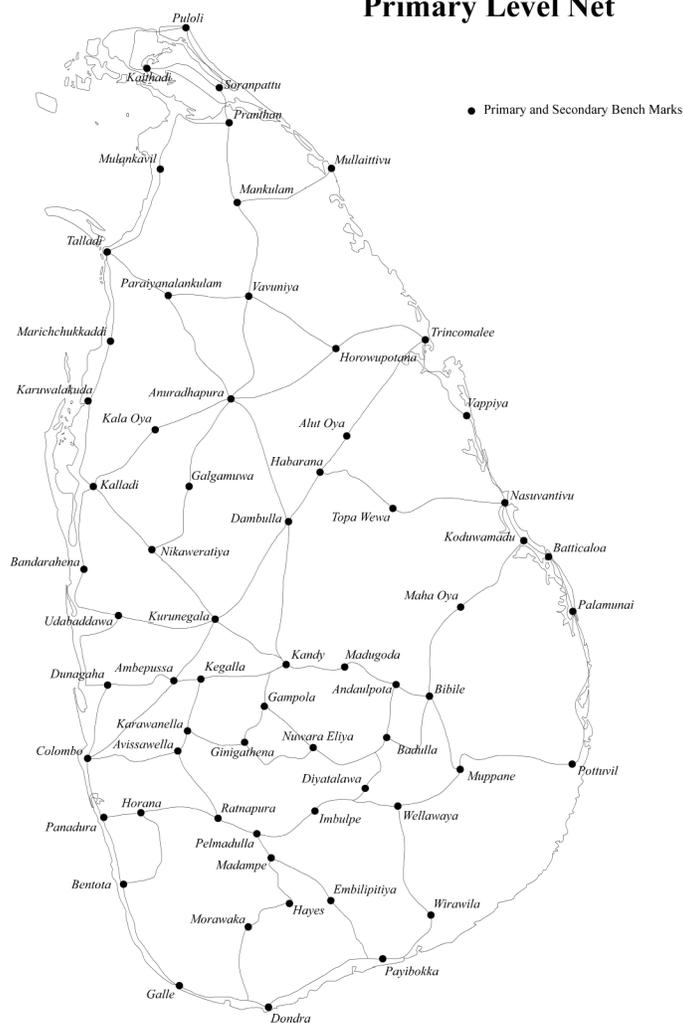
Until 1909, levelling (as the procedure to determine heights between points on the earth's surface) had been undertaken as and when the need to meet immediate engineering survey requirements arose. From 1909, levelling operations were undertaken in a more systematic manner, but had to be stopped in 1914 on account of World War 1. Upon recommencing in 1925, it was decided to start afresh. The reasons were mainly the unsuitability of the earlier methods of levelling and the limitations of the equipment used for establishing precise height points over the country. The re-levelling was done with precise levels as well as invar staves, and great care was adopted in levelling procedures, in order to achieve results of the highest accuracy. The geodetic levelling comprises of 4000 km of double-levelling forming 27 circuits. The primary network covers the entire country and compares favourably with levelling of high precision in other countries of

the world. From then on, this levelling has been extended by secondary, tertiary and minor levelling to provide height control for all development projects in Sri Lanka including the Mahaweli Scheme. Figure 2 shows the primary precise level network of the country. All these height control points are monumental and maintained by the Survey Department.

Figure 1



Figure 2



Engineering Surveys

These Surveys have been carried out by the Department mainly for development projects carried out in Sri Lanka. This category includes all contour surveys required by the Irrigation Department and other Government Departments and Statutory Bodies for the purpose of designing engineering projects of various kinds. The majority of these contour surveys are for irrigation, flood protection, designs, construction of roads, railways, and water supply & drainage.

The survey requirements in these schemes vary from type to type and departmental standards are available for each type of survey.

Land Information Systems (LIS)

One of the important activities of the Survey Department is to supply the land information to the government institutions and to the general public.

The functions are:

- Issue of copies of plans
- Court Commission Surveys
- Preparation of Final Village Plans
- Maintenance of old records
- Issue of Survey Diagrams

The Department possesses a huge number of old Title Plans, field sheets etc. which need to be preserved for next generations to come. Having initiated the measures to protect these documents in 2006, the department has commenced scanning and archiving these valuable documents.

Land Titling and Related Services Project (LTRSP)

Present land registration system in Sri Lanka has many drawbacks which are very clearly seen and experienced. The land itself is not properly identified and ownership is not guaranteed by a deed in the existing registration of deeds system.

A learning and innovation pilot project initiated to identify and develop methodology, legal framework and Institutional arrangement for Land Title Registration in Sri Lanka.

The project was considered as the best method for a rapid and economical land titling system. It was launched in March 2002. The main activities of the Department for this project include Surveying and Adjudication. Initially five Divisional secretary areas were selected as project sites. 17063 land parcels have been surveyed and title certificates were issued to the public. On the results of this pilot study it has been decided to expand title registration programme to cover entire country and will commence in 2007.

Remote Sensing

The Center for Remote Sensing (CRS)

Satellite Remote Sensing was introduced to Sri Lanka Survey Department in late 1970's. The Sri Lanka Center for Remote Sensing at the Survey Department act as a central organization for Remote Sensing related activities in Sri Lanka. The goal of the CRS is to carry out specific operational work related to the Remote Sensing specially interpretation of aerial photographs and satellite images. The main task of this activity is to support and

supplement the existing mapping (Land use maps, Image maps etc.) and related services in Sri Lanka. The CRS also maintains satellite image archiving for Sri Lanka.

Digital Topographic Base Data for GIS Applications

Until 1992, the Survey department produced and supplied topographic data exclusively in the form of printed maps using conventional mapping techniques.

The department has commenced digital data compilation by photogrammetric methods in 1992, and commenced digitizing existing topographic maps in the late 1990s. The department has completed digitizing 1:50,000 topographic map series, and 1:10,000 series is now in progress. Digitizing of 1:250,000 map of Sri Lanka consisting different layers has also been completed.

With these data, the Survey Department has established digital topographic vector databases for GIS applications, which are available for other institutions in Sri Lanka.

The topographic vector databases comprise many different data layers that vary slightly depending on the scale.

The databases are in the form of Arc Info coverage and organized in the form of tiles as shown in the grid index for topographic mapping. The data can be supplied either as separate tiles or even combination of many tiles and in the form of original data format, or as shape files or as DXF files. Many government Departments and other Institutions obtain different layers of this vector data according to their individual needs.

Topographic Mapping

The Department produces two types of Topographic maps 1:10,000 and 1:50,000 mainly for the benefit of defense, planners, and academics for the student population in Sri Lanka. The 1:50,000 series commenced in 1978 and finished in 1996 replacing the 1:63,360 Topographic map series known as “one inch series” produced by the British rulers.

There are 89 sheets at the scale of 1:50,000 covering the entire island and 1832 sheets cover the same area at 1:10,000. However 56 sheets of 1:50,000 still categorized as Interim series since they were produced using the half-mile plain table boards which were the base for the one-inch series. There are 33 sheets produced by stereo compilation, plotting from aerial photographs. All 89 sheets are periodically revised by the field surveyors. Between years 2000-2005, only 70 out of 89 sheets have been revised and printed.

Out of 1832 sheets at 1:10000 only 803 sheets have been produced by stereo compilation. In 1992 the method of compilation changed to digital format.

At present department is enriched with ten semi-analytical plotters, two analytical plotters, two digital workstation and 7.2-120 micron high-resolution photo scanner. It produces high quality orthorectified, and geo-referenced aerial photographs too.

Field checking for map compilation is also now carried out for 1:10,000 series digitally as well as by ground survey methods.

The Department has launched a new experimental digital series at 1:50,000 by generalizing the 1:10,000 maps to replace the Interim series. Experiments have been carried out to explore the possibilities of using software for the generalization. It is planned to launch this new series in 2007 and the Department would have series of workshops to enlighten the map users and student population before replacing the existing series.

Thematic Mapping

The Department produces a variety of thematic maps for the map users. They are particularly useful for the general public and students. They could be generally categorized as follows:

Educational maps
Road Maps
Land Use maps
Historical maps

Town Maps
Tourist Maps
Administrative maps

Some of the town maps including City of Colombo are available in digital form. In addition Survey Department caters of customized requirements and a large number of tailor-made maps are produced annually to the individual requirements. Thematic maps are also available in book form as School Atlas, Town Atlas, and Road Atlas.

National Atlas

The Department has undertaken the tremendous task of producing the second edition of National Atlas following the pioneering effort of the first edition, published nearly two decades ago. In this second edition of the National Atlas there are 71 map titles supported by texts, full page maps small maps, tables, diagrams & statistics and photographs. It covers the following fields; Physical, Archeology and Art, Population, Agriculture, Transport, Industry and power, Commerce, Economy, Government, Administration and Justice, Social Conditions, Education and Training etc. This Atlas is a collation of information representing what can be considered the most physical and social characteristics of our country. It gives a many-faceted image of Sri Lanka and also provides succinct information to interested persons at home and abroad. Addressed to the general reader, it also provides information to a constituency ranging from the specialist to the young explorer with easy access to comparative material over a wide range of subjects. The Atlas is scheduled to be completed and on sale by early 2007.

Institute of Surveying & Mapping, Diyatalawa (ISMD)

Prior to 1967, the training activities were purely confined to training of surveyors for Survey Department. Afterwards, the institute, being the largest and leading institute that provides training in surveying has gradually taken over almost all the basic training needs of the Survey Department and some other organizations at their request.

With the rapid and continuous development in the profession of surveying and mapping, ISMD is appropriately changing its functions so as to fulfill the current needs. The main functions of ISMD at present can be categorically given as;

- to promote the sound application of surveying and mapping technology through programs of education, research and advisory services
- to hold examinations for the purpose of ascertaining the persons who have acquired proficiency in surveying, levelling and mapping, photogrammetry and remote Sensing
- to grant diplomas to persons who have pursued approved courses of study in the institute and who have passed the examinations of the institute
- to grant the degree in surveying sciences to persons who have pursued the course and been successful at the examinations. Post Graduate degree course known as Higher Diploma Course is also available for those who pursue career advancement. However both these courses have been limited to the officials in the Department.
- to update the knowledge and skills of relevant officers, organize regular refresher courses .

The Survey Department has two annual publications namely “Survey Journal” and “Performance Report”.

The Survey Journal contains articles of technical or research or management or legal nature written by the departmental staff.

The Performance Report basically contains the performance by the Department in a particular year under the subtitles of Human Resources Management, Financial Management, Physical Resources Management, Activities in Surveying and Mapping.

Consultancy Services

These services are provided to the organizations on their request for technical assistance related with the survey profession by the officers attached to the Department having specialized professional skills. Customized services and consultancy services on surveying and allied fields are undertaken only on requests of Government/Semi-government organizations.

Supervisory Services

These services are provided to any Government Organization or a Statutory Bodies when they need to supervise the work done by survey professionals in the private sector.

Land Survey Council

The Survey Department has a major role to play in the Land Survey Council established in pursuance of the Survey Act no. 17 of 2002.

The Surveyor General is the Chairman of the council and the Additional Surveyor General serves as the Vice Chairman. Director, Institute of Surveying and Mapping is a member and all of them are considered as ex-officio members.

The other members are called appointed members and three members are nominated by the Survey Institute of Sri Lanka and one academic member is nominated by the University Grant Commission.

The Survey Act stipulates the powers and functions of the Surveyor General in general act in the Land Survey Council.