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Country Report - Sri Lanka

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1. The Country

In the emerald-green waters of the Indian Ocean, the island country of Sri Lanka formerly called "Ceylon", frequently referred to as the "Teardrop of India," was first populated by the Sinhalese peoples from northern India in 543 BC. The nation has a total area of 65,610 km², with 64,740 km² of land and 870 km² of water. Its coastline is 1,340 km long. The main island of Sri Lanka has an area of 65,268 km²; it is the twenty-fifth largest island of the world by area. Sri Lanka is a tropical country which is located closer to the equator. The geographical location of this island is latitude 5.55" to 9.51" and longitude 79.41" to 81.53" east. The breadth of the country is 224km and the length is 432km.

(Source: https://en.wikipedia.org/wiki/Geography_of_Sri_Lanka).

2. Geo Information Evolution in Sri Lanka.

To the first map available of Sri Lanka drawn based on calculations and descriptions given in "Geographia" authored by Ptolemy (Claudius Ptolemy) in 150 AD, Sri Lanka, identified as Taprobana, was an island positioned close to the western coast of Southern India. As European influences spread throughout southern Asia in the 16th century, Sri Lanka was eventually occupied by the Portuguese and then later, in the 17th century, the Dutch. In 1796, the island was ceded to Britain by the Netherlands, and became a crown colony in 1815. Before the arrival of British, both Portuguese and Dutch people collected Geo information and made few country maps due to the trade manner.

British interests developed the country and due to that, the Survey Department came into existence in 1800 A.D. The fact that the Survey Department was one of the first departments to be established under the British rule amply proves the importance of surveying of land for the effective governance of a country. British first conquered the maritime provinces of Sri Lanka. The Survey Department being **219** years old has served nearly three fourth of its age under British rules and influences.

The Survey Department of Sri Lanka is a body within the Ministry of Lands & Parliamentary Reforms. As the oldest Government Department of Sri Lanka, Sri Lanka Survey Department (SLSD) is the National Surveying & Mapping Organization pioneering the fields such as Land Surveying, Mapping, Satellite Remote Sensing (RS), Global Positioning System (GPS), Geographical Information Systems (GIS), Land Information Systems (LIS), Geo Names (Geographical names) and NSDI (National Spatial Data Infrastructure), Airborne Remote Sensing and Photogrammetric activities in Sri Lanka.

Those fields were become more IT contributed fields today as the fast development of ICT technology related to those fields, the department drive towards new direct to increase its efficiency.

Survey Department is led by the Surveyor General and has a total workforce about 7000 personnel, including approximately 900 surveyors supported by about 5000 Survey Field Assistants. The Department has Provincial Offices headed by Provincial Surveyor Generals, District Offices and Divisional Survey Offices each of which covers 2-3 Divisional Secretariat divisions. There are 94 Divisional Survey Offices servicing the 334 Divisional Secretariats. Furthermore, Divisional Survey Offices also support the activities of land administration and management technically at the District level.

Major Institutional Role and Responsibility of Survey Department is:

Standardization and production of all Surveying and Mapping in Sri Lanka Establish and administer the National Geodetic Control Network Produce and maintain records of topographic, thematic and special purpose maps Provide land surveying, land information and related services. Establish and administer a system of accreditation for registered surveyors Receive, approve and maintain cadastral surveying records.

SLSD authorized is to collect land information under the major Acts such as; Survey Act - No.17 of 2002 Registration of Title Act – No. 21 of 1998 Partition Act – No. 21 of 1977 as amended Departmental Survey Regulations, 5th Edition 2015 Survey Department Standing Orders, 13th Edition UDA Regulations for the Sub-Division of Land.

3. Role of Survey Department, as the National Mapping Organization.

3.1 As a producer of Geospatial Information

The Survey Department was mainly involved in Block survey at the initial stages of its establishment. The scope of the Department has been widened in greater scale over the years. Currently, it has been involving in many segments of surveying and mapping such as Topographic mapping, Geodetic surveys, Ortho-photo map production, Cadastral surveys, GIS and LIS databases etc. It applies modern technologies including Remote Sensing, Photogrammetry, Global Navigation Satellite Systems, UAV Surveys, among others, for surveying and mapping activities of its mandate.

In early stages, Entire Island was mapped using plane table method at the scale of one inch to one mile. This map series popularly known as “One Inch Maps” consist of 72 sheets. During the period 1980 - 1997 the department has produced 1: 50,000 Topographical maps for the entire island by combining these one inch maps and aerial photographs.

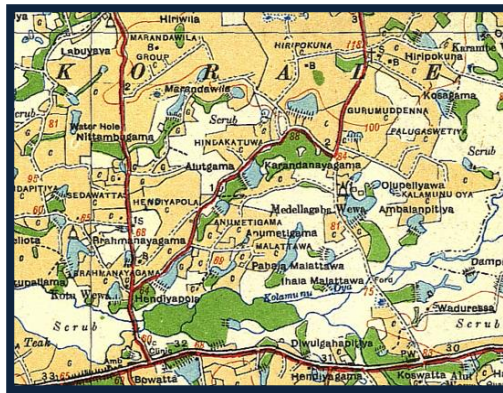


Figure 1: One inch Map Series



1:50000 Map Series

The department is engaged in producing 1 :10,000 map series consist of 1834 sheets using photogrammetric methods and high resolution satellite images. Sri Lanka was completely Aerial photographed at the scale of 1: 40,000 in 1956. Subsequently country has been photographed again at the scale of 110,000 and 1: 20,000.

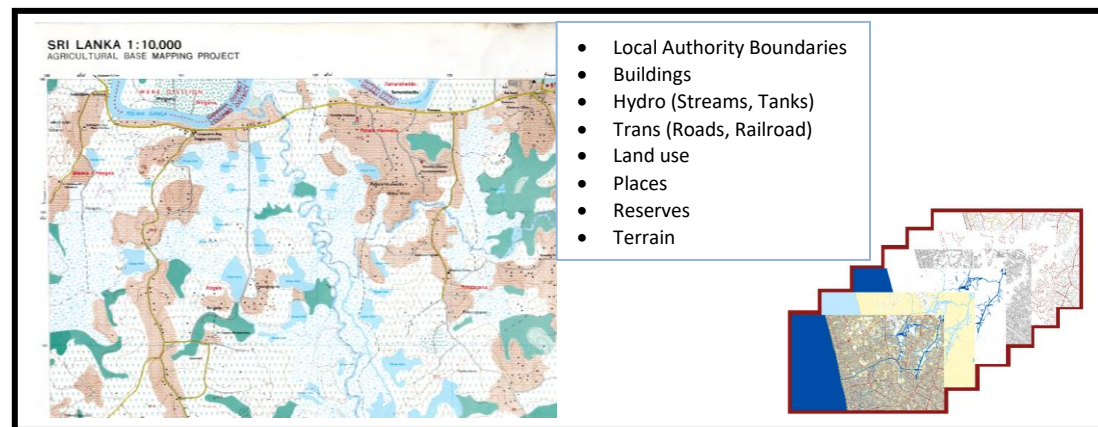


Figure 2: 1:10,000 Digital Database Information (Data Layers)

Since 1999, the department has introduced geodetic type Global Positioning System (GPS) receivers to determine the co-ordinate values of the ground control points.

A geodetic control network has been established throughout the country. Various activities of geodetic surveys were carried out over the past 20 years.

Precise leveling and measurements of previously established geodetic control points with the Global Positioning System are its present activities. Recently, steps have been taken to determine the national geoid of the country in order to facilitate the Mean Sea Level applications for the entire country.

The department entered the mainstream of developments in computer assisted technology for mapping in 1992 at photogrammetric branch for data collection. The GIS branch was established in 1999 and started with commenced of digitizing printed 1:50000 & 1:10000 scale topographic maps in order to create the digital topographic database.

Then the existing digital data of 1:10000 were converted into GIS format with different layers. With these data, the Survey Department has established digital topographic vector databases for GIS applications which can be supplied for the users.

The digital topographic vector databases comprise of eight different data layers that vary slightly depending on the scale. The data file contains eight different layers such as administrative boundaries, buildings, transport, hydrology, terrain, landuse, toponomy & utility.

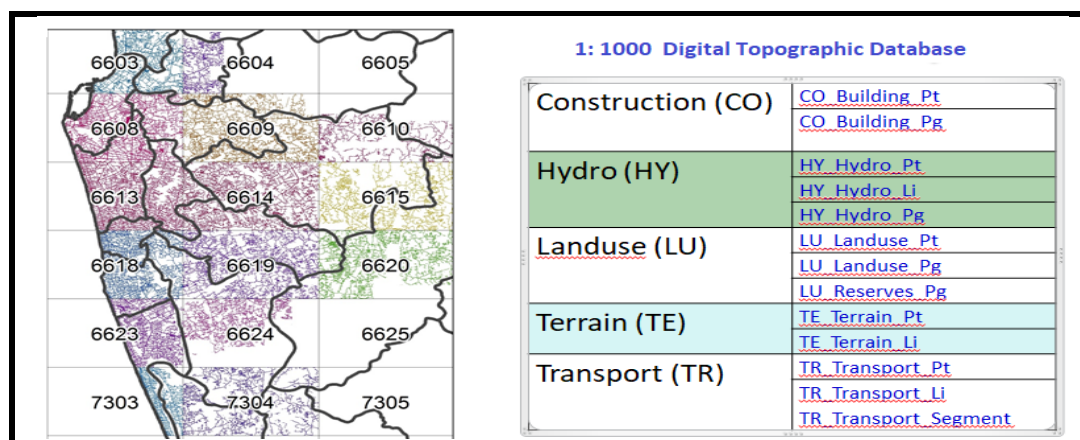


Figure 3: 1:1000 Digital Database Information

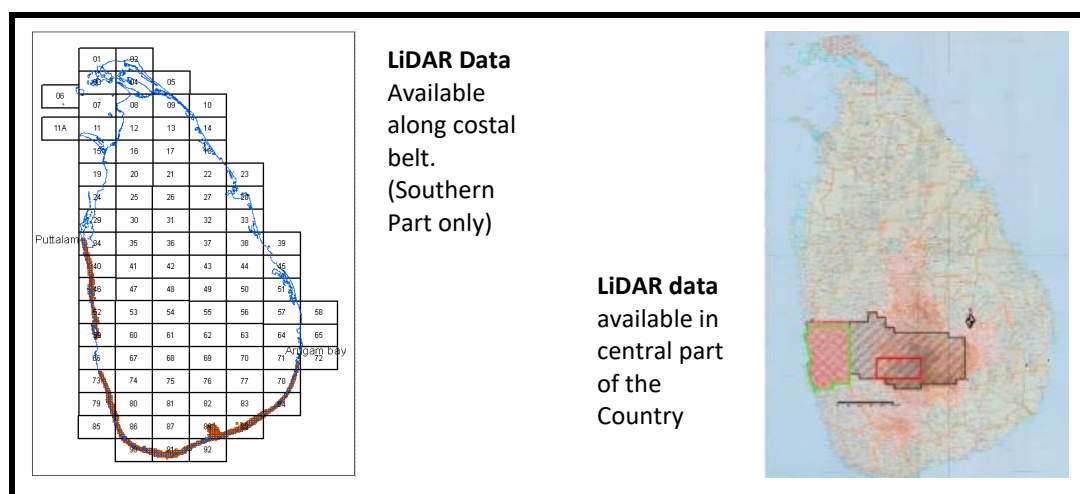


Figure 4: Availability of LiDAR Data.

Issues related to land information has been longstanding barrier for utilization of Land as a tool for generating capital. **The Survey Department provides e-services for citizens of Sri Lanka**, hence the objectives of e- services is to provide a solution to the above issues and to ensure convenient access to land information, registration information, facilitate development of access to the local authority boundary information, Map information while the safety of documents and providing a speedy and more convenient and economical service to General Public and other government organizations.



Figure 5: 219 Year continuous Service for the Country. <https://www.survey.gov.lk>



Figure 6: Survey Department provides e-services for citizens of Sri Lanka

The Survey Department of Sri Lanka is on the threshold of breaking new frontiers in their profession to resolve this problem by extending beyond its traditional applications of mapping, to establish a Land Information System [LIS] which is a groundbreaking concept in Sri Lanka. The 'Land Information Systems', is the infrastructure that allows users to access the Government's significant land and geographic information resources from a one stop 'shop' with the help of the Global Information System [GIS].

In Sri Lanka registration of deeds was proposed to be replaced with registration of title system, introduced by the Registration of Title Act 21 of 1998. Under this system certainty of ownership of a land is guaranteed by the government, taking away repeated examinations of the past title. Therefore, title registration is expected to minimize land disputes across the systematic Cadaster surveys throughout the country. Survey Department has already engaging on preparation of Cadaster Plans.

Surveyor General, Being the responsible authority for the LIS of the country, mandated by the Survey Act No. 17 of 2002, launched LIS through the worldwide web as a dynamic product of the Survey Department; the National Institution, which leads in all the developing projects in Sri Lanka.

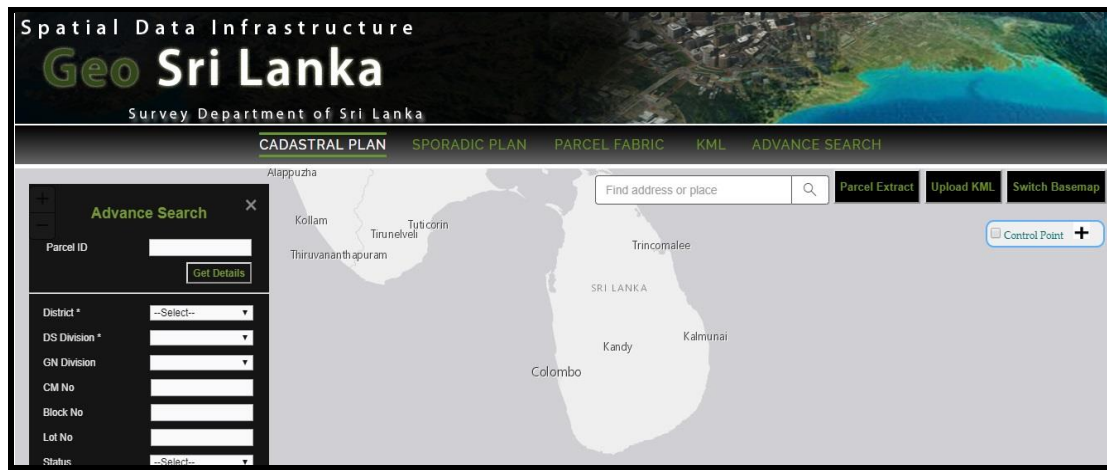


Figure 7: LIS Web portal https://www.survey.gov.lk/nsdi/lis/index_cad.php

LIS is a 'Tool for legal, administrative and economic decision making support and an aid for planning and development, which consists of a database containing spatially referenced land related data for a defined area and procedures and techniques for the systematic collection, updating, processing and distribution'.

The LIS has been sourced with the field surveyed data under the Land Title Registration Project. The Digital Geo-spatial data collected for preparation of Cadastral Maps have been processed to create a parcel based LIS and attributed with Tenement Information, collected for the requirements for issue of land titles.

The individual land parcels of the published area can be interactively visualized with the related attributes. However, the parcel ownerships have been censored at owners' identity and secure purpose. The information of the progressive areas at availability of field surveyed data has been published and the system will be updated for new surveys in due course. Land information can currently be viewed in LIS Web Site.

Estimated number of parcels for the entire country is around 12 million parcels. The department introduced digital land Information System (LIS) in 2003 and accelerated from 2009. Up to now, we have completed around 1,368,000 land parcels and inserted into the LIS database. The Survey Department is being strategically re-organizing its system architecture of the Land Information System in order to facilitate the customer needs.

Centre for the Remote Sensing was established in 1980 with the commencement of the Swiss/Sri Lanka Satellite Remote Sensing Project. Satellite Remote Sensing was introduced to Sri Lanka Survey Department in late 1970's. The Sri Lanka Centre for Remote Sensing of the Survey Department is the focal point of the Satellite Remote Sensing under the UN-ESCAP since 1996.

The principal triangulation of Ceylon began in 1857 with the measurement of the Negombo baseline. The triangulation observations were made with 8-inch and 13-inch vernier theodolites, and were completed in 1885. This triangulation was subsequently connected to the Indian Triangulation in 1887.

In 1993, Survey Department decided to establish a new Sri Lankan horizontal geodetic control network and thus datum using only GPS. The survey took nearly two years (1996-1998). This led to the [horizontal] Sri Lanka Datum 1999 (SLD99). The previous network was revised and upgraded at the same time as SLD99 and made available for use in Sri Lanka since 2000. The national map-grid coordinates, termed SL_GRID_99.

The coordinates of SLD99's origin point at Institute of Surveying and Mapping, Diyatalawa (ISMD) were determined from two GPS baselines to the DORIS (Doppler Orbit Determination and Radiopositioning Integrated on Satellite) station at the Surveyor General's Office (SGO) in Colombo (COLA; DOMES ID 23501S001), which was active from 1991. International DORIS Service--<http://ids.cls.fr>.

Sri Lanka Continuously Operating Reference Station Network (**SLCORSnet**) comprises of physical GNSS reference stations at remote designated locations that transmit the collected GNSS raw data live to the Control Centre based in Colombo at the Survey Generals Office. This raw data is processed using a GNSS network processing software housed at the Control Centre which then will be transmitted to the users in the field over the internet based on their geographic location in the form of RTCM corrections.

Online delivery of RINEX raw data and online post-processing services are provided as real-time web services from the SLCORSnet. Once, registered under SLCORSnet and once user has purchased these services, and allowed to use these services freely during the subscription period.



Figure 8: SLCors Net Web portal <http://www.slcorsnet.survey.gov.lk/>

SLCORSnet provides:

- Provides real-time GNSS corrections to any industry that needs centimeter level real-time positioning accuracy using widely known correction methods such as VRS, FKP or MAC.
- Also provides live-streaming of DATUM transformation parameters coupled with standard RTCM.
- Provides GNSS Raw data within the network in RINEX or Virtual RINEX formats for any physical reference station or virtual point on the grid.
- Provides real-time on-line based fully autonomous GNSS post processing service.
- Provides real-time monitoring for all active GNSS peripherals in the field as long as its connected to the SLCORSnet.

3.2 As a disseminator of Geospatial Information

As mentioned above, Survey Department has produced various kinds of geospatial information products. Currently, the department is in a position to provide such geospatial products, including Geodetics control points, Aerial photographs, Topographical maps, land Use Maps, and Cadastral data to government and private organizations useful for any kind of development, and research and planning activities.

The dissemination of the geospatial products is done in analogue as well as in digital format. The Department charges nominal fees for the data. Available digital data for users: 1:250,000 , 1: 50,000 and 1:10,000 data for entire country , 1:5000 covered only 24 town areas, 1:2000 covered only Colombo and suburbs, Color/BW Ortho images, Scanned aerial photographs, Digital Orthophotos for Northern area and Digital enlargements of aerial photographs etc.

3.3 As a nodal authority for National Spatial Data Infrastructure

Sri Lanka implemented a National Spatial Data Infrastructure (NSDI) program. NSDI has been identified as one of the key initiatives under the National Digital Policy - “Digitalization of the Economy” by the Government of Sri Lanka.

Survey Department has undertaken an initiative for establishing national spatial data infrastructure in the country since 2001.

The primary focus of NSDI is to create world-class infrastructure and solutions that will enable spatial data standardization, avoid data duplication, improve data quality, improve transparency in data sharing across departments and provide a technology platform for developing spatial data decision support tools.

This NSDI platform which facilitates the public to access geospatial data was launched. Accordingly, geographical information on a particular location could be obtained via this platform that comes with a website, a metadata catalogue and a geo-portal for accessing data.

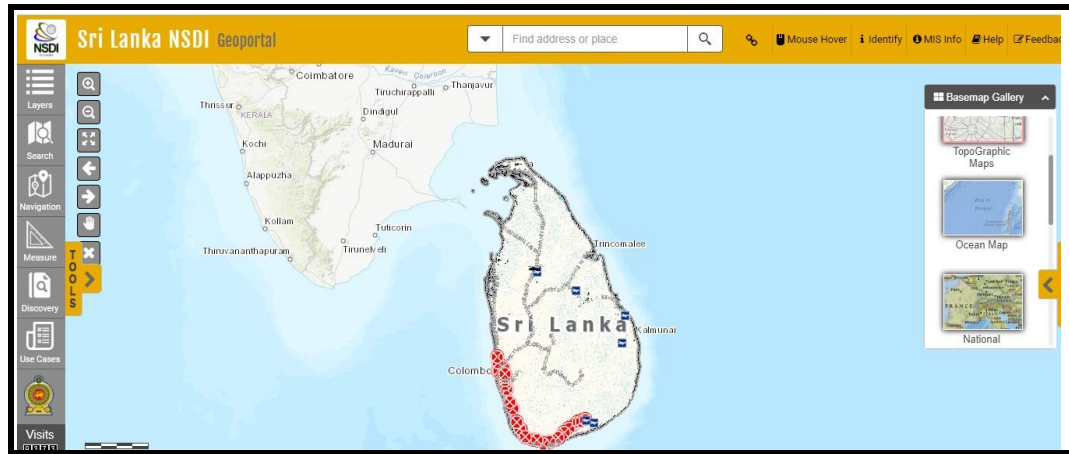


Figure 9: NSDI Web portal. <https://www.nsd.gov.lk/>

The project is making its best effort to bring all the stakeholders including governmental, non-governmental and private sector organizations working in the field of geospatial information in its network. The Survey Department has still to work hard for achieving expected progress in this sector.

NSDI work Plan is conducted by ICTA with the collaboration of Survey Dept. Main activities are Conduct a baseline survey on NSDI, Requirement study of the NSDI, Development of NSD policy, Preparation & migration of existing data, Legal background study for assessing legal amendments and new regulatory requirements for NSDI and **Establishment of Geo Portal- Phase 1 and 2.**

At present **Phase 1** is already completed, such as Uploaded layers can be viewed, Data discovery, access and visualization of spatial data, Metadata Catalogue for uploaded data set and case applications are developed for raise awareness about the NSDI and the role of the Geo Portal Disaster Management.

Phase 2, to be implemented such as establishment of the spatial data content management system which handles import data, upload data, export data, share and query, view, analysis, publish and printing.

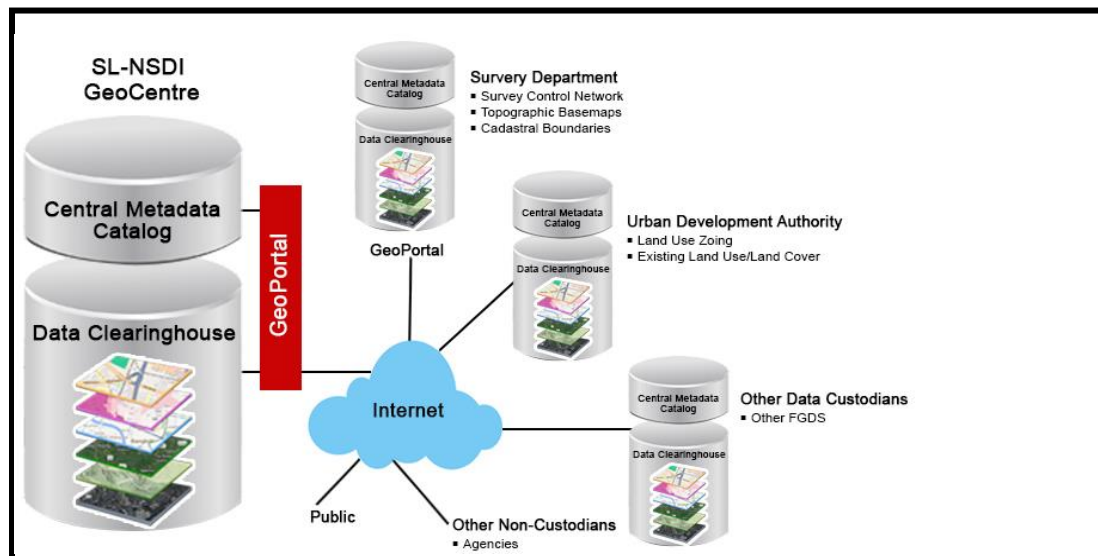


Figure 10: Structure of NSDI- Sri Lanka. <https://www.nsd.gov.lk/>

SL-NSDI Steering Committee provide leadership in support of the NSDI program and administered under the Department of National Planning (NPD), co-chaired by the Secretary, Ministry of National Policies & Economic Affairs & Surveyor General.

3.4 As an active partner of Geographical Names Regulatory Board (GNRB)

SLSD has already completed standardization of geographical names in Sinhala and Tamil languages of existing features such as names of places of interests, administrative units, and names of roads and water bodies, collected at village level and further refined getting feedback from local authorities by publishing these standardized geographical names online. There was a national committee involved in verifying standardized data performed based on a set of principles and guidelines. Standardization process started in the year 2015 and was successfully completed at the end of year 2018.

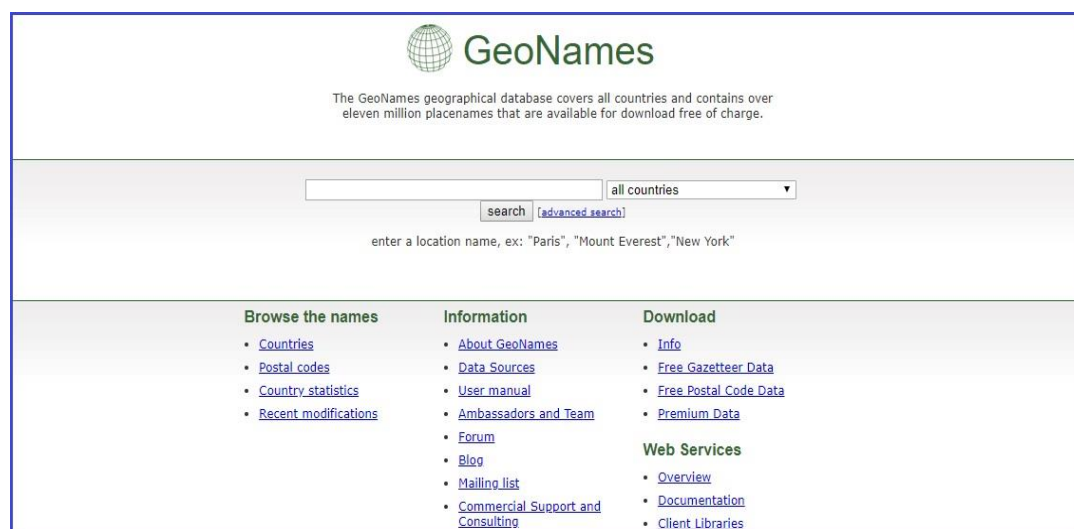


Figure 11: GeoNames Web portal <https://www.geonames.org/>

The existence of the national committee for standardization of geographical names ended in the same year 2018. About three hundred thousand standardized geographical names are now online for public reference and use. Steps are now being taken to make government organizations aware of the availability of these geographical names with spatial locations with a view to enabling those entities to utilize such standardized names in official use with ease. One of the other important goals SLSD has achieved is the formulation of a Romanization System for Sinhalese language, which was a long felt need especially required by the tourists to correctly pronounce Sinhala geographical names if published in Romanized characters especially on tourist maps.

3.5 As a regulatory body of Geospatial Industry

In recent years, the Department is gradually changing its role of providing surveying and mapping services in the country to assuming a lead role in regulating the national surveying and mapping activities. The Land Survey Act and corresponding Regulations have mandated the Department to issue surveying license to the professionals, individuals as well as organization, endorse technical specifications for any kind of surveying and mapping activities carried out through public fund, and control the unauthorized production of geospatial data.

Institute of Surveying and Mapping Diyatalawa (ISMD) recognized as a Degree awarding institute). Institute of Surveying and Mapping is the place of to promote the sound application of surveying and mapping technology through programmes of education, research and advisory services

The necessity of the advanced training facilities in Land Surveying and related fields in order to award degrees and diplomas, for instance postgraduate diploma, arose considerably during the recent past.

As Sri Lankans, we were thoroughly depending on institutes abroad for such professional level and Land Survey related needs. Only few officers in the Survey Department would secure such opportunities by way of foreign grants and scholarships. Hence, it was of great importance to upgrade the Institute of Surveying and Mapping as a degree awarding institute in Surveying Sciences.

This degree course has been designed so as to provide knowledge in Photogrammetry, Remote Sensing, Hydrography and Cartography other than Geodesy and Land Surveying. It consists of subjects such as Land Law, Land Valuation, and Environmental Studies, IT which make it suitable for Land Administration as well.

Institute of Surveying and Mapping obtained academic membership of International Federation of Surveyors (FIG) and Membership No: AC-40146. Survey Department has maintained academic collaboration with other degree awarding institutes such as University of Sabaragamuwa and Kotalawala Defense Academy, which are awarding Degree of Surveying Sciences in the Country.



Figure 12 Institute of Surveying and Mapping, Diyatalawa, Sri Lanka <https://www.survey.gov.lk>

4.0 Key Implementation areas for Geospatial Information sector in SLSD- 2019-2021

Various challenges exist in Sri Lanka in the sector of Geospatial information. Major challenges in the sector can be listed out as follows:

- With the development and commercial availability of sub meter spatial resolution satellite imagery, geospatial tools (Software/ Hardware) can accommodate the needs of Department technicians better than ever before. So technology updating among the staff is mainly focusing.
- Heights are a necessary component of surveying and mapping and that should be as useful to the user as possible. So finalize the Geoid model for the Sri Lanka is another key component.
- Implementing and expanding the available SLCORSnet for the entire country in order to uplift the accuracy level and data integrity in the country.
- To establish proper parcel base information fabric for the entire country to enable quick access and reduce time consuming of professionals when getting old survey information.
- To have entire country coverage of LiDAR survey.
- Establish proper mechanism to produce quick geo data when disaster situation occurred, to support other related organizations.