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நில அளவைச் சஞ்சிகை

SURVEY JOURNAL

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The Sri Lanka Survey Department is the one of the oldest Government Department in Sri Lanka and was established in 1800. The Sri Lanka Survey Department has always been the leader in surveying and mapping in Sri Lanka. It was carried out efficiently and systematically, professionally qualified professionals in accordance with accurate land information standards.

The Sri Lanka Survey Department was started Survey with plane table, compass, thedolite but now expand to UAV and GNSS technology. The mapping has been developed into hard copy and soft copy and arrangements have been made for public viewing through the website of the Sri Lanka Survey Department. The Sri Lanka Survey Department provides leadership to carry out a pioneering mission in development activities in Sri Lanka.

Cover page designed by Typographic Branch, S.G.O.

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Maps and Land Survey Maps in Dutch Period – An Overview

by

Dr. K.Thavalingam - Retired Surveyor General

Introduction

Although Sri Lanka occupies a small place in the world map, in the history of cartography it has been a country of considerable significance for over two thousand years. Ptolemy's map of the island of the 2nd century AD is the most significant and influential example of this.

From the 8th to the 15th centuries Sri Lanka's contacts with the Arab world were extensive through trading activity and the knowledge of Arab geographers of the island and the surrounding region in general was far superior to that of contemporary Europeans. Arab and Maldivian pilots are said to have produced their own charts based on research using scientific techniques. For the first time Maldivian charts showed Sri Lanka's position between the 6th and 10th degrees north latitudes. Medieval European cartographers, primarily Italian, represented Sri Lanka in their maps though in confused form.

It was only from the mid-17th century, with the Dutch occupation of the maritime regions of Sri Lanka, that mapping of the island progressed rapidly. Once the Dutch had driven the Portuguese out of the country in the mid-17th century, occupied the coastal regions and obtained a monopoly on the cinnamon trade, maps and plans for military purposes became increasingly important. From then on the Dutch were busy measuring and mapping the coastline, bays and waterways, drawing detailed plans of towns and forts as well as parts of the interior.

Portuguese tombos (land registers) gave the Dutch a useful basis for their own surveys. The Dutch Governors employed land surveyors and military engineers to produce beautifully coloured maps, plans and pictorial sketches of the forts and towns and their environs under Dutch control. In contrast to the maps of the entire island, which provide more detailed geographical features, maps and plans of the towns were motivated by military and administrative objectives.

Further, the Dutch encouraged agriculture in the lowlands in order to reduce expenditure on rice imports. They undertook new works of irrigation, restored tanks (man-made lakes) constructed by the ancient Sinhala kings, and also constructed canals to drain the excess water and to transport commercial produce. These too required detailed maps and plans. In addition, they also produced maps and plans of the interior (including the capital, Kandy), which was ruled by the Sri Lankan kings.

These maps provide a fine visual overview of the colonial intervention that took place progressively over the years. The early maps show the whole island, with all the Dutch forts along the coast and only the interiors of the southwest and the Jaffna peninsula outlined as Dutch possessions. Often, the rest of the map is filled with bushes, rocks and exotic animals, although sometimes indigenous regional names are given.

The Dutch East India Company (VOC) (A company whose main purpose was trade, exploration, and colonization) sent thousands of reports regarding their administration in Sri Lanka back to the United Provinces of the Netherlands. Many of these reports had cartographic material attached.

The maps (collected from the reports) shown in this article is drawn by military engineer and surveyor Johan Christiaanszoon Toorzee in 1697-1698. There are three types of maps shown here. Those are area maps mentioned as overview maps (maps of parts of Sri Lanka, showing the important rivers, cities, ports and the coastlines), fortification maps and land survey maps (land survey maps which are mainly accompanied with reports or tombos)

Map of Colombo

Map-1. Map of Colombian Lands

Statement mentioned in the above map

Map of Colombian Lands: - Presently belonging to the district or dessave; to the north determined by the river of Caymello, and to the south by that of Bentotte; consisting of the following Corles, namely; Alutcour, Hapittijgam, Hina, Hevegam, Halpittij, Reijgam, Passedum, and a part of the Wallalawittij Corle. Wherein lays the fortresses Colombo, Nigombo, Hangwelle and Kaliture.

Colombo the 16th November Anno 1698 [signed J.C. Toorzee, Engineer]

The map (Map-1) is primarily meant to illustrate the territory belonging to the *dessave*, or district, of Colombo. The colours on the map represent the different *corles(korales)*, smaller districts sub-ordinate to the *dessave*. Other than the extent of the *corles* within the *dessave*, the map shows important rivers in dark blue and the important roads in yellow with black dots. Many of the towns are also shown with small circles, as well as the fortresses owned by the Dutch.

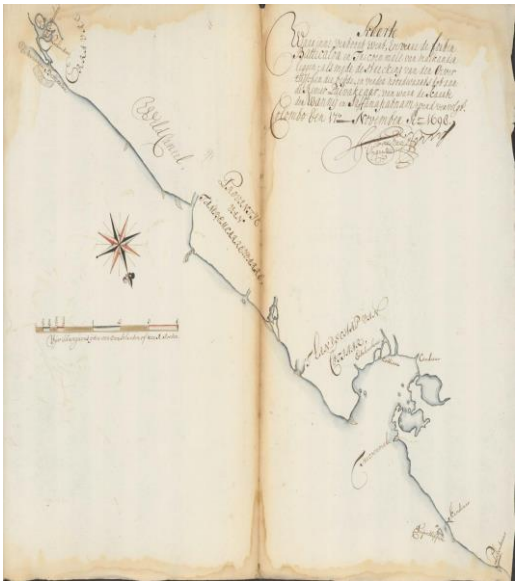
Map of Jaffna

Map-2 : Jaffna & Vanni

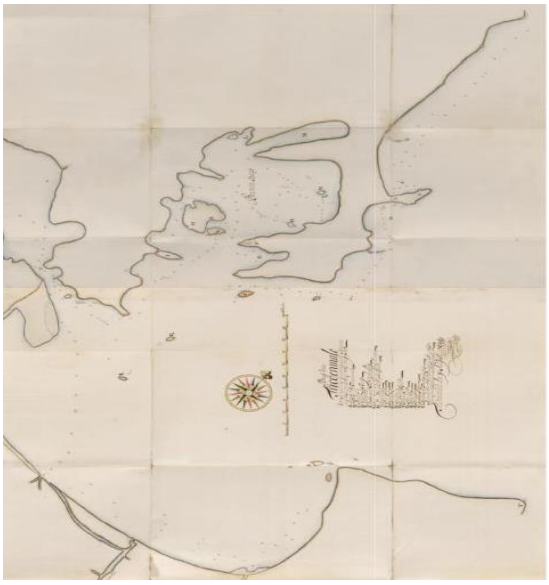
The map of Wanny and Jaffnapatnam (Map-2) was drawn in a smaller scale than the other ones, showing much more territory. The description points out some important features of this map: the coloured four provinces of the Jaffna peninsula and the "inhabited islands", the fortifications on the Jaffna peninsula marked with letters, and the "New Elephants-road" marked in red (The elephant road is mentioned in one of the many pages of the manuscript devoted to the elephant trade.).

Map of Galle

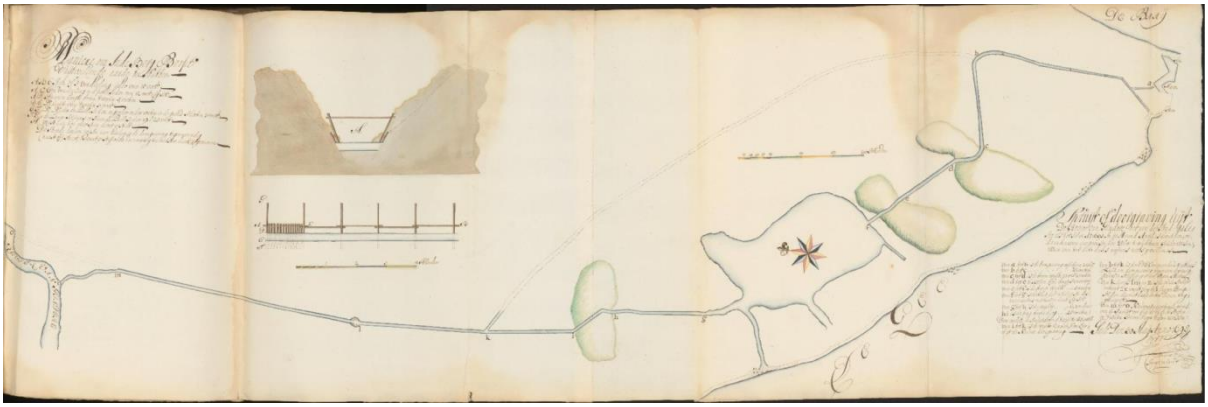
Map-3: "Kaart van het Commandement Gale", *District of Galle,*



Map-4: "Kaarte waarinne vertoont wert, hoeverre de forten Batticaloa en Tricoenmale van malkander leggen", Overview of the distance between Batticaloa and Trincomale ,



Map-5: "Baaij van Tricoenmale", Bay of Trincomale,

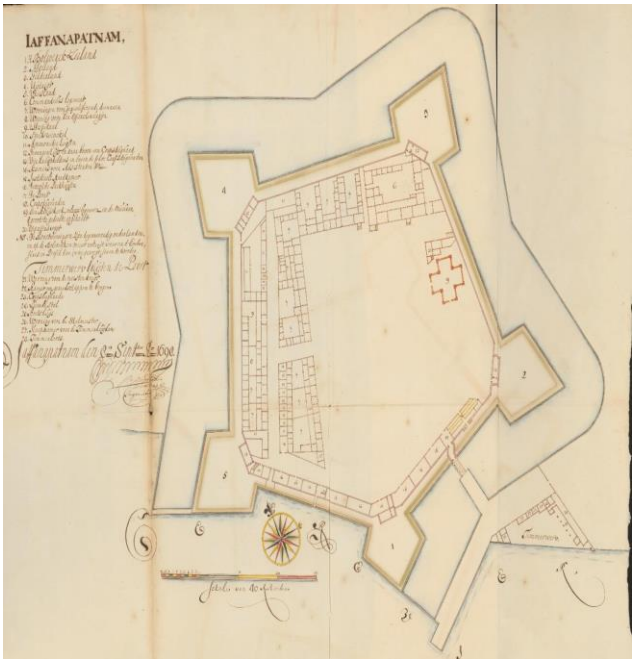


Map-7: Designs for the river Gindere

Fortification maps: Types of forts and their roles are listed below.

Type	Role in system	Examples in South Asia
Fortress	Main administrative and logistical center for region. Supports other fortifications in area	Colombo, Galle, Jaffna
1st tier forts	Maritime forts for control of trade- routes and important nodal points in the trading network.	Trincomalee, Manaar, Batticaloa, Matara, Negombo, Kalutara, Kalpitiya
2nd tier forts	Protection of Company territory, production of trade goods and important tactical locations (protection of other forts, often also with a role in commerce control).	Hammenhiel (protects Jaffna), Oostenburg (inner bay Trincomalee), Hangwelle (protects Colombo), Katuwana (protects Galle), Pijl (Jaffna), Beschutter (Jaffna), Elephant (Jaffna), Pooneryn (Jaffna)

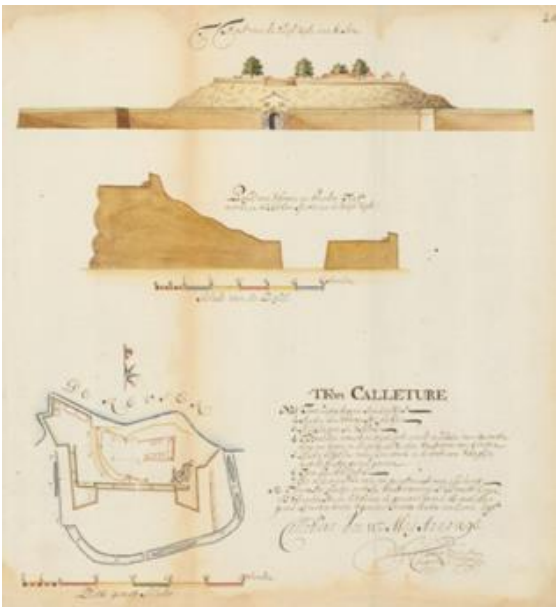
Maps of Some Forts



Map-10 :"Iaffana patnam", *Jaffna Fort 1698*

Map-11: “T Fort Batticaloa", *Fort Batticaloa*

Maps- 12 "Gale", Fort *Galle*



Maps – 13 'T Fort Calleture", *Fort Kalutara*

The *Tombo*

The *tombo* administration was initially introduced by the Portuguese in Sri Lanka. They were the first European power to hold significant lands in Sri Lanka and sought to properly record the land holdings of its inhabitants so they could be taxed. They started this process after integrating the conquered kingdom of Kotte, which held the western part of Sri Lanka. Kotte itself had a form of land administration called *lekam miti*, which the Portuguese based their administration on. When the Dutch conquered land from the Portuguese, they in turn took over the *tombo* from the Portuguese.

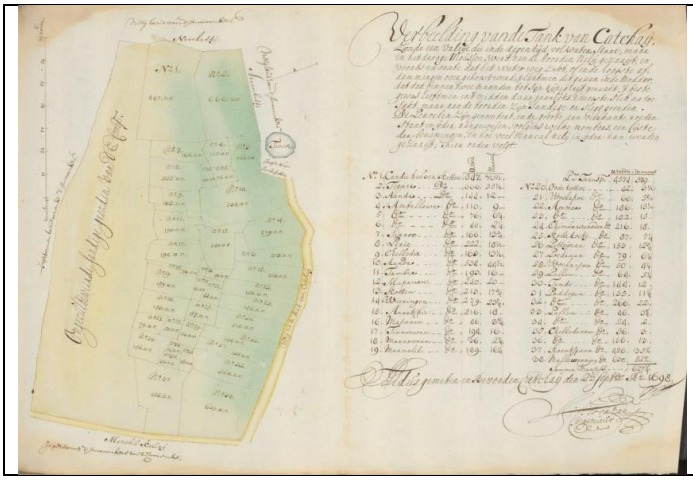
Unlike the Portuguese, however, the Dutch saw the need to have maps accompanying the *tombo*. There were two parts of the *tombo*: the *Head tombo* and the *Land tombo*. The former was a registry of people living in the lands controlled by the Dutch, while the latter was a registration of their lands. The *Land tombo* records owner of the land, the names of the lands he owns, the trees planted there, and the revenues due from it. With the maps, however, one could also see the shape and the extent of these lands as well as their relative positioning. As written in the report of Toorzee's group, it was difficult to make an accurate count of the various trees each tract of land without a proper map of the different tracts and their borders. This, in turn, would make it more likely that the resulting inaccuracy in the number of trees on a plot of land would incur a tax rate either too high or too low for the person in question.

Head Tombo & Land Tombo

Land Survey Maps

For the purpose of preparation of new tombo, it was difficult to make an accurate count of the various trees each tract of land without a proper map of the different tracts and their borders. This, in turn, led to incur a tax rate either too high or too low for the person in question. The last decade of the 17th century as period in which the first initiative for mapping was taken.

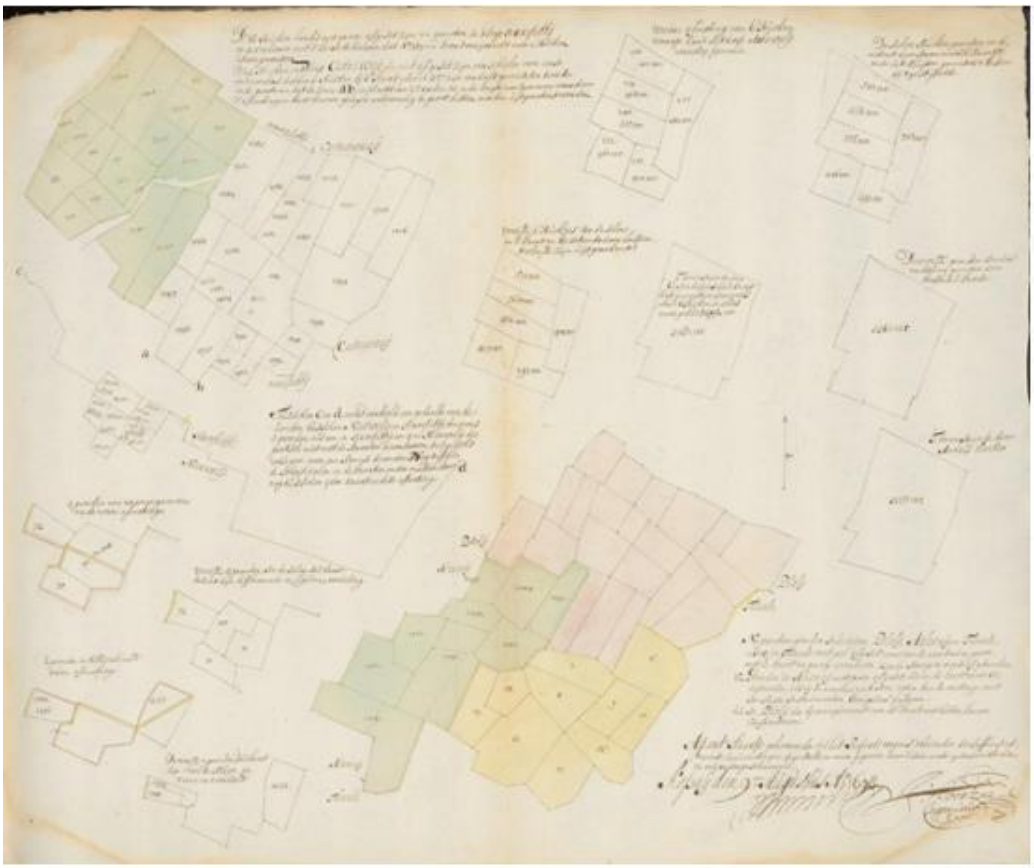
Survey Map of the Tank of Kachchai.

	Map 14 "Vebeelding van de Tank van Catchij", *The Tank of Kachchai*,

17th century- maps were quite distorted

It was found that there were many defects in the new *tombo* prepared by Dutch and the maps made by the surveyors. There were many complaints about the new tombo of Jaffna. When Toorzee re-measured the lands near the village of Atchuveli, he found that the recorded maps were quite distorted. This meant that either the measurement tools were incorrect, or the maths done to convert the measurements onto paper went wrong, or both. The local surveyors had been using measuring ropes, as opposed to chains. These caused issues because conditions caused by for example weather could make the ropes lengthen or shorten. This could cause a fairly significant distortion and make the tax rates for various people higher or lower than they should be or make it impossible to make a proper inventory of the trees on a plot of land, as the map would be inaccurate. Furthermore, the compasses used were of bad quality: they had a deviation between them of up to 3 degrees. Further it was noted that the local inhabitants were not even able to show the boundaries of their own lands.

Land Survey Maps (last decade of the 17th century)



Land Survey Maps

Military Engineer J C Toorzee tested the accuracy of the maps

At the village of Altchewelij the four native surveyors were tasked with drawing six lots of land to check the accuracy. These were then confronted with the map made by Toorzee, as can be seen on the land survey map. Each of the six maps and put them together in Figure 1. Some are distorted in shape to an unacceptable degree and there are also large discrepancies in the area calculated by these surveyors.

In conclusion, then, it was impossible for the surveyors to deliver on the maps which were intended to improve the land registry. Because The surveyors were natives who lacked the knowledge and experience to map these areas properly. (2) The measuring ropes were faulty and the surveyors did not bother to use even wooden pegs to mark what they had already measured, deeming a groove in the ground to be sufficient. (3) The compasses were inadequate. The drawing materials were also not up to standard.

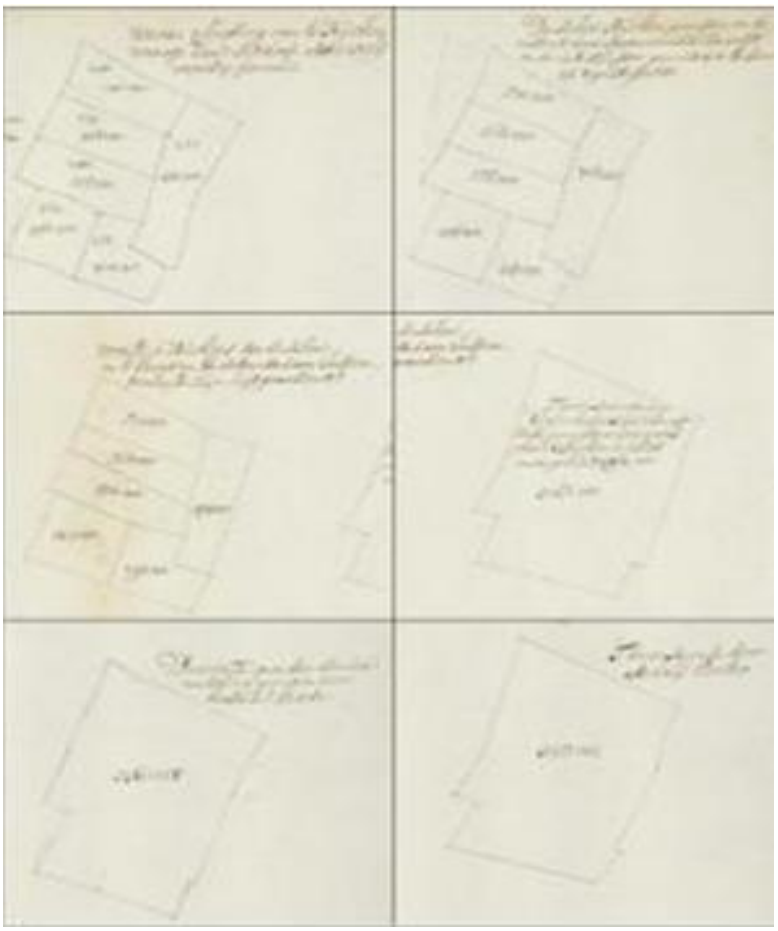


Figure-1

(Note : This article is written based on Research Master Thesis on “Maps in De Heere’s Journal, Cartographic Reflections of VOC Policy on Ceylon, 1698” of Clemens Deimann.)

The Surveyors Responsibility and Importance for Land Surveying using GNSS

by

Mr. K.R.Sarath- Snr. Deputy Surveyor General (Resource Management)

1. Land Surveying

1.1 Looking closely at history, Land Surveying can be seen as a practice of technology and a social discipline. Both emphasize accurate distance and angle measurements at the Earth's surface. Since the last four-decade, land surveyors have been using GNSS Land Surveying technology for geodetic control networks in world wide.

The Global Navigation Satellite System (GNSS) is a system that can locate particular locations anywhere in the globe, independent of the time of day or the weather. The technology used for GNSS Geodetic Surveying is now more portable and user-friendly than ever before, making it a viable alternative to the Traditional Surveying methods used in the past. Mostly GNSS is used for large-scale topographic surveys because the precision (possibly in centimeters) the technology provides is sufficient for many tasks.

1.2 **Technique of Augmentation**

The vast majority of land surveys are conducted with respect to the geodetic control network. Traditional surveying techniques use measurements derived from land boundaries, landmarks, or even a surveyor's stake to carry out more exact detailed surveys.

By using GNSS, coordinates can be pinpointed on a global frame of reference, and can be obtained the measurements without taking into account the different anatomical features of the environment in which the measurements are performed.

GNSS survey equipment is often used for GNSS augmentation techniques to achieve the required degree of accuracy. Dual-frequency receivers that use Real-Time Kinematic (RTK) corrections are only one example of this approach. Other examples include satellite-based augmentation systems such as EGNOS and WAAS (RTK). The appropriate augmentation technique is selected after considering several parameters, including the accuracy of the measurements, the availability of equipment, the length of the measurements and the characteristics of the site.

1.3 **DGNSS**

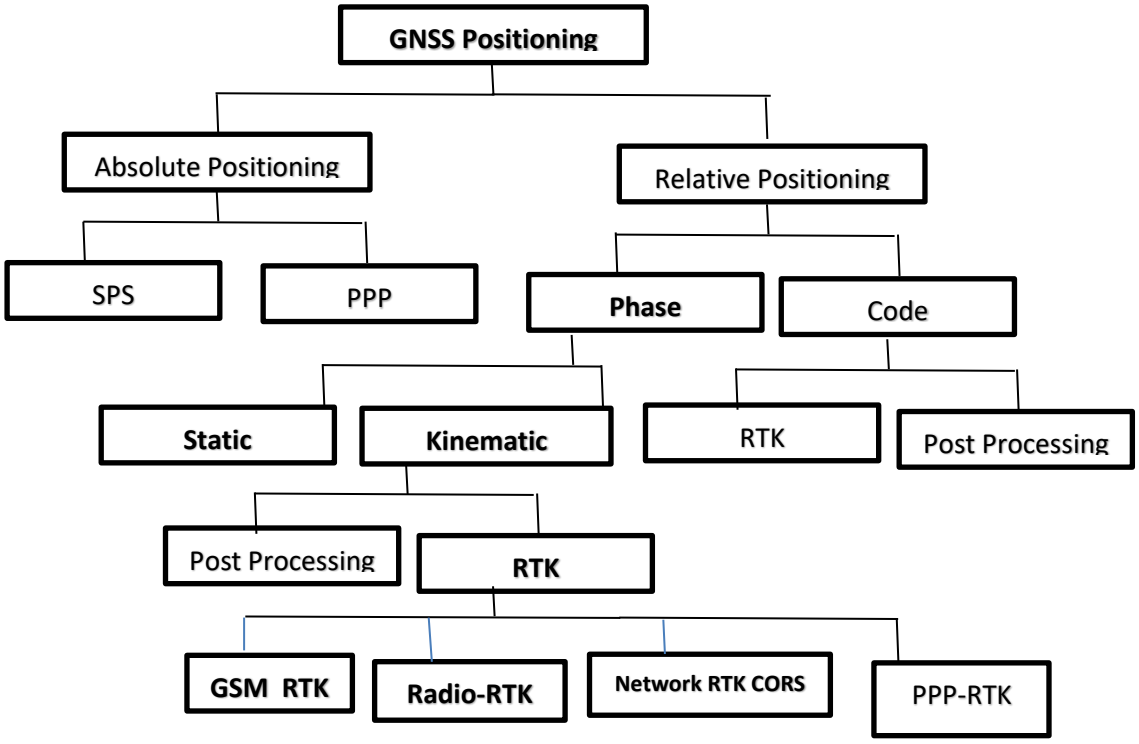
Most of the time, Differential Global Navigation Satellite System (DGNSS) is also known as Real Time Kinematic (RTK). Without the coordinate information derived from a stable basis, these algorithms will not operate properly. A surveyor can use either an already established network of base stations, a single base station located in public access, or their own base station to gather data from base stations. Alterations made during post-processing, as opposed to changes made in real-time, are another option that the surveyor has (which needs a connection between the base station and the rover).

2. Why Survey Department use GNSS for Land Surveying

At present, Sri Lanka Survey Department has a large number of GNSS equipment. Numerically it has been given two to each Divisional Survey Office in the Department. In general, high-end GNSS Land Surveying equipment cost more than high-end traditional surveying equipment; however, this price difference typically becomes insignificant for large topographic surveys when centimeter-level accuracy is acceptable. GNSS stands for a global navigation satellite system. Traditional methods are still the method of choice for surveys requiring precisions on the order of

centimeters when a clear view of the sky is unavailable or when vertical accuracy is of the utmost importance. If surveying is carried out using GNSS equipment as per the technical instructions given by the Surveyor General, it is because GNSS methods may produce more accurate results than traditional alternatives. Therefore, the use of the GNSS methods is preferred when doing land surveys.

3. GNSS Survey Methodology



Note: Among the above GNSS Survey method, Sri Lanka Survey Department uses Static and GSM RTK, Radio RTK, Network RTK mode

4. General introduction to CORS

4.1 CORS

CORS is an abbreviation that stands for **Continuously Operating Reference Station**. It is an automated, permanently configured GPS reference station facility.

The CORS facility continuously collects and record GPS data the facility is comprised of the GPS receiver and antenna setup in a stable manner at a safe location with a reliable power supply. The receiver operates continuously, logging raw data, sometimes also streaming the raw data to navigation devices. Most CORS facilities include a computer located on site. Data from the receiver is usually downloaded and saved to the computer from where it can be transmitted to a server. The computer may also be used to remotely control and monitor the CORS. Reference stations vary in extent and complexity. The CORS data requirements will determine the appropriate level of complexity which in turn affect the costs.

In addition to supplying GPS observational data needed for relative positioning, a reference station may also, depending on its configuration, contribute to a variety of efforts such as the generation of precise satellite ephemerides and clock correction data, crustal motion monitoring and atmospheric and earth rotation studies.

A CORS system must also address issues such as the distribution, archiving, and quality control of the data that it collects.

4.2 VRS

VRS is an abbreviation that stands for; **Virtual Reference Station**. VRS technology is designed to use the existing network of CORS to calculate what a reference station (e.g. an RTK base station) very close to the user's receiver would receive from satellites and then pass the appropriate base station data to the user's receiver. The advantage of this approach is that while the virtual rover solution uses a single base station, the VRS uses a network of base stations, but gives the appearance of just one. The system can have multiple users with a virtual station constructed to suit each user's location and needs.

The VRS uses a central server to gather and process data from a network of base stations (CORS). A dedicated bi-directional communication link is required between the user's receiver and the VRS server. The user's receiver has to provide the central server with an approximate location and request a suitable virtual reference station, and the central server has to send the data directly to the user's receiver.

Since the VRS central server has current data for the surrounding CORS, it is able to calculate the expected signal that a base station near the user's receiver would see, correct the solution for known ionospheric and tropospheric delays, satellite clock offsets, etc. and provide a data stream to the user's receiver that will allow a direct solution of the virtual vector between the virtual reference station and the user's receiver. The user's receiver then calculates the virtual vector and applies it to the virtual reference station to obtain its own position. The effect is as though the user was doing regular RTK and allows movement. The VRS central server is able to shift the virtual base station as needed for a moving receiver, in such a way as to maintain the required precision.

VRS has the major advantage of requiring only one receiver, rather than the two usually required for RTK. Because there is no real base station, so long as communication signals can be established, there is no limit to how far the rover can travel, other than remaining within the overall Network.

Most VRS use a subscription service as the connection is specific to a given user and receiver. VRS gives results very similar in quality to RTK.

5. SLCORSnet of Sri Lanka

5.1 Introduction

According to the sections 2 and 5 in Survey Act No 17 of 2002, the Surveyor General shall be responsible for the establishment, maintenance and upgrading where necessary of the National Geodetic Control system.

For this purpose, a geodetic control network was established in 1999 where the density of the control points is constantly increased and the day-to-day surveys are connected to the control network. Although the density of the control network is constantly increased, it is necessary to establish a large number of control points to connect the measurement activities carried out throughout Sri Lanka to the control network.

With the development of Global Navigation Satellite System (GNSS) technology, this requirement can be met by establishing a continuously updated Geodetic Survey Control System in Sri Lanka and does not require the re-establishment of control points or increase in density. No annual cost is required for the densification of control points. Also, it is easier to carry out survey work using Global Navigation Satellite System (GNSS) equipment.

For this purpose, it was planned many years ago to establish a geodetic survey control system in Sri Lanka, and according to that plan, Sri Lanka is to be covered by a system of 40 stations. For this requirement, in 2016, 6 stations covering the western part of the island have been established. The 6 stations are established in Colombo, Kalutara, Ratnapura, Kegalle, Avissawella and Madampe.

5.2 SLCORSnet facility

Network RTK solution are provided by SLCORSnet through its control unit with Geo++ and Topnet+ software to the any Land Surveyor who are requested SLCORSnet facilitates. These GNSS coordinate are very accurate and it is within the centimeter level.

Further it provides following facilitate to the Land Surveyors who are surveyed land in western part of Sri Lanka,

- GNCASTER
- SSRPOST
- GNWEB

6. GSM & Radio RTK

In practice, RTK systems use a single base-station receiver and a number of mobile units. The base station re-broadcasts the phase of the carrier that it observes, and the mobile units compare their own phase measurements with the one received from the base station. There are several ways to transmit a correction signal from base station to mobile station. The most popular way to achieve real-time, low-cost signal transmission is to use a radio RTK, typically in the UHF Band. In most countries, certain frequencies are allocated specifically for RTK purposes. Most land-survey equipment has a built-in UHF-band radio modem as a standard option. RTK provides accuracy enhancements up to about 2 km from the base station. More than 2 km the errors can be occurred. It greatly affects the accuracy of Land Surveying.

This allows the units to calculate their relative position to within millimeters, although their absolute position is accurate only to the same accuracy as the computed position of the base station. The typical nominal accuracy for these systems is 1 centimeter ± 2 parts-per-million (ppm) horizontally and 2 centimeters ± 2 ppm vertically.

In GSMRTK the base corrections are transmitted to the Rover through a data link.

Although these parameters limit the usefulness of the RTK technique for general navigation, the technique is perfectly suited to roles like Land Surveying. In this case, the base station is located at a known surveyed location, often a benchmark, and the mobile units can then produce a highly accurate map by taking fixes relative to that point. RTK has also found uses in auto drive/autopilot systems, precision farming, machine control systems and similar roles. To maintain the accuracy are instructed by the Surveyor General the distance should be maximum within 10 km between the base station and mobile unit stations if used GSM RTK. It is maximum within 2 km if used Radio RTK.

At present, in worldwide, many of countries including the western part of Sri Lanka too have been operated the RTK networks extend the use of RTK to a larger area containing a network of reference stations. Operational reliability and accuracy depend on the density and capabilities of the reference-station network.

A Continuously Operating Reference Station (CORS) network is a network of RTK base stations that broadcast corrections, usually over an Internet connection. Accuracy is increased in a CORS network, because more than one station helps ensure correct positioning and guards against a false initialization of a single base station.

A Virtual Reference Network (VRN) can similarly enhance precision without using a base station.

7. Issues

Measurements are never exact and regardless of the survey instrument or method used, there will always be a degree of variance. These variances are known as errors and will need to be reduced or eliminated to maintain specific survey standards. It is important for the surveyor to understand the different types of errors in order to minimize them.

Errors can be categorized as,

- Mistakes
- Accidental
- Systematic or Cumulative
- Compensating Errors

These errors can be reduced to a great extent if the land surveyor pays attention to the Departmental Survey Regulation and Circulars issued by the Surveyor General.

Additionally, the Land Surveyor shall be verified the following important points before start his own surveys,

- The Surveyor should check and verify the accuracy of the control points.
- Before login the CORS it must be checked it is networked or single base one. (The surveyor must understand the difference between Network RTK, GSM RTK with Single Base Stations)
- According to survey method (e.g., GSM RTK with Single Base Stations) it should be checked the distance between Base station and Rover Stations
- The GNSS instrument being used should be calibrated and checked for errors periodically before start the work.
- The surveyor should have a good understanding of the GNSS instrument in use. For example, while using RTK, there are different solutions the surveyor should look out for; float solution and fixed solution. Fixed solution means the receiver has calculated correct solution while Float solution means the algorithm has not been solved yet thus being less accurate.
- In the case of booking, the surveyor should verify the information who is writing down to reduce booking errors. Instrument height is very important whether it is slope or vertical and its reading value.

8. Other Issues

"GNSS Accuracy" is an application dependent quantity. Land Surveying and other aspects of daily life do not have the same level of GNSS requirements. Accordingly, the accuracy is also reduced or increased.

However the facts are some professionals advertise through popular media documentary programs that land surveying can be done with required accuracy using GNSS technology from Handheld devices. Further they mentioned GIS technology used for mapping in this stage.

Unfortunately, they do not specify how to apply GNSS corrections, for example satellite clock errors, Ionosphere correction, troposphere correction or Multipath errors etc. and further, not mentioned the methods used to measure land using GNSS devices such as GSM RTK, Radio RTK or Network RTK.

This is misleading the General Public. By definition, land is immovable and indestructible. Therefore, it has a cultural dimension that lies at the heart of any nations. It is a definite asset of General Public.

Also, it is no possible to deceive or mislead the people by showing the tricks of land surveying by raising ideologies.

It is the responsibility of the Land Surveyors as well as the General Public to bring them to justice according to the Survey Act No 17 of 2002.

"AN INCH OF TIME CANNOT BE BOUGHT WITH AN INCH OF GOLD"

Land Fabric Domain (LFD)

Pathway Towards

Land Administration Domain Model (LADM ISO-19152)

by

Mr. Nelson Wijenayake - Retired. Snr.DSG / Director (ISM)

Abstracts

A well-functioning land administration system (LAS) is crucial for a country's development. It provides a solid foundation for economic growth, social stability, and environmental sustainability. Land Administrative Domain Model (LADM) ISO 19152 is the ISO recognized global solution, which can be customized in Sri Lanka through a well-functioned mechanism. This technical paper elaborates an easy pathway to develop a local land administration system for Sri Lanka. The draft system architecture presents here a well-defined top-level mechanism for the system developers to follow up in designing of functional model.

1. Introduction

Land administration systems generally, refer to the institutional frameworks, policies, procedures, and technologies put in place to manage and govern land resources. These systems are designed to ensure efficient and effective land administration, including land tenure, land registration, land use planning, and property rights management.

Survey Department of Sri Lanka (SDSL), since established in 1800, has been conducting its nationally mandated land administration responsibilities as timely solutions in respective eras. The SDSL had introduced the Land Title Registration process under the Registration of Title Act, No. 21 of 1998, in collaboration with the respective organizations empowered by the act. SDSL as the nationally responsible organization for geospatial data, initiated the Parcel based Land Information System (PB-LIS) in concern of developing, maintaining and updating the system as corporate LIS to support the land administration of the country.

1.1 Conventional Survey Plan and PB-LIS Source Data

The SDSL as streamlined by the Departmental Survey Regulations (DSR), has regularly conducted preparation of survey plans for respective land administration over the country aiming the following context.

Land administrative survey plans were often created to establish clear records of land tenure and ownership. They provided a systematic way to document and map land parcels, delineating boundaries and indicating ownership rights and interests. These plans helped to ensure secure land rights, resolve disputes, and facilitate land transactions. It is important to note that SDSL had continuously adapted the similar purposes and practices related to land administrative survey plan preparation.

The changing governance structures, and societal needs over the time, have influenced the diverse objectives and methods of land administrative planning. Meanwhile, the computer

assisted land administration systems (LAS) have been developed continuously with state-of-the-art applications. Many countries over the world, have developed their own LASs to cater their national land administrative needs with latest IT applications. However, the SDSL has still been preparing the conventional land administrative survey plans as the only reference document for national land administration.

The Land Information System (LIS) introduced and initiated in 2007, is based on the limited attribute data provided through the SDSL survey plans; Lot number, Land name, Extent, Claimant's name, Land-use and other specific details under remarks.

The decisive information for modern land administration which can be traceable to populate the current parcel based LIS (PB-LIS) are immense and feasible mechanisms yet to be designed.

It can be studied that the following sector information are feasible to corporate with the PB-LIS with introducing a suitable mechanism.

I. Land Taxation and Revenue Collection: Land administrative plans are used as a basis for assessing and collecting land taxes and revenues. They provide information on land use, area, and value, enabling governments to levy appropriate taxes and generate revenue for public administration and infrastructure development.
II. Land Use Planning and Regulation: Land administrative plans are instrumental in land use planning and regulation. They help authorities to identify suitable areas for different purposes such as agriculture, residential, commercial, or industrial use. By mapping land uses and zoning restrictions, these plans guide development activities, ensured orderly growth, and protect environmental resources.
III. Infrastructure Development: Land administrative plans support infrastructure development initiatives. They facilitate the identification of suitable locations for transportation networks, utilities, public facilities, and other infrastructure projects. These plans aided in coordinating and managing the allocation of lands for public infrastructure, enhancing overall urban and rural development.
IV. Land Administration and Management: Land administrative plans serve as a fundamental tool for land administration and management. They provided a comprehensive overview of land parcels within a jurisdiction, enabling efficient management of land resources, monitoring land use changes, and maintaining accurate records for land administration purposes.
V. Disaster Risk Management: Land administrative plans play a role in disaster risk management by identifying areas prone to natural hazards such as floods, earthquakes, or landslides. By mapping these risks, authorities could develop strategies to mitigate the impact of disasters, plan for emergency response, and implement appropriate land-use policies in high-risk areas.

1.2 What is LADM ISO-19152

LADM ISO-19152, also known as the "ISO 19152:2012 - Geographic information - Land Administration Domain Model (LADM)," is the international standard developed by the International Organization for Standardization (ISO). LADM provides a conceptual framework and data model for describing the legal, spatial, and administrative aspects of the land and spatial unit.

LADM provides a conceptual model with four classes related to

1) LA-party Parties (people and organizations);

2) LA-RRR Rights, responsibilities, and restrictions related with BAUnit / patialUnit

3) LA-BAUnit Basic administrative units,

4) LA-SpatialUnit Spatial units (parcels, and the legal space of buildings and utilities)

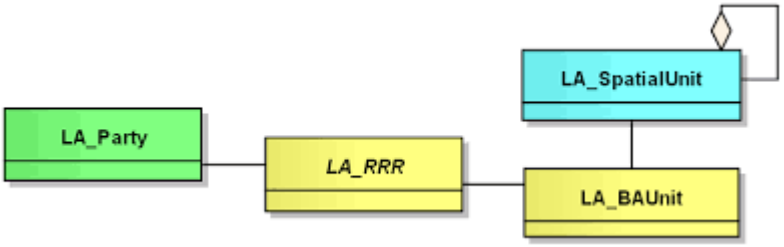


Figure-1; Basic Classes of LADM-ISO 19152:2012

As classified, the LADM consist of LA-Party, LA-RRR, LA-BAUnit and LA-Spatial Unit feature classes, which are broadly attributed in respect of relevant directives. Especially, the Spatial Unit represents a physical portion of the Earth's surface and is used to model land parcels, buildings, and other spatial objects relevant to land administration. It serves as the central entity for capturing information about the spatial and legal aspects of land.

The Spatial Unit feature class generally includes the following attribute fields:

1. Geometry: This attribute captures the spatial representation of the spatial unit, such as points, lines, or polygons.
2. Identification: This attribute contains unique identifiers or codes assigned to each spatial unit for identification purposes.
3. Administrative Hierarchy, captures the hierarchical relationship between spatial units, such as parent-child relationships.
4. Legal Rights, stores information related to legal rights associated with the spatial unit, including ownership, restrictions, and encumbrances.
5. Spatial Extent, represents the extent or boundaries of the spatial unit, defining its geographic coverage.
6. Descriptive Information, includes additional descriptive data about the spatial unit, such as its address, purpose, or physical characteristics.

The “Spatial-Unit” feature class in LADM has been designed to facilitate the management of land administration systems by providing a standardized and interoperable representation of land-related information. It enables the integration and sharing of land data across different systems and jurisdictions, supporting efficient land administration processes and decision-making.

2. Land Fabric Domain and LIS pathway to LADM-ISO 19152

As detailed in the section-1, above, it is obvious that the LADM has been modeled with a massive bundle of information related to land administration domain. LADM data can also be modeled by any interested party to suit with their own country basis.
The architecture shown in figure-2, illustrates an easy pathway to approach the LADM through introductory initiative Land Fabric Domain (LFD).

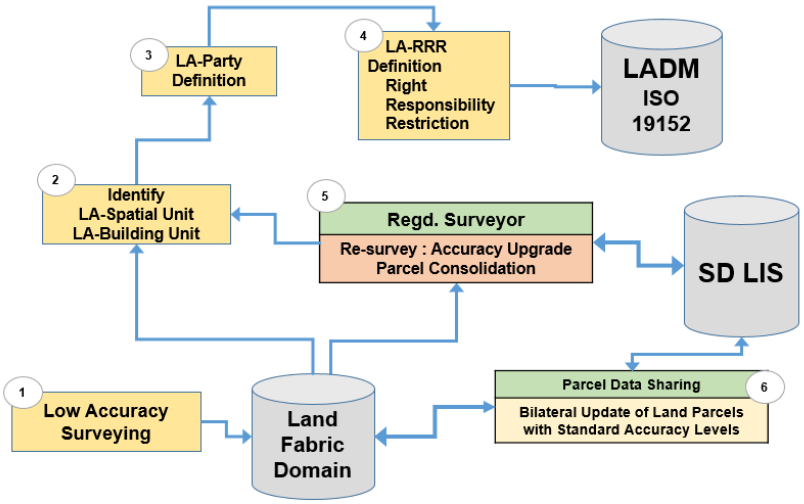


Figure-2: LFD to LADM pathway and PB-LIS Interaction

2.1 Land Fabric Domain (LFD)

LFD Logical Approach

Parcel Based Land Information System (PB-LIS) as governed by the SDSL is confined with the Departmental Survey Regulations (DSR) for preparation of land administrative plans. Also the positional accuracy of the spatial entity; land parcel should be constrained at accepted standards so that the scope of the PB-LIS is restricted to observe quick changes for expansion.

Therefore, it is necessary to introduce an alternative mechanism for catering the national land administrative needs. Land Fabric Domain (LFD) is the conceptual model, proposed to follow an alternative process for acquiring spatial data and pathway to LADM with easy interaction with the PB-LIS updating. Hence, LFD is consist of spatial data in varied sources at highest possible accuracy standards. LFD focuses on bilateral integration of spatial and non-spatial components so that spatial data be integrated through different accuracy hierarchies and the whole system with respective parallel service models too. It is advisable that LFD feature classes may be modeled by the Surveyor General; SG's appointed team of technical staff.

2.2 LFD to LADM Pathway Architecture

LFD to LADM pathway architecture is consist of six main processes as detailed in figure-2. The pathway architecture concerns on SDSL governed PB-LIS and its collaborative interaction with the LADM pathway. The system architecture processes shown in figure-2, are detailed in the following context;

1. Low Accuracy Surveying is planned to map the land plots and the buildings therein at a highest possible accuracy through modern survey techniques. It will be considered to cooperate with the Survey Department for sharing of land parcel data at higher accuracy levels. Data acquisition has to be followed by the LFD feature specifications which should be formulated in advance at a broad discussion among the SG's appointed technical staff.

2. Identify the Spatial Unit/Building Unit and Legal Spaces
Defining of Spatial unit, Building units and Legal spaces related to each land parcel or building has to be carefully followed referring to the respective feature classes described under feature classification criteria. The terminologies in respect of legal spaces should be

clearly defined. Terminologies used for legal spaces in Sri Lanka Condominium surveys (such as common elements and accessory units etc.) are different in comparison with the LADM ISO-19152.

3. LA-Party Definition is the ownership parties and the types and they should be classified under feature classification.

4. LA-RRR Definition is about Right, Responsibilities and Restrictions. Each spatial entity can have one or more of RRR and they should be detailed under feature classification.

5. Re-Survey, Accuracy Upgrade & Parcel Consolidation
Land parcels are subject to change in parcel consolidation. Therefore, any resurvey of parcel boundaries and relevant attributes editing, should be followed by the SG's accepted mechanism. The process should be carried out by a registered surveyor and corrected parcels may update the PB-LIS too.

6. Bilateral update of Land Parcel with Standard Accuracy Levels

LFD is consisting of spatial units at multiple accuracy levels. LFD authority is responsible to update and maintaining the domain. Land parcel subdivision, amalgamation and boundary changes should be accommodated and restored in accordance with the national standards. Therefore, it is advisable to make an agreement with the Surveyor General for bilaterally sharing of spatial units with PB-LIS at accepted accuracy hierarchies.

3. Recommendations for Effective and Efficient Mechanism to LADM

The LADM pathway architecture shown in figure-2 above can further be studied against its implementing mechanism aiming the system sustainability, efficiency and effectiveness. Figure-3, below illustrates follow up proceedings for implementation.

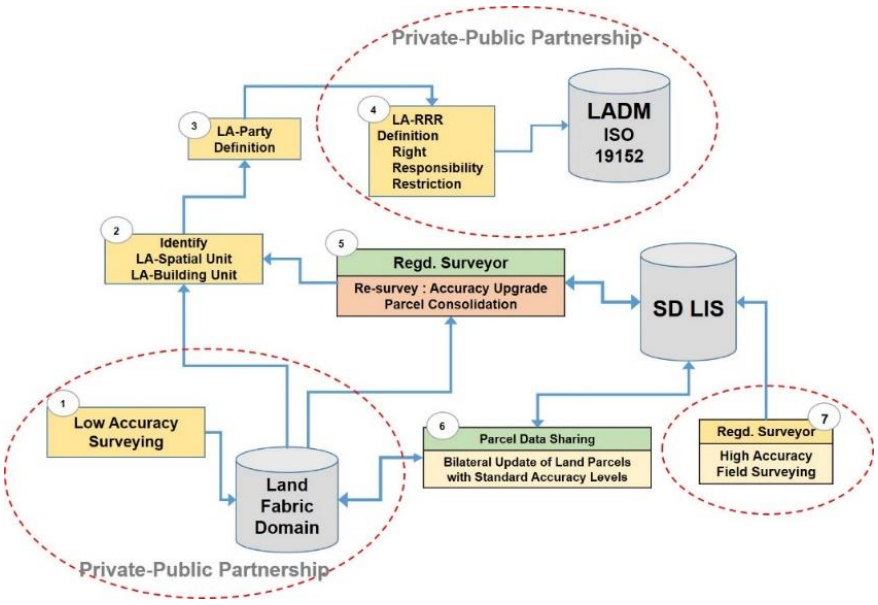


Figure-3: Effective and Efficient Mechanism to LADM pathway

Densification of the LFD with comparatively lower accurate data collection should be carried out with introducing effective mechanisms. Spatial data consistency and compatibility should be thoroughly studied and the entity geometry; point, line and polygon representation against their validity, reliability and positional accuracy must clearly be analyzed for designing the LFD functionality.

In order to manage the proposed new components; LFD and LADM densification activities, private public participation (PPP) concept may be introduced. The activities suggested for PPP are illustrated in the figure-3. The administrative and organizational issues may be discussed by a committee appointed by the surveyor general.

4 Concluding Remarks

Effective and efficient land administration system is an essential need for Sri Lanka national development. LADM ISO 19152 as the world recognized system, can easily be customized for local requirements. Therefore, the respective organizations should follow up the international reviews and alternative mechanisms to propose suggestions to the government for quick changes.

Land Fabric Domain (LDM) may be considered as a sustainable solution for developing of national land administration system and easy pathway towards LADM ISO 19152.

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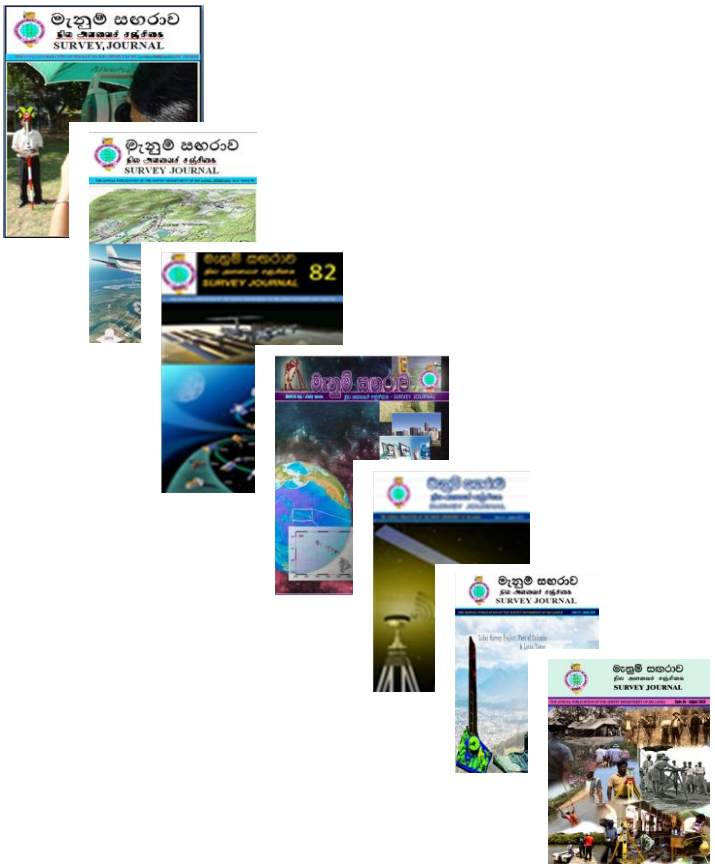
Surveying is an art. . .
Journal is a story of the journey. . .
It is like a novel. . .
Until the very last page you don't know how it will end. . .



GIS based Approach to Analyze Geometric Factors for Road Accidents

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Abstract- Road safety is one of the main problems faced by the Developing countries. Millions of road users are dying due to road accidents and it causes a huge loss to the economy as well as humankind. As a middle-income country, Sri Lanka also having a poor record on road safety. Averagely, 8 people per year die due to road accidents in Sri Lanka. Kandy- Colombo highway is one of the busiest roads in Sri Lanka, reporting a considerable number of accidents in each year. The road segment from Kegalle to Peradeniya on this road includes a number of road geometry types, since it covers mountains and flat areas. Therefore, the road segment of Kegalle to Peradeniya in Colombo-Kandy highway was selected as the study area of this research. The study involved reviewing of Road Traffic Accident (RTA) Locations recorded in 2018 - 2022 from Kegalle, Mawanella, Kadugannawa and Peradeniya police divisions. Road safety management heavily depends on comprehensive data collection. Therefore, 1278 RTA records were obtained in order to identify the density of accidents in the interested area. The analysis of RTA locations was conducted through dividing the study area into eight segments according to their geometric types and ArcMap software to identify the density of each segment. This study is highly focusing on road geometric factors causes for the RTA such as simple curve, compound curve, reverse curve and straight line at slope and flat area. ArcMap software and Road map were used for determine above factors on study area. Most influencing road geometric factor has identified and suggest authorities to minimize the RTA through well road safety management system in that segment.

Index Terms- GIS, Road geometry, Road Traffic Accident (RTA)

INTRODUCTION

Road accidents are gradually increasing year by year. Many people tend to buy motor vehicles with the development of the world. So, the number of vehicles on the roads are getting increasing, causing accidents and traffic congestion. World Health Organization (2018) statistics reveals that, over 1.35 million people died and between 20 to 50 million people suffer from injuries in every year due to road traffic crashes. It has become the 8th leading cause of death for the people in all age categories, and Primary cause of death for the children and young adults between 5 - 29 ages. Another important factor was accidents deaths rate is 3 times higher in low-income countries than in higher income countries.

As a middle-income country Sri Lanka is also heavily affected by Road accidents. It resulted in a total of 33,567 motor vehicle accidents and 2,829 deaths in 2019. Road accidents cause an Average of 8 deaths every day (Ministry of Transport and highways, 2022). Increasing the number of private vehicles is one of the main causes of the growing accident rate. 8 million vehicles were registered in Sri Lanka by 2019 and 4.6 million motorcycles and 1.1 million Three wheels are included.

Joining the biggest capital cities of Sri Lanka such as Colombo, Kandy and Kegalle, the Colombo-Kandy highway of Sri Lanka has the highest vehicle population and high passenger population are the main reasons for higher number of accidents on that road. Therefore, identifying those locations and influencing factors and providing safer roads for the road users are very important tasks which should be done by the road safety authorities and engineers. Therefore, this research was conducted with the objective of identifying the most impacting road geometric factors causing the RTA in Highways using GIS approach. ArcMap software was used for this analysis, since the capability to perform complex spatial analysis and providing an easy and accurate approach for data selection, preparation, segmentation, reduction and screening.

2 METHODOLOGY

2.1 Study Materials:

- Road map of Sri Lanka - Road Development Authority

- Accident data were obtained from Kegalle, Mawanella, Kadugannawa and Peradeniya police stations.

2.2 Software used:

- ArcGIS software
- Google EarthPro software
- Microsoft Excel

2.3 Methodology

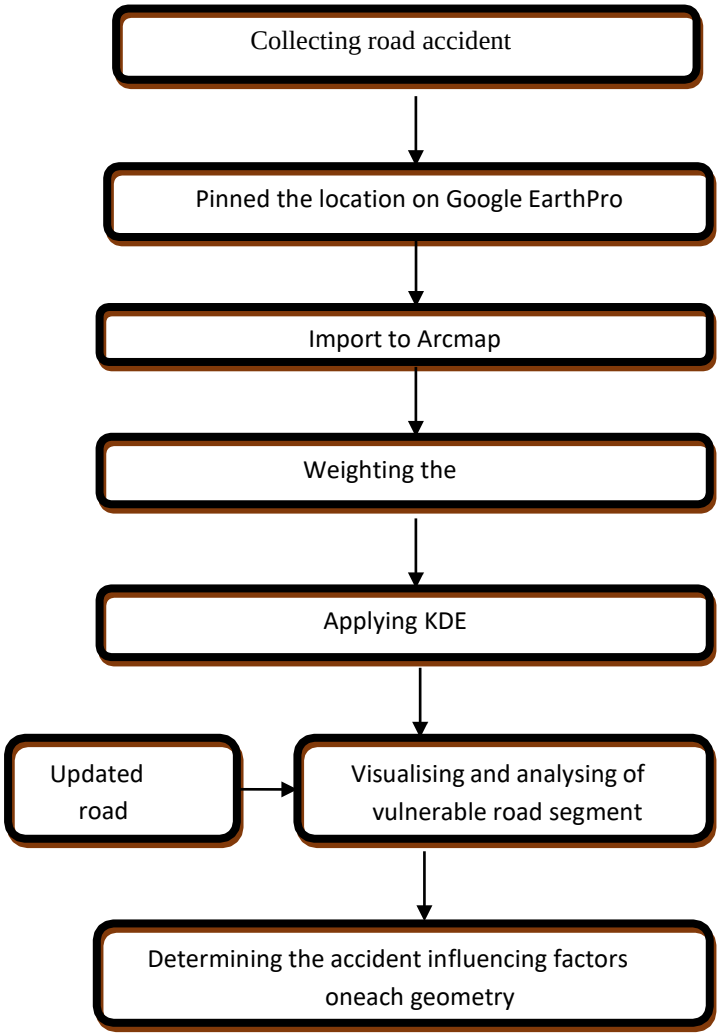

Figure 01: Research Methodology Flow Chart

3 RESULTS AND DISCUSSION

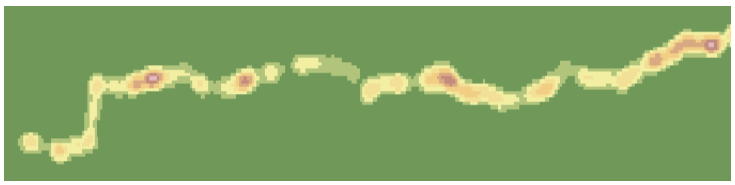

Figure 02: Heat Map

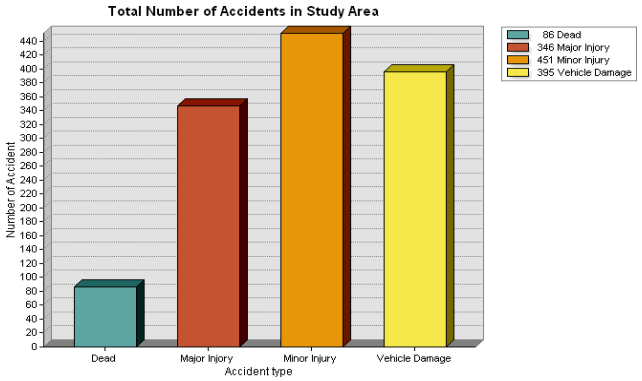

Chart 01: Number of Accidents

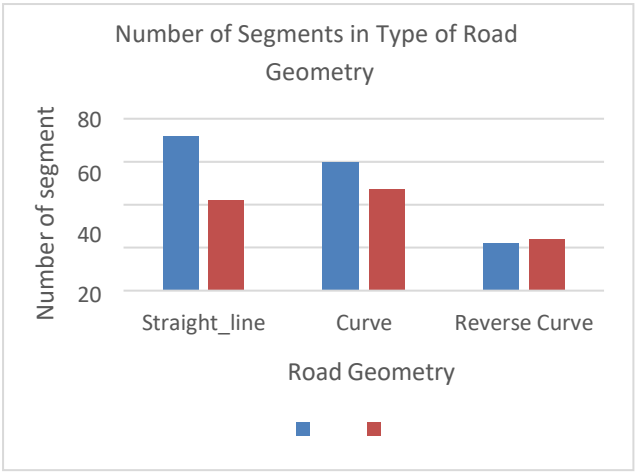

Chart 02: Number of Segments in Type of Road Geometry

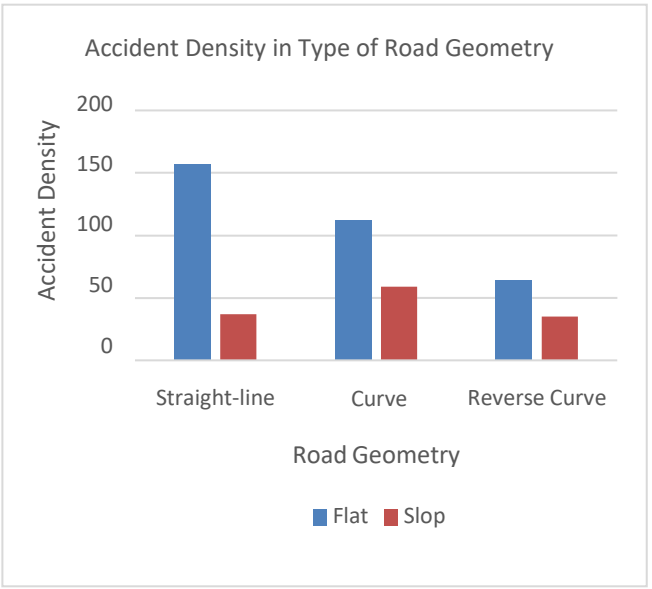

Chart 03: Accident Density in Type of Road Geometry

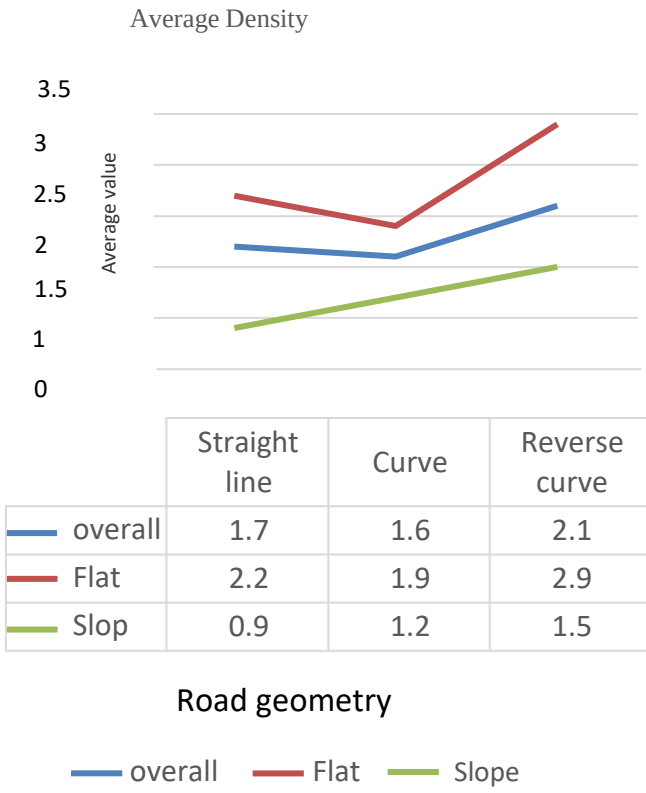

Chart 04: Average Density value in Type of Road Geometry

When focusing the accident density in the whole study area, it can be observed that there is not a significant difference between the road types. The ratio between the total accident density and the total number of segments in each road type is slightly equal for straight lines and curves.
However, there is a noticeable difference for reverse curves. This Suggest that while reverse curves have a lower overall accident density, they may have a higher concentration of accidents in certain areas

Table 01: Accident Prone Area

Segment Number	Road type	Accident Density
45	Straight line	6
48	Straight line	8
59	Reverse Curve	5
73	Curve	5
129	Curve	5
132	Straight line	5
157	Straight line	5
205	Straight line	5
206	Curve	6
211	Straight line	6
212	Reverse Curve	5
219	Reverse Curve	6
225	Straight line	8
229	Straight line	8
230	Reverse Curve	5
231	Curve	5
233	Curve	8
240	Reverse Curve	5
242	Straight line	5

When focusing on accident-prone areas, it can be noted that the majority of them are straight lines. This highlights the need for increased safety measures on straight roads to prevent accidents. On the other hand, while reverse curves have the lowest number of accidents overall, they have a relatively higher accident density in accident-prone areas. This could indicate that there are certain factors specific to reverse curves that contribute to accidents, which should be investigated further.

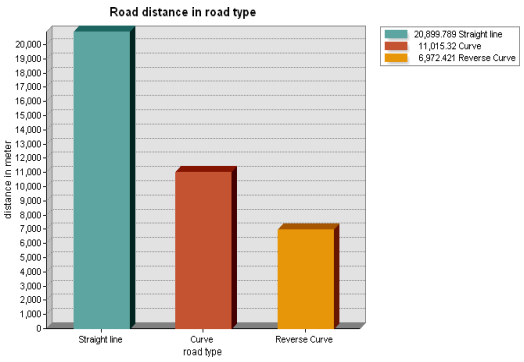

Chart 05: Road Distance in Type of Road Geometry

When considering the distance of each road segment, used the equation number 1

$$P = \frac{\left(\frac{n}{N}\right)*100}{\left(\frac{m}{M}\right)*100}$$ --------Equation 1

Where,
P is ratio of density percentage and distance percentage of each type n is accident severity in a road type, N is accident severity on whole study area, m is road distance of considering road type and M is road distance of study area.

$P_{\text{Straight line}}$ = 0.78
P_{Curve} = 1.30
$P_{\text{Reverse curve}}$ = 1.19

The results show that curves have a higher influence on accidents compared to straight lines. This is followed by reverse curves, with straight lines having the least influence. These findings suggest that road segments with curves and reverse curves may require additional safety measures to reduce the likelihood of accidents.

After conducting site visits to prone areas and engaging in discussion sessions with experts, several road environment factors and prevention plans have been identified as significant contributors to road accidents across different types of geometries. These factors play a crucial role in influencing the occurrence of accidents on the roads.

In straight-line geometries, high traffic areas, uncontrolled pedestrian crossings in town areas, and uncontrolled junctions influence road accidents. To prevent accidents, implement measures such as traffic signals, pedestrian crossings, increased law enforcement, and publicawareness campaigns.

In curves, lack of pedestrian walkways, poor visibility, and curves attached to the largest straight lines contribute to accidents. Prevention measures include constructing pedestrian walkways, improving visibility through signage and clearing sightlines, and implementing speed reduction measures and advance warning systems.

In reverse curves, factors like lack of road width, shortest reverse curves, lack of warning markings or signage, and vehicles parked on the shoulder influence accidents. Implement a prevention plan that includes widening roads, installing warning markings and signage, conducting regular maintenance, and enforcing parking regulations to prevent obstructions.

4 CONCLUSION

According to this research finding, Traffic crashes can be occurred due to one or more factors. Also, there are numerous strategies to minimize the road accidents specially Education, Enforcement of law and Environment. Providing the safe environment for road user is one of the main strategies to reduce the road accidents. According to the findings of this study, road safety improvement suggestions are given to minimize the impact of identified road factors in each type of road geometry.

This research identifies, the Accident density in A1 highway from Kegalle to Peradeniya through the past 5 years (2018-2022) accident data collected from Kegalle, Mawanella, Kadugannawa and Peradeniya police stations. Accident locations are computerized and divided into 267 accident clusters. Then, KDE methodology from Arcmap used to identify the black spots.

There are 19 accident prone segments were selected for the analysis of this research and Henawala town area was founded as a most dangerous blackspot in our study area. Nine out of Nineteen Road segments are classified under straight line roads while five were on curved roads and another five were on reverse curve. Furthermore, this study has analysis on road geometric factors causing the accidents under 6 categories for the road sections. Those are straight-line, curve and reverse curve in slope and flat area. Six road factors considered for each road type, those are Uncontrolled Junction, Poor sight distance, lack of roadway facilities, uncontrolled passenger crossings, unprotected Passenger walkways, lack of road markings, hazardous road surface conditions.

Finally, most influence road factors identified in each type of geometries and discuss about common types of accidents occur due to that factor. Moreover, strategies and road safety measures are suggested to minimize or entirely stop the impact from that factor in future.

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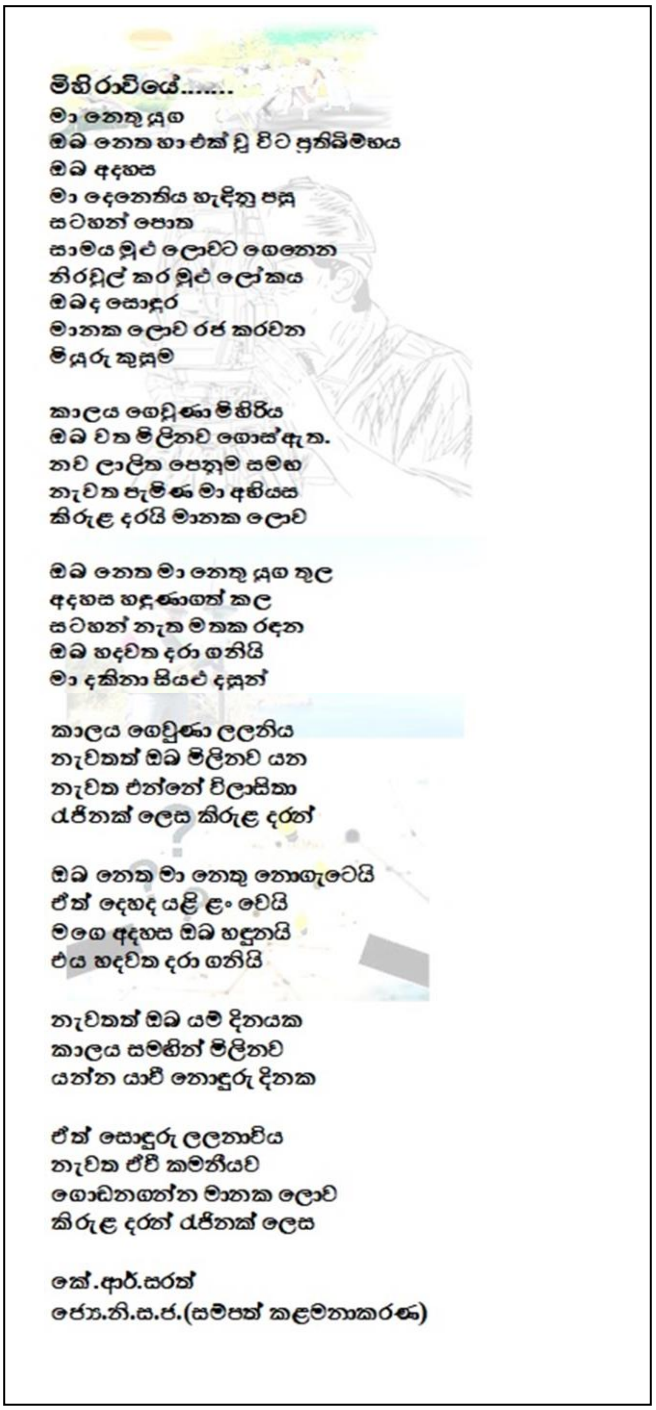
HEARTOGRAPHY

ලබැඳි සිතුම් සිත්තම් කල
හද විකෝණමානයෙන්
ගලපා දිශානතිය
මැන හැඟුම් වපසරිය
නුඹගේ...
ගෙන අනුලම්බයන් එහි
සියුම් තැන්හි
ගලපා සිතිවිලි සමෝච්ජයන්
ප්‍රක්ෂේපනයකොට
ඇන්දෙමි
කුඑදුල් සෙනෙහසේ
තේමා සිතියම
සසර හුරු
පරිමාණයට...!

අජිත් පුෂ්පකුමාර
සිතියම් තාක්ෂණික නිළධාරි
භූගෝලීය තොරතුරු පද්ධතිය අංශය
සර්වේ ජනරාල් කාර්යාලය



මිහිරාවියේ.....
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ඔබ අදහස
මා දෙනෙතිය හැඳිනූ පසු
සටහන් පොත
සාමය වූළු ලොවට ගෙනෙන
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මියුරු කුසුම

කාලය ගෙවුණා මිහිරිය
ඔබ වත මිලිනව ගොස් ඇත.
නව ලාලිත පෙනුම සමඟ
නැවත පැමිණ මා අභියස
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ඔබ නෙත මා නෙතු යුග තුළ
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ඒත් සොඳුරු ලලනාවිය
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කිරුළ දරන් රැජිනක් ලෙස

කේ.ආර්.සරත්
ජ්‍යා.නි.ස.ජ.(සම්පත් කළමනාකරණ)

මැනුම් හා සිතියම්කරණයේ තිස් තුන් වසරක අත්දැකීම් (සය වන කොටස)

එස් .කේ . විජයසිංහ
විශ්‍රාමික අතිරේක සර්වේයර් ජනරාල්

6. ප්‍රධාන කාර්යාලයට පත්වීම

විද්‍යාපති උපාධිය හැදෑරීම සඳහා තෝරා ගැනීමේදී ඉදිරිපත් කරනු ලැබූ එක් කොන්දේසියක් වූයේ ප්‍රධාන කාර්යාලයට අනුබද්ධව පැවති ඉඩම් පරිහරණ සැලසුම් ව්‍යාපෘතියට අදාල මිනින්දෝරු දෙපාර්තමේන්තුවේ කාර්ය භාරයට දායකව රාජකාරි කටයුතු කලයුතු බවය. ඒ අනුව විද්‍යාපති උපාධිය අවසන් කර ආපසු පැමිණි 1990 මුල් වකවානුවේ සිට සර්වේයර් ජනරාල් කාර්යාලයේ රාජකාරි කටයුතු සඳහා අනුයුක්ත කරන ලදී.

එම ව්‍යාපෘතියට අවශ්‍ය උපකරණ බොහොමයක් මිලදී ගන්නා ලද නමුත් භූගෝලීය තොරතුරු පද්ධතියක් ස්ථාපනය කිරීමට අවශ්‍ය උපකරණ සහ මෘදුකාංග මිලදී ගැනීමේ ප්‍රමාදයක් සහ ගැටළුකාරී තත්ත්වයක් හේතුවෙන් ව්‍යාපෘතිය අතරමඟ නවතා දැමීමට බලධාරීන්ට සිදුවූ අතර, එබැවින් එවකට හිස්වූ තනතුරක්ව තිබූ කෘෂිකාර්මික පදනම් මත සිතියම් ගතකිරීමේ ව්‍යාපෘතිය (Agricultural Based Mapping Project – ABMP) භාර මිනින්දෝරු අධිකාරී තනතුරට පත්විය. ආසන්නතම අධීක්ෂණ නිලධාරියා වන නියෝජ්‍ය සර්වේයර් ජනරාල් වරයා වූයේ කලින් සඳහන් කල ක්ෂේත්‍ර පුහුණු කාලය තුලදී එවකට අනුරාධපුර සිටි මිනින්දෝරු අධිකාරීවරයාය. ඒ වනවිට මා හට සහකාර මිනින්දෝරු අධිකාරී තනතුරින් මිනින්දෝරු අධිකාරී තනතුර වෙත උසස් වීමක්ද ලැබී තිබුණි. එම උසස් වීම 1991.01.01 දින සිට බල පැවැත්විනි.

6.1 නුවරඑළියට යාම

එම තනතුරේ කටයුතු කරන අතරතුර හදිසියේම නුවරඑළිය දිස්ත්‍රික් මිනින්දෝරු අධිකාරී ලෙස කටයුතු කිරීමට උපදෙස් ලැබුණි. ඒ එහි කටයුතු කරමින් සිටි මිනින්දෝරු අධිකාරීවරයා විනය පරීක්ෂණයක් මත වැඩතහනම් කිරීම හේතුවෙනි. පරීක්ෂණයකට අදාල ලිපිගොනුවක් අතුරුදහන්වී තිබීම එයට හේතු කාරක විය. මා කටුමාන සංචාරක බංගලාවේ පදිංචිව සිටිමින් කටයුතු කල අතර, කල යුතු ප්‍රධාන කාර්යයක් වූයේ අතුරුදහන් යැයි පැවසෙන ලිපිගොනුව සොයාගැනීමයි. සති තුනක පමණ උත්සාහයකින් පසුව කාර්යාලයේම ලේඛනාගාරයේ තිබී ලිපිගොනුව හමුවිය. ඒ බව කොළඹට දැන්වූ විට වහාම එයද රැගෙන කොළඹ ප්‍රධාන කාර්යාලයට පැමිණෙන මෙන් උපදෙස් ලැබුනි. වසර 34 ක මුළු සේවා කාලයටම දිස්ත්‍රික් මිනින්දෝරු අධිකාරීවරයෙකු ලෙස කටයුතු කිරීමට ලද එකම අවස්ථාව සති 3 කින් අවසන් විය. ප්‍රධාන කාර්යාලයට ආපසු පැමිණෙන විට කලින් සිටි තනතුරට වෙනත් නිලධාරිනියක අනුයුක්ත කර තිබිණි.

6.2 ඉඩම් තොරතුරු පද්ධති අංශය

එබැවින්, එවකට අළුතින් ආරම්භ කරන ලද ඉඩම් තොරතුරු පද්ධති අංශයට (ලේඛණ කළමනාකරණ අංශය ලෙස දැන් හැඳින්වෙන) අනුයුක්තව කටයුතු කිරීම ආරම්භ කරන ලදී. නැවත වරක් ආසන්නතම උසස් නිලධාරියා වන නියෝජ්‍ය සර්වේයර් ජනරාල්වරයා වූයේ කලින් සඳහන් කල ක්ෂේත්‍ර පුහුණු කාලය තුලදී එවකට අනුරාධපුර සිටි මිනින්දෝරු අධිකාරීවරයාය. ඔහු අනුරාධපුර මිනින්දෝරු අධිකාරී ලෙස සිටියදී ඉතා සැර පරුෂ නිලධාරියෙකු ලෙස ප්‍රකටව සිටි අයෙක් බව කලින්ද සඳහන් කර ඇත. වර්තමාන අනුයුක්ත කිරීම අළුතින් ආරම්භ කරන ලද අංශයක බැවින් නියමිත සේවා ස්ථානයක්ද නොමැති වූ අතර ආසන්නතම අධීක්ෂණ නිලධාරියා හැකිතාක් දුරට මහ හැර සිටිය හැකි ස්ථානයක් වූ එවකට හිස්ව තිබූ පළමු මහලේ පිහිටි කාමරයක කාර්යාලය පවත්වාගෙන යන ලදී.

එහෙත් ඔහු විසින් දිගින් දිගටම කරන ලද බලවත් ඉල්ලීම සහ පීඩනය මත ටික දිනකට පසුව ඔහුගේ කාමරයේම ඔහු විසින්ම සංවිධානය කරන ලද මේසයක් පුටුවක් භාවිතා කර කාර්යාලය පවත්වාගෙන යාමට සිදුවිය. ඉතා සැර පරුෂ නිලධාරියෙකු සමග එකම කාමරයේ රාජකාරි කිරීමේ දුෂ්කරතාවය අමුතුවෙන් කිවයුතු නැත. එහෙත් ටික දිනකින් ඔහු සමඟ ඉතා හොඳ සම්බන්ධයක් පවත්වාගෙන යාමට හැකිවිය. ඇතැම් ජ්‍යෝෂ්ඨ නිලධාරීන් පවා අසලකටවත් යාමට බියක් දැක්වූ ඔහු සමඟ එක කාමරයක කටයුතු කිරීම එක් අතකින් දක්ෂ කමකි. කළමනාකරණය සහ පරිපාලනය පිළිබඳ හසල අවබෝධයක් සහ අත්දැකීම් ඇති එවැනි නිලධාරීන් සමඟ ඉතා කිට්ටුවෙන් කටයුතු කිරීමට අවස්ථාව ලැබීම පසු කලෙක එවැනි කටයුතු නොබියව කිරීමට ඉමහත් පිටිවහලක් විය. යම් යම් අවස්ථාවන් නිසි පරිදි කළමනාකරණය කර ගැනීම කලමනාකරුවෙකුගේ මූලික කාර්යය භාරයයි.

මෙම වකවානුව වනවිට ඉඩම් පරිහරණ සැලසුම් ව්‍යාපෘතියේ ප්‍රතිපාදන මත දෙපාර්තමේන්තුවේ මැනුම් හා සිතියම්කරණ ක්‍රියාවලි සම්ප්‍රදායානුකූල ක්‍රම මඟින් කිරීම වෙනුවට සංඛ්‍යාංකිකව (පරිගණක ඇසුරෙන්) ඉටුකිරීමට අවශ්‍ය උපකරණ මිලදීගෙන තිබුණි. සොකියා SET 3B පූර්ණමාන 102 ක්, Casio FX 880 P වර්ගයේ සාක්කු පරිගණක (Pocket Computer) 800 ක් ආසන දොලහක වැන්රථ 20ක්, ඩබල් කැබ් 17 ක් ආදිය මැනුම් කටයුතු සඳහාද, ගුවන් ඡායාරූප ගැනීමේ කැමරාවක්, නව ඡායාරේඛනමිතික උපකරණ 3 ක්, නවීකරණය කරන ලද පැරණි ඡායාරේඛනමිතික උපකරණ 7 ක්, Orthophoto උපකරණයක් සිතියම්කරණය සඳහාද යොදාගැනීමට මෙමඟින් හැකියාව ලැබුණි. මෙම උපකරණ මඟින් දෙපාර්තමේන්තුවේ මැනුම් හා සිතියම්කරණ ක්‍රියාවලි විශාල පරිවර්තනයකට ලක්විය.

මැනුම් කටයුතු සඳහා යොදවන ලද නවීන උපකරණ භාවිතයට නිලධාරීන් හුරු කිරීම සහ ඒ සඳහා ක්‍රමවේද සකස් කිරීම කලයුතු විය. ඉතා දීර්ඝ කාලයක් තිස්සේ පුරුදු පුහුණුව සිටි ක්‍රමවේදයක් වෙනස් කිරීම ලෙහෙසි පහසු කටයුත්තක් නොවිය. තාක්ෂණික දැනුම ලබාදීම පහසු වුවත් නව තාක්ෂණය යොදාගැනීමේදී අනිවාර්යයෙන් සිදුවිය යුතු ආකල්පමය වෙනස සිදුකිරීම දුෂ්කර විය. විකෝණමානය සහ දම්වැල යොදා අනුලම්භ ගැනීම මඟින් ක්ෂෙත්‍ර නිරීක්ෂණ කිරීමේදී කලයුතු සංවිධාන කටයුතුවලට වඩා වෙනස් සංවිධාන ක්‍රමයක් අනුගමනය කලයුතු විය. පාලන ලක්ෂ්‍ය පිහිටුවීම, උපකරණ ස්ථාන තෝරාගැනීම, සහායකයන් සමඟ සන්නිවේදනය කරනු ලබන ආකාරය ක්ෂේත්‍ර පොත් පවත්වා ගතයුතු ආකාරය පවා වෙනස් විය යුතු විය. මෙය ලියන වකවානුව වනවිටත් වෙනස් කල නොහැකිවූ ආකල්පයක් වූයේ මිනින්දෝරුවරයා විසින්ම උපකරණය හැසිරවීමේ පුරුද්දයි. මිනින්දෝරුවරයාගේ කාර්යභාරයේ වැදගත්ම කොටස වන්නේ නිවැරදිව මායිම් මැනීමයි. උපකරණය මඟින් මිලි මීටරයට නිවැරදිව මිනුම් ගනු ලැබුවත් මිනුම් ගනු ලබන මායිම් ලක්ෂය නිවැරදි නොවේ නම් එහි ප්‍රයෝජනයක් නොමැති අතර එසේ කිරීමට නම් මිනින්දෝරුවරයා උපකරණය හැසිරවීම සුදුසු සහායකයෙකුට භාරදී තමා මායිම දිගේ යායුතු වේ.

ඒ අනුව දිවයිනේ සෑම ප්‍රදේශයකටම ගොස් ක්ෂෙත්‍ර නිලධාරීන් පුහුණු කිරීමට අවස්ථාව ලැබුණි. එවකට උතුරු නැහෙනහිර පැවති යුධ වාතාවරණය හේතුවෙන් එම ප්‍රදේශ හැර අනෙකුත් සියළුම දිස්ත්‍රික්කවලට ගොස්, ක්ෂෙත්‍ර නිලධාරීන් හමුවී සොකියා SET 3B පූර්ණමාන භාවිතය පිළිබඳව පුහුණුවක් ලබාදීම හරහා දිවයිනේ සෑම ප්‍රදේශයකම පාහේ සංචාරය කිරීමටත් ක්ෂේත්‍ර නිලධාරීන් හඳුනා ගැනීමටත් ලැබීම සේවාකාලය තුල ලද මහඟු අවස්ථාවක් විය.

6.3 දඬුවම් දීම

එකල අප සිටි අංශයේ සේවය කල කණිෂ්ඨ සේවකයෙකු අනෙකුත් නිලධාරීන්ට ඉමහත් කරදරකාරී පුද්ගලයෙක් විය. ඔහු චන්ඩියෙකු ලෙස පෙනීසිටීමින් කිසිවෙකුගේ උපදෙස් පිලිනොගන්නා චරිතයක් විය. ඔහු නිලධාරීන්ගෙන් ණයට මුදල් ගෙන ආපසු නොදෙන පුද්ගලයෙක් වූ අතර මුදල් ලබාගන්නේද බලහත්කාරයෙනි. ණයට දුන් මුදල් ආපසු ඉල්ලීමටද සමහරු බිය විය. එවැනි අයට මරණීය තර්ජන හා මහමඟදී පහර දෙන බවට බියගැන්වීම් කල අවස්ථාද වාර්තාවී තිබුණි. එවකට දිනපතා ගම්පහ සිට මරදාන දක්වා දුම්රියෙන් ගමන් කල මා හට ද මරදානේදී පහර දෙන බවට තර්ජනය කර තිබුණි. මා

කුඩා කල සිට මරියකඩේ ප්‍රදේශයේ (මා ඉගෙන ගත් කොළඹ ආනන්ද විද්‍යාලය පිහිටා ඇති ප්‍රදේශය) හැදුනු වැඩුනු පුද්ගලයෙකු බැවින් තර්ජනවලට බිය නැති බව දැන්වීමි. එහෙත්, අවශ්‍යතාවයක් වුවහොත් ප්‍රයෝජනයට ගැනීම සඳහා ශක්තිමත් කුඩයක් නිතර අතැතිව ගමන් කලෙමි.

ඔහු කාර්යාලය තුල බීමත්ව හැසිරුන අවස්ථාද වාර්තාවී තිබුනි. අවවාදවලින් නිවැරදි කල නොහැකි පුද්ගලයෙකු ලෙස වටහාගත් බැවින් කාර්යාලය තුල බීමත්ව හැසිරෙන අවස්ථාවක් සොයා ගැනීමට නිලධාරින්ට උපදෙස් ලබාදීමට සිදුවිය. දිනෙක, දහවල් දෙකට පමණ බීමත්ව තමාගේ අසුනේ මේසය මත හිස තබා නිදාගෙන සිටින බවට ලැබුනු තොරතුරක් අනුව ඔහුට එලෙසම නිදාගැනීමට හැර නාරාහේන්පිට පොලිසියට ගොස් පැමිණිල්ලක් කල අතර පොලිස් නිලධාරියෙකු සමඟ පැමිණෙන විටත් නිදාගෙන සිටි ඔහු පහසුවෙන් අල්ලාගැනීමට පොලිස් නිලධාරියාට හැකිවිය.

පසුකලෙක පැවති විධිමත් විනය පරීක්ෂණයේදී සාක්ෂි දීමට පෙර මා හමුවූ ඔහු බැගෑපත්වෙමින්, පරීක්ෂණ මණ්ඩලයෙන් සමාව රැගෙන දෙන ලෙස ඉල්ලා සිටියත් ඒ වන විට ඒ සඳහා තිබූ සියළු මාර්ග අවහිර ව තිබුණු අතර පරීක්ෂණ මණ්ඩලයේ තීරණය අනුව ඔහුව රාජ්‍ය සේවයෙන් පහ කරන ලදී.

6.4 ඉන්දීය සංචාරය

1994 වසරේ ලෝක බැංකුව විසින් පිරිනමන ලද ආධාරයක් මත නාගරික සංවර්ධන අධිකාරිය මඟින් ක්‍රියාත්මකවූ ඉඩම් තොරතුරු සහ භූ ලක්ෂණාත්මක තොරතුරු පද්ධතියක් නිර්මාණය කිරීම පිළිබඳ නියමු ව්‍යාපෘතියකට අදාළ සති දෙකක අධ්‍යයන චාරිකාවක් සඳහා මිනින්දෝරු දෙපාර්තමේන්තුව නියෝජනය කරමින් ඉන්දියාවේ නවදිල්ලි නගරයට යාමට අවස්ථාවක් ලදිමි. ඒ සඳහා නාගරික සංවර්ධන අධිකාරිය, ජනලේඛන හා සංඛ්‍යාලේඛන දෙපාර්තමේන්තුව, ලංකා විදුලිබල මණ්ඩලය, ජාතික ජල සම්පාදන හා ජලාපවාහන මණ්ඩලය සහ තක්සේරු දෙපාර්තමේන්තුව යන ආයතන කිහිපයකම නිලධාරින් නියෝජනය විය.

අතර මැද යෙදුණු සති අන්තයේ දිනක නවදිල්ලි නගරයේ සිට කිලෝ මීටර් දෙසීයක පමණ දුරින් පිහිටි අග්‍රා නගරයට චාරිකාවක් ගිය අතර එමඟින් ලෝකයේ පුදුම හතෙන් එකක් වන ටජ් මහල් මන්දිරය දැකබලා ගැනීමට හැකිවීම වාසනාවකි.

6.5 ඉඩම් හිමිකම් ලියාපදිංචි කිරීමේ පනත් කෙටුම් පත

මෙම වකවානුවේ එනම් 1996 වසරේ ඉටුවූ ජාතික වශයෙන් වැදගත් කර්තව්‍යයක් වූයේ ඉඩම් හිමිකම් ලියාපදිංචි කිරීමේ පනත් කෙටුම්පත පාර්ලිමේන්තුවට ඉදිරිපත් කිරීමයි. මෙම පනත් කෙටුම්පතේ නිර්මාතෘවරයා වූයේ මිනින්දෝරු දෙපාර්තමේන්තුවේ සිටි කීර්තිමත් නිලධාරියෙකු මෙන්ම මිනින්දෝරු වරයෙකු ලෙස සේවයට බැඳී සර්වේයර් ජනරාල් තනතුර දක්වා ගමන්කල එකම නිලධාරියා ලෙස ඒ වනවිට වාර්තාවී තිබූ එස්. බෙරුගොඩ මහතාය. ඉඩම් හිමිකම් ලියාපදිංචි කිරීමේ විෂය පිළිබඳ දැනුමට අමතරව ඔහුට සිංහල මෙන්ම ඉංග්‍රීසි භාෂාවන්ගෙන් ලිවීමේ මනා හැකියාවක් තිබුනි. ඔහු සර්වේයර් ජනරාල් ලෙස විශ්‍රාම ගන්නාතෙක් 1990 සිට 1994 දක්වා ඔහු ඇසුරේ වසර කිහිපයක්ම රාජකාරි කටයුතු කිරීමෙන් ලද ආභාෂය පසු කලෙක ඉතා ප්‍රයෝජනවත් විය. එහෙත් ඔහුගේ අකුරු කියවීම තරමක් අපහසුවූ බැවින් ඔහු කියවන විට අප විසින් ලියා ගැනීමට පුරුදුව සිටි අතර පිටු කිහිපයක ලියවිල්ලක් වුවද එක දිගට වචනයක් හෝ නොවැරදී ලියාගැනීම පිණිස කියවීමට (dictate) ඔහුට හැකියාව තිබින.

ඔහු සර්වේයර් ජනරාල් ලෙස විශ්‍රාම ගෙන ටික කලකට පසුව ඔහුගේ දියණිය වෙසෙන නවසීලන්තයේ පදිංචියට ගිය අතර වසර 2008 දී පමණ ලංකාවට පැමිණි අවස්ථාවක සර්වේයර් ජනරාල් කාර්යාලයට පැමින අප සියළු දෙනා හමුවී කාර්යාලයේ සියළුම අංශ නැරඹීමට අවශ්‍ය වූ අතර ඒ සංචාරයේ පරිවාර නිලධාරියා ලෙස මා පත්කරනු ලැබුවේ එවකට සිටි සර්වේයර් ජනරාල්වරයා ය. ඔහු නැවත නවසීලන්තයට ගොස් මා වෙත කෙටි ගුවන් ලිපියක් එවා තිබුනු අතර එහි සඳහන් වූයේ මෙසේය.

My Dear Sisira Putha,

I am very grateful to you for the love and kindness shown to me during my recent visit to Sri Lanka. It was really a great pleasure to be with your loved ones and to see that they are doing well. I wish you many, many more successes.

කලින් සඳහන්කල පනත් කෙටුම්පත පාර්ලිමේන්තුවට ඉදිරිපත් කල 1996 වසර වනවිට එහි නිර්මාතෘවරයා විශ්‍රාම ගොස් විදේශගතව සිටි අතර ඒ සම්බන්ධව මිනින්දෝරු දෙපාර්තමේන්තුවේ කාර්යභාරය ඉඩම් තොරතුරු පද්ධති අංශයට පැවරිණ. එවකට කෘෂිකර්ම සහ ඉඩම් අමාත්‍යවරයාව සිටි දි.මු. ජයරත්න මහතා පනත් කෙටුම්පත පාර්ලිමේන්තුවට ඉදිරිපත් කල 1996 මැයි මස අට වෙනි දින "ඉඩම් අයිතිය තහවුරු කෙරෙන නව පිළිවෙතක්" යනුවෙන් ලිපියක් දිනමිණ පුවත්පතෙහි පළකිරීමටද මවිසින් පියවර ගනු ලැබිණ. මෙම පනත් කෙටුම්පතට ශ්‍රී ලංකා නීතීඥ සංගමය බලවත් ලෙස විරෝධය පළකරන ලද බැවින් පනත් කෙටුම්පත පාර්ලිමේන්තු තේරීම් කමිටුවකට යොමුකිරීමට පියවර ගනු ලැබිණ. එකල බොහෝ කාලයක් වැය කරන ලද්දේ මෙම පනත් කෙටුම් පතට අදාලව පාර්ලිමේන්තු තේරීම් කමිටුවට කරුණු ඉදිරිපත් කිරීම සඳහාය. විවිධ මත භේදයන්ට භාජනය වූ මෙම පනත් කෙටුම්පත අවසානයේ සම්මත කරන ලද්දේ 1998 වසරේ දී 1998 අංක 21 දරණ හිමිකම් ලියාපදිංචි කිරීමේ පනත ලෙසය. එම කාලය තුල මෙම පනත් කෙටුම්පතට පක්ෂව මෙන්ම විපක්ෂවද විවිධ ලිපි එකල පුවත් පත්වල පළවිය.

මෙම කාර්යයට දායක වීමේදී, කලින් සඳහන් කල විද්‍යාපති උපාධිය සඳහා අධ්‍යයනය කල ඉඩම් ලියාපදිංචි කිරීමේ මූලධර්ම ප්‍රයෝජනවත් විය. තවද මෙම කාර්යයට සම්බන්ධව සිටි ඉඩම් අමාත්‍යාංශයේ උසස් නිලධාරීන් සමඟ ඇතිකර ගත් සබඳතාවයන් පසු කලෙක රාජකාරී මෙන්ම පෞද්ගලික අවශ්‍යතාවයන් සඳහාද මහෝපකාරී විය.

A, WEDNESDAY, MAY 08, 1996

ඉඩම් අයිතිය තහවුරු කෙරෙන නව පිළිවෙතක්

මිහිස්දෙරු අධිකාරි
එස්. කේ. විජයසිංහ
විසිනි

නව ක්‍රමය

අයිතිය

අඩුපාඩු

හඳුනා ගැනීම

හිමිකම් ලියා පදිංචි කිරීමේ ක්‍රමය මගින්, මෙප්පු ලියා පදිංචි කිරීමේ ක්‍රමය තුළ ඇති තවත් වැදගත් දුර්වලතාවක් වන නොබෙදූ හවුල් ඉඩම් පැවතීමේ අවස්ථාව නැතිවී යයි. අද මෙරට ඉඩම් සංවර්ධනයට විශාල බාධාවක්ව පවතින්නේ නොබෙදූ හවුල් ඉඩම් විශාල ප්‍රමාණයක් පැවතීමයි. හිමිකම් ලියා පදිංචි කිරීමේ ක්‍රමයක් තුළ හවුල් අයිතිය සඳහා අවස්ථාවක් නොමැත.

හවුල් ඉඩම

ආදරනීය පුත්‍රෝත්සවය අදයි

6.6 Casio FX 880P සඳහා පරිගණක වැඩසටහන

Casio FX 880P සාක්කු පරිගණකය මඟින් මැනුම් දත්ත ගණනය කිරීම සඳහා පරිගණක වැඩසටහනක් සකස් කිරීමට හැකිවීම මෙම වකවානුව තුල ලැබූ විශේෂ අත්දැකීමක්වූ අතර ඒ සඳහා රාජකාරි කාලයට අමතරව විශාල කාලයක්ද, ශ්‍රමයක්ද වැය කිරීමට සිදුවිය. එම පරිගණක වැඩසටහන එම යුගයේ විශාල ඉදිරි පිම්මක් වූ අතර එය භාවිතා කල යුතු ආකාරය පිළිබඳවද වෙනම උපදේශාත්මක වැඩසටහන් මෙන්ම උපදෙස් මාලාවක්ද සකස් කල යුතු විය. මෙම වැඩසටහන දෙපාර්තමේන්තුවේ සියළුම මිනින්දෝරුවරුන් භාවිතා කරන ලද අතර පුද්ගලික අංශයේ බලයලත් මිනින්දෝරුවරුන් අතරද ඉතා ජනප්‍රිය විය. එය සෑම දෙනාටම නොමිලයේ ලබා දෙන ලද අතර ඉන් වසර 15 කට පමණ පසු, එනම් 2017 වසරේ පවා එම වැඩ සටහනට ඉල්ලුමක් පැවතුනි.

6.7 වෘත්තීය සමිති කටයුතු

1990 සිට 1997 දක්වා වන වකවානුව තුල මිනින්දෝරු දෙපාර්තමේන්තුවේ මාණ්ඩලික නිලධාරී සංගමය හරහා වෘත්තීය සමිති කටයුතු වල නියැලීමටද අවස්ථාව යෙදුනි. 1991 වසරේ සහකාර ලේකම් ධුරයද 1992 වසරේ සිට 1997 වසර දක්වා ලේකම් ධුරයේද ඉන්පසු 2001 වසරේ සිට වසර දෙකක් හෝ තුනක් භාණ්ඩාගාරික ධුරයේද කටයුතු කරන ලද අතර එමඟින් දෙපාර්තමේන්තුවේ සහකාර මිනින්දෝරු අධිකාරීවරුන්ගේ සිට සර්වේයර් ජනරාල්වරු දක්වා වූ සියළුම මාණ්ඩලික නිලධාරීන් දැන හඳුනා ගැනීමටත් ඇසුරු කිරීමටත් අවස්ථාව ලැබුණි.

ඒ වනවිට උපාධිධාරී මාණ්ඩලික නිලධාරී සංගමයක්ද පැවති බැවින් මාණ්ඩලික නිලධාරී සංගමයේ ප්‍රධාන තනතුරු සියල්ලටම පාහේ පත්කරනු ලබන්නේ උපාධිධාරී නොවන මාණ්ඩලික නිලධාරීන් වුවත් තෝරාගත් උපාධිධාරීන් කිහිප දෙනෙකු තනතුරුවලට පත්කර ගැනිණ.

වෘත්තීය සමිති කටයුතුවල අදටත් නොවෙනස්ව පවතින වඩාත්ම දුෂ්කර කාර්යය වූයේ වාර්ෂික ස්ථාන මාරු සම්බන්ධයෙන් කටයුතු කිරීමයි. දිවයිනේ විවිධ ප්‍රදේශවල පැතිරී ඇති සේවා ස්ථානවලට ප්‍රධාන නගර කිහිපයක් ආශ්‍රිතව පදිංචිව සිටින නිලධාරීන් අනුයුක්ත කිරීමට සිදුවීම ලෙහෙසි පහසු කටයුත්තක් නොවීය. සෑම වසරකම අගෝස්තු මස සිට නොවැම්බර් මස පමණ දක්වා වන ස්ථාන මාරු මණ්ඩල සහ අභියාචනා මණ්ඩල පැවැත්වෙන වකවානුව ඉතාම කාර්ය බහුල වකවානුවකි. දිනපතාම දවසේ පැය විසිහතර පුරාම පාහේ ලැබෙන දුරකථන ඇමතුම් වලට පිළිතුරු ලබාදිය යුතු විය.

මෙහිදී ස්ථාන මාරු සඳහා ලැබෙන අයදුම්පත් අදාල වෘත්තීය සමිති එක්වී සමාලෝචනය කර එක් එක් නිලධාරියාගේ සේවාකාලය තුල සේවය කල ස්ථාන "ජනප්‍රිය", "ජනප්‍රිය නොවන" සහ "දුෂ්කර" යනුවෙන් වර්ගීකරණයකට ලක්කර වෘත්තීය සමිතිවලට එකඟවිය හැකි ස්ථාන මාරු ලැයිස්තුවක් සකස් කරනු ලැබේ. එක් නිලධාරියෙකු හට ජනප්‍රිය සේවා ස්ථානයක් තවත් නිලධාරියෙකුහට ජනප්‍රිය නොවිය හැකි බැවින් ජනප්‍රිය යන නිර්ණායකය විවාදාත්මකය. එහෙත් එකල රටේ පැවති අනාරක්ෂිත වාතාවරණය තුල උතුරු සහ නැඟෙනහිර පලාත් අති දුෂ්කර පළාත් ලෙස සලකන ලදී.

6.8 රාජකාරි නිවාස දුරකථනය

අප දෙපාර්තමේන්තුවේ එකල දිස්ත්‍රික්කයක් භාරව කටයුතු කල නිලධාරියා තනතුරින් මිනින්දෝරු අධිකාරී වූ අතර රාජ්‍ය සේවයේ සම මට්ටමේ අනිකුත් ප්‍රාදේශීය නිලධාරින්ට හිමිව තිබූ රාජකාරි නිවාස දුරකථනයක් ඔහුට හිමි නොවිය. නිල නිවාසවල පදිංචිව සිටි නිලධාරින්ට රාජකාරි අවශ්‍යතාවය මත රජය විසින්ම සපයන ලද දුරකථනයක් තිබුනි. අද මෙන් ජංගම දුරකථන නොතිබූ එකල දුරකථනයක් යනු අතිශය සුඛෝපභෝගී භාණ්ඩයකි. දුරකථනයක් ලබාගත හැක්කේද විදුලි සංදේශ දෙපාර්තමේන්තුවෙන් පමණක් වූ අතර ඒ සඳහා වැයවන මුදලද අති විශාල මෙන්ම අයදුම්කරුට බොහෝ කලක් පොරොත්තු ලේඛණයක රැඳී සිටිය යුතුද විය.

මිනින්දෝරු අධිකාරී තනතුර දරණ නිලධාරි සංඛ්‍යාව 46 ක් වූ අතර ඔවුන්ගෙන් විසිදෙදෙනෙක් දිස්ත්‍රික්ක භාරව කටයුතු කල අතර 8 දෙනෙක් පළාත් කාර්යාල වලද ඉතිරිය කොළඹ සර්වේයර් ජනරාල් කාර්යාලයේ සහ දියතලාව මැනුම් හා සිතියම් ගතකිරීමේ ආයතනයේද සේවය කලහ. (එකල පැවති දිස්ත්‍රික් සංඛයාව 25 ක් වුවත් පවත්වාගෙන ගිය කාර්යාල සංඛ්‍යාව 22 ක් විය) නිල නිවාසවල පදිංචිව නොසිටි නිලධාරින්ට රාජකාරි නිවාස දුරකථනයක් ලබාගැනීම සඳහා කෙතරම් ඉල්ලීම් කලද එය ඉටු නොවන තත්වයක් තුල වෘත්තීය සමිති මට්ටමින් ක්‍රියාත්මක වීමේ අවශ්‍යතාවයක් ඇතිවිය. ඒ සඳහා මිනින්දෝරු දෙපාර්තමේන්තුවේ මාණ්ඩලික නිලධාරි සංගමය සහ උපාධිධාරී මාණ්ඩලික නිලධාරි සංගමය එක්ව කටයුතු කරන ලද අතර මෙම අවශ්‍යතාවය නිලධාරි මට්ටමින් ඉටුකරවා ගත නොහැකිවූ බැවින් මිනින්දෝරු දෙපාර්තමේන්තුව අයත් ඉඩම් විෂය භාර ඇමතිවරයා හමුවී ඉල්ලීම ඉදිරිපත් කිරීමට තීරණය කෙරුණි.

එවකට ඉඩම් ඇමතිවරයාව සිටි අභාවප්‍රාප්ත ගාමිණී අතුකෝරල මහතා හමුවී මෙම ඉල්ලීම ඉදිරිපත් කල විට ඔහු විමසා සිටියේ මිනින්දෝරු අධිකාරී තනතුර දරණ නිලධාරි සංඛ්‍යාව කොපමණද යන්නයි. සංඛ්‍යාව 46 ක් බවත් එයින් 30ක් පමණ නිල නිවාසවල පදිංචිව සිටින බවත් මෙම අවශ්‍යතාවය යෙදී ඇත්තේ ඉතිරි නිලධාරින් 16 ක් පමණ දෙනාට බවත් පැවසූ විගස මෙම ඉතිරි නිලධාරී කණ්ඩායමටද රාජකාරි නිවාස දුරකථනයක් ලබාදෙන ලෙස අදාල නිලධාරින්ට උපදෙස් ලබාදෙන ලදී. ඇමතිවරයාගේ තීරණයට ප්‍රධාන වශයෙන් බලපාන ලද්දේ මෙම අවශ්‍යතාවය යෙදී ඇත්තේ සුළුතර නිලධාරි සංඛ්‍යාවකට වීම බව අපගේ හැඟීම විය. එය තහවුරු කිරීම සඳහා අප ලබාදුන් පිළිතුර නිවැරදි වුවත් නොකියවුනු කොටස වූයේ මෙම නිලධාරීන් කලින් කලට ස්ථානමාරු ලැබීමට ඇති ඉඩකඩය. ඒ අනුව යම් කාලයකට පසුව 46 දෙනාටම රාජකාරි නිවාස දුරකථනයක් හිමිවිය. සියළු තොරතුරු අවංකව ලබාදී යම් යම් ඉල්ලීම් දිනාගත නොහැකි වුවත් ලබාදෙන තොරතුරු සම්පූර්ණයෙන්ම නිවැරදි විය යුතුය.

මෙම තීරණයෙන් ටික කලකට පසු එවකට මා පදිංචිව සිටි හේනේගම ගමෙහි නිවසට දුරකථනයක් ලබාගැනීමට හැකිවිය. හේනේගම නගරයේ තැපැල් කන්තෝරුවට සහ නිවාස දෙකකට ඒ වනවිට දුරකථන පැවති නමුත් නගරයේ සිට මීටර් 800 ක් පමණ දුරින් ගම දෙසට වන්නට පිහිටි අප නිවසේ සවිකරන ලද මෙම දුරකථනය එම ප්‍රදේශයේ වූ මුල්ම දුරකථනය විය. ඒ වෙනුවෙන්ම කණු යොදා රැහැන් ඇද සවිකරන ලද මෙම දුරකථනය, නිවසට අමතර වටිනාකමක් ලබාදුන් අතරම අප නිවැසියන්ට කරදරයක්වන තරමට දුරකථන ඇමතුම් ගැනීම සඳහා අසල් වැසියන් පැමිණෙන්නට විය. අසල් වැසියන්ගේ ඉල්ලීම වූයේ මුදලක් අයකරගෙන හෝ දුරකථන ඇමතුම් ලබාගැනීමට ඉඩදෙන

ලෙස වූ අතර මෙය රාජකාරි නිවාස දුරකථනයක් වූ බැවින් දුරකථන බිල ගෙවන ලද්දේද බිල් පතෙහි මුදලින් 10% ක් මගේ වැටුපෙන් අයකර දෙපාර්තමේන්තුව විසිනි. මෙවැනි තත්වයක් යටතේ අසල් වැසියන්ගෙන් මුදල් අයකර දුරකථන ඇමතුම් ලබාදිය නොහැකි බැවින් දුරකථන ඇමතුම් යම් පාලනයකට යටත් කිරීමේ අරමුණින් ඇමතුම් ලබාගැනීම පිළිබඳ සටහන් කිරීමට පොතක් යොදවන ලදී.

එයින්, සමහරක් අසල්වැසියන් අප දුරකථන අංකය ඔවුන්ගේ ඥාතින් සහ හිතවතුන්ටද ලබාදී ඇතිබව දැනගන්නට ලැබුනේ වරින් වර ලැබෙන දුරකථන ඇමතුම් වලිනි. එවැනි අවස්ථාවල ඔවුන්ගේ නිවෙස්වලට ගොස් පණිවුඩය ලබාදීමට හෝ ඔවුන් ගෙන්වාගෙන දුරකථන ඇමතුමක් ලබාගැනීමට ඉඩ සැලැස්වීමටද සිදුවිය. වෙලාවකින් කලාවකින් නොරවූ මෙය කොතරම් කරදරයක් වුවත් දුරකථනයක් හේතුවෙන් අසල්වැසියන් අමනාප කරගැනීමද යෝග්‍ය නොවේ. පසු කලෙක දුරකථන භාවිතය වැඩිවීමත් සමඟ මෙම තත්ත්වය ක්‍රමයෙන් ටිකෙන් ටික වෙනස්විය.

ඒ 1994 ජනාධිපතිවරණ සමයයි. මැතිවරණ සමයක් යනු රජයේ සේවකයින් වෙත යම් යම් වරප්‍රසාද ලැබෙන වකවානුවයි. මෙවරද වෘත්තීයමය ගණයේ රාජ්‍ය නිලධාරීන් හට ලබා දෙන නව වෘත්තීය දීමනාවක් පිළිබඳ සංවාදයක් ඇතිවී තිබුණි. මෙම වකවානුව වනවිට මිනින්දෝරු වෘත්තිය නිහඬ සේවාවක් වූවා විනා රාජ්‍ය සේවය තුල පවා එතරම් ප්‍රසිද්ධියට පත්ව තිබූ වෘත්තියක් නොවිය. නිලධාරින් බොහෝ දෙනෙකුටද අවශ්‍ය වූයේ හැකිතාක් දුරට ජනතාව අතර ප්‍රසිද්ධියට පත් නොවී සැඟව විසීමටය. එමඟින් ලබාගත හැකි ප්‍රතිලාභය වූයේ තමන්ට කැමති විටෙක මැනුම් කඳවුරේ සිටීමින් වැඩ කිරීමටත්, කැමති විටෙක වෙනත් පුද්ගලික කාර්යයන්හි යෙදීමට හැකිවීමත්ය. එකල පැවති එක් රජයේ සේවක වැටුප් වැඩිවීමකදී මිනින්දෝරු සේවය බලධාරීන් විසින් මුළුමනින්ම අමතක කර තිබුණි. එම වැටුප් වැඩිවීම ලබාගැනීමට පසුව විශාල පරිශ්‍රමයක් දරන්නට සිදුවිය. එබැවින් මෙම යෝජිත නව වෘත්තීය දීමනාව ලබාගැනීමට නම් ක්‍රියාකාරීවීමේ අවශ්‍යතාවය මතුවිය. ඒ සඳහා යොදාගනු ලැබුවේ ඒ වනවිට නිළනොවන මට්ටමින් පිහිටුවා තිබූ වෘත්තීයවේදීන්ගේ වෘත්තීය සංගම්වල ඒකාබද්ධ කමිටුවයි. (Joint Committee of Professional Trade Unions) එයට ඉංජිනේරු සේවයේ, විද්‍යාත්මක සේවයේ, මෙන්ම වෛද්‍ය සේවයේ වෘත්තීය සංගම්ද එකතුවී සිටි අතර ක්‍රියාකාරීන් ලෙස වාරිමාර්ග දෙපාර්තමේන්තුවේ ඉංජිනේරුවරුන්, දුම්රිය දෙපාර්තමේන්තුවේ ඉංජිනේරුවරුන්, කාළගුණ විද්‍යා දෙපාර්තමේන්තුවේ සහ කිරුම් මිණුම් දෙපාර්තමේන්තුවේ විද්‍යාඥයින් කටයුතු කලහ. එම උත්සාහය සාර්ථක වූ අතර රුපියල් දහසක වෘත්තීය දීමනාවක් ලබාගැනීමට සමත්වූ අතර එය එකල ලැබූ වැටුපට සාපේක්ෂව ගත්කල විශාල දීමනාවක් විය.

6.9 පළමු තීරු බදු සහන වාහන බලපත්‍රය

මෙම වකවානුවේදී, එනම් 1993 දී වෘත්තීයවේදීන්ගේ වෘත්තීය සංගම්වල ඒකාබද්ධ කමිටුවේ බලවත් ඉල්ලීමක් මත, රාජ්‍ය සේවයේ අවම වශයෙන් වසර පහක සේවා කාලයක් සහිත වෘත්තීය මට්ටමේ නිලධාරීන් සඳහා තීරුබදු සහන යටතේ නවීන වාහනයක් හෝ වසර තුනකට වඩා පැරණි නොවන වාහනයක් ගෙන්වා ගැනීමේ ක්‍රමවේදයක් ලංකාවේ ප්‍රථම වරට හඳුන්වාදී තිබුණි. මෙය රජයේ නිලධාරීන්ට අළුත්ම අත්දැකීමක් විය. මීට පෙර වාහන පාවිච්චි කල හෝ නොකල බොහෝ දෙනා මෙම තීරුබදු සහනය යටතේ වාහනයක් ගෙන්වා ගැනීමට උත්සුක විය. ලබාදී තිබූ එන්ජින් ධාරිතා සීමාව සහ CIF අගයේ සීමාව යටතේ නවතම (Brand New) ඩීසල් වාහනයක් රුපියල් ලක්ෂ 5-6 අතර ගණනකටද, පාවිච්චි කල ඩීසල් වාහනයක් රුපියල් ලක්ෂ 3-4 කටද ගෙන්වාගත හැකි විය. වෙළඳ පොළේ පෙට්‍රල් සහ ඩීසල් මිළ අතර විශාල පරතරයක් තිබූ බැවින් බොහෝ දෙනා උත්සාහ කරන ලද්දේ කෙසේ හෝ ඩීසල් වලින් ධාවනයවන වාහනයක් මිලදී ගැනීමටය. මිල මුදල් යහමින් තිබෙන අය නවීන වාහනයකටද අනිකුත් අය පාවිච්චි කල වාහනයක්ද ගෙන්වා ගැනීමට කටයුතු කරන ලදී. ඒ දෙකම අපහසු අය තම බලපත්‍රය වෙනත් අයෙකුට විකුණා දැමීමටද කටයුතු කරන ලදී. එසේ විකුණනු ලැබූ බලපත්‍රයක එකල වටිනාකම වූයේ රුපියල් ලක්ෂයක් පමණි.

අන්තර්ජාලය හෝ විද්‍යුත් තැපෑලක් නොතිබූ මෙම අවධියේ පාවිච්චි කල වාහනයක් තෝරාගත හැකි වූයේ වාහනය සම්බන්ධයෙන් ඒජන්ත වරයෙකු විසින් ලබාදෙන තොරතුරු මඟින් පමණි. ණයවර ලිපියට හැකිතාක් දුරට එම තොරතුරු එක්කර තැබීම මඟින් මිලදීගනු ලබන්නා ගේ ආරක්ෂාව සැලසේ. පෙට්‍රල් ලීටරයක් රුපියල් 60 ක් පමණ වූ එම වකවානුවේ ඩීසල් ලීටරයක් රුපියල් 25ක් පමණ වූ බැවින් සියළුම දෙනා පාහේ උත්සාහ කලේ ඩීසල් වාහනයක් ගෙන්වා ගැනීමටය.

ම'විසින් ගෙන්වා ගත්තේ පාවිච්චි කල TOYOTA Corolla II වර්ගයේ ඩීසල් වාහනයක් වූ අතර ඒ සඳහා වැයවූ මුදල රුපියල් 290,000/- කි. මගේ මතකය අනුව එවකට මිනින්දෝරු අධිකාරී තනතුරේ

සිටි හතලිස් හය දෙනා අතරින් මුලින්ම වාහනයක් ගෙන්වා ගත්තේ මම බවයි. එහි ලියාපදිංචි අංකය වූයේ 64-3590 වේ.

6.10 සාද සංවිධානය

වෘත්තීය සමිති කටයුතු සමඟ නිලනොවන මට්ටමින් පැවරුන තවත් ප්‍රධාන රාජකාරියක් වූයේ සාද සංවිධානය කිරීමය. මිනින්දෝරු දෙපාර්තමේන්තුව තුල විවිධ තරාතිරම් වල විවිධ මට්ටමේ සාද පැවැත්වේ. රාජකාරි මට්ටමේ ක්ෂේත්‍ර පරීක්ෂණයක් හෝ සාකච්ඡාවක් පවා අවසන් වන්නේ සැඳෑ සාදයකිනි. වෘත්තීය සමිති වල වාර්ෂික මහා සභා රැස්වීමක් වුවද සාදයකින් අවසන් වූ අතර ඊට අමතරව උසස්වීම් සාද, ප්‍රිය සම්භාෂණ, සමුගැනීමේ සාද වලින්ද අඩුවක් නොවිය. සාදයට සහභාගිවූ සංඛ්‍යාව 10 පමණ සිට 150 පමණ දක්වා විචලණය වූ අතර, ඒ අනුව සාදය පැවැත්වෙන ස්ථානය තෝරාගත යුතුවූ අතර බොහොමයක් මහා පරිමාණ සාද සඳහා 1990 සිට 2015 පමණ දක්වා තෝරාගනු ලැබුවේ විද්වත් වෘත්තිකයන්ගේ සංවිධාන (Organization of Professional Associations) ගොඩනැඟිල්ලේ පිහිටි අවන්හලයි. අවන්හලට යාබද ව රට බීම හලක්ද, බීර උද්‍යානයක්ද (Beer Garden) ඒ හා බැඳුණු වෙනත් වෙනත් පහසුකම්ද පවතින බැවින් සහ පහසුවෙන් ලහාවිය හැකි මෙන්ම වාහන නැවැත්වීමේ ඉඩකඩද තිබීම පහසුවක් විය. එහෙත් එය වෙන් කර ගැනීම සඳහා සංවිධානයේ සාමාජිකයෙක් ඉදිරිපත් විය යුතුය. ශ්‍රී ලංකා මිනින්දෝරු සංගමයේ මෙන්ම විද්වත් වෘත්තිකයන්ගේ සංවිධානයේ සාමාජිකයෙකුවූ පසු කලෙක එම සංගම් දෙකෙහිම සභාපතිවරයෙක් ලෙසද කටයුතු කල අප හිතවත් අභාවප්‍රාප්ත එච්.එච්. සුබසිංහ මහතාගේ සහාය එතුමා ජීවත්ව සිටියදී ඒ සඳහා යොදා ගැනුණි. ඔහුට දිගින් දිගටම ඒ සඳහා කරදර කල නොහැකි බැවින් පසු කලෙක මමද විද්වත් වෘත්තිකයන්ගේ සංවිධානයේ යාවජීව සාමාජිකත්වයක් ලබාගතිමි.

1997 වසරේ මිල අධික බැවින් ලබා නොගත් රුපියල් 2500/- ක් වූ යාවජීව සාමාජිකත්වය 2002 වසරේ දී රු 5000/- ක් දී ලබා ගැනීමට සිදුවීම මෙරට එකල පැවති උද්ධමනය පිළිබිඹු කරයි.

Farm Land Consolidation (Enhancing Efficiency and Sustainability in Agriculture) Based on the experience in "Isuru" farmer organization area in Nachchaduwa Major Irrigation Scheme, Anuradhapura - (Year 2021 - Year 2022)

by

Mr. T.M.J.W.Gunathilaka-Superintendent of Surveys (R&D)

General Introduction:

Agriculture plays a vital role in ensuring food security, economic growth, and environmental sustainability. As the global population continues to increase, the demand for food and agricultural products rises in parallel. To meet these demands efficiently, it is crucial to optimize agricultural practices and maximize productivity. One approach that has gained traction in recent years is farm land consolidation. This article explores the concept of farm land consolidation, its benefits, challenges, and its potential to enhance efficiency and sustainability in agriculture.

Understanding Farm Land Consolidation:

Farm land consolidation refers to the process of merging smaller, fragmented agricultural land parcels into larger, contiguous units. It involves redistributing land holdings to create more efficient and productive farms. Instead of numerous small-scale farms with irregular shapes, consolidation creates larger, more streamlined agricultural operations. This process can be voluntary or enforced through government policies.

Benefits of Farm Land Consolidation:

From different ways the Land Consolidation will be benefitted to the people who involved in and to the society.

1. Increased Productivity
2. Improved Efficiency
3. Sustainable Resource Management
4. Enhanced Profitability
5. Agricultural Innovation and Research

Challenges and Considerations:

In this process of Land Consolidation there are many challenges to be resolved to achieve it successfully.

Land Fragmentation and Ownership:

Consolidation requires resolving complex land ownership issues, as multiple owners may hold small parcels of land. Legal frameworks and policies need to be in place to facilitate voluntary land exchange or enforce consolidation, ensuring fair compensation and addressing concerns of landowners.

Socioeconomic Implications: Consolidation can result in the displacement of small-scale farmers and rural communities. Adequate measures must be taken to mitigate social and economic impacts, ensuring the inclusion of affected stakeholders in the process. Supportive policies and programs should be implemented to facilitate the transition and provide opportunities for alternative livelihoods.

Environmental Concerns: While consolidation can lead to better resource management, it must be accompanied by sustainable agricultural practices. Environmental safeguards, including soil conservation measures, water management plans, and biodiversity preservation strategies, should be incorporated to minimize adverse ecological impacts.

Infrastructure and Connectivity: Consolidated farms require improved infrastructure, such as road networks, irrigation systems, and storage facilities, to support efficient operations and transportation. Investments in rural infrastructure and connectivity are necessary to ensure the success of consolidated farming systems.

Back Ground Study

Land consolidation projects in Sri Lanka have a long history, with the government implementing various initiatives to consolidate fragmented agricultural land holdings for improved productivity and efficiency. Here is an overview of the major type of land consolidation projects in Sri Lanka.

- Gal Oya Development Scheme (1950s onwards)
- Uda Walawe Left Bank Development Project (1970s onwards)
- Mahaweli Development Project (1970s onwards)
- At Dewahuwa major irrigation Scheme (In 1972)
- Accelerated Mahaweli Development Program (1980s)
- Deduru Oya Development Project (1980s onwards)
- Dry Zone Livelihood Support and Partnership Project (2000s)
- Smallholder Agribusiness Partnerships Program (2010s)

These are just a few examples of the land consolidation projects in Sri Lanka. Over the years, the government has undertaken various initiatives to consolidate fragmented land parcels, enhance agricultural productivity, and promote sustainable land management practices. These projects have played a vital role in transforming the agricultural landscape of Sri Lanka, improving rural livelihoods, and contributing to the country's food security and economic development.

There are many examples can found about Land Consolidation Projects in world as well as in Asian countries.

China: In recent decades, China has implemented extensive land consolidation programs to address the issue of small-scale and fragmented farms. The government initiated large-scale projects, particularly in the northern part of the country, to consolidate small plots into larger farms. These efforts aimed to

improve productivity, promote mechanization, and facilitate the adoption of modern agricultural practices.

European Union (EU): The EU has supported farm land consolidation as part of its Common Agricultural Policy (CAP). Various EU member states, such as Poland, Romania, and Hungary, have implemented land consolidation programs to restructure small and fragmented land holdings. These initiatives aim to increase the competitiveness of agricultural enterprises, enhance land use efficiency, and improve environmental sustainability.

United States: Land consolidation efforts have been undertaken in the United States to address the issue of small family farms and fragmented land ownership. These initiatives aim to create larger, more economically viable agricultural operations. For example, some regions in the Midwest, such as Iowa, have seen voluntary land consolidation programs that encourage farmers to merge their land holdings through financial incentives.

Brazil: In Brazil, particularly in the Cerrado region, land consolidation programs have been implemented to address the challenges of small-scale farming and inefficient land use. These initiatives seek to promote larger-scale farming operations, enhance agricultural productivity, and combat deforestation by concentrating farming activities on consolidated lands.

Ukraine: Ukraine has undergone land consolidation efforts in recent years, particularly in the context of its agricultural reforms. The government has initiated programs to merge small and fragmented land plots into larger, more productive farms. This consolidation aims to attract investment, increase farm efficiency, and modernize the agricultural sector.

Japan: Hokkaido, Japan's northernmost island, has witnessed farm land consolidation efforts to address the issue of small-scale and fragmented agriculture. These initiatives aim to create larger farms, improve efficiency, and promote the adoption of advanced technologies. The consolidation process involves the voluntary merging of small plots, often facilitated by government support and incentives.

In the Niigata Prefecture, located on the northwest coast of Honshu Island, land consolidation programs have been implemented to consolidate fragmented rice paddies. The goal is to increase the size of agricultural holdings, improve irrigation systems, and enhance overall productivity. These initiatives are driven by the need to modernize agriculture and make it more economically sustainable.

Thailand: Thailand has implemented land consolidation programs to address the issue of small and fragmented agricultural holdings, particularly in the central region of the country. The government has encouraged farmers to voluntarily participate in land consolidation schemes, aiming to create larger and more efficient farms. These initiatives also focus on promoting modern agricultural practices, improving irrigation systems, and enhancing productivity.

The Royal Irrigation Department of Thailand has undertaken land consolidation projects in certain areas to optimize the use of water resources and enhance agricultural productivity. By consolidating small land parcels, the department aims to improve irrigation efficiency, promote the adoption of water-saving technologies, and increase farm incomes.

Philippines: The Philippines has implemented land consolidation programs through the Comprehensive Agrarian Reform Program (CARP). The CARP aims to redistribute agricultural lands to landless farmers and promote more productive and efficient farming practices. Through land

consolidation, small and fragmented landholdings are merged to create larger, economically viable farms. These initiatives also provide support services and training to farmers to enhance their agricultural skills and knowledge. The Department of Agrarian Reform in the Philippines has facilitated land consolidation projects in certain regions, particularly in areas with small-scale and fragmented agriculture. The objectives include improving land productivity, promoting mechanization, and providing farmers with access to credit and markets. These efforts are aligned with the goal of reducing poverty and improving rural livelihoods.

Farm land consolidation initiatives in South Asia have been relatively limited compared to some other regions. However, there are a few examples of farm land consolidation efforts in countries like India and Bangladesh:

India: In India, farm land consolidation programs have been implemented in some states to address the issue of fragmented land holdings. For instance, in states like Punjab and Haryana, where small and fragmented land parcels are common, initiatives have been undertaken to consolidate land through voluntary land pooling or cooperative farming models. These efforts aim to create larger, more productive farms, promote mechanization, and enhance agricultural efficiency.

Bangladesh: In Bangladesh, the government has initiated programs to consolidate fragmented agricultural land holdings. The objectives of these initiatives include improving land management, enhancing productivity, and promoting the adoption of modern agricultural practices. In some regions, cooperative farming models have been promoted to consolidate small plots and facilitate joint farming activities.

It is worth noting that South Asian countries face unique challenges in implementing farm land consolidation due to factors such as small landholdings, high population density, complex land tenure systems, and social and cultural considerations. As a result, the extent and impact of farm land consolidation in South Asia may be relatively limited compared to other regions with different agricultural structures and policies.

The involvement of Survey professionals in Land Consolidation

The involvement of survey professionals is crucial for the successful implementation of farm land consolidation. Survey professionals, such as land surveyors, play a pivotal role in assessing, mapping, and providing accurate data on land parcels. Their expertise ensures that consolidation processes are conducted with precision and adherence to legal and regulatory requirements. Here are the key areas where survey professionals contribute to farm land consolidation:

Boundary Surveys: Survey professionals conduct boundary surveys to determine the precise boundaries of individual land parcels. This is essential for identifying the extent and location of each parcel, ensuring that consolidation plans are based on accurate and reliable data. Boundary surveys help avoid disputes and conflicts related to land ownership and boundaries.

Topographic Surveys: Topographic surveys provide detailed information about the terrain, elevation, and physical features of the land. This data helps in designing efficient drainage systems, irrigation networks, and infrastructure planning for consolidated farms. Topographic surveys also aid in identifying potential environmental concerns or constraints that need to be addressed during the consolidation process.

Land Measurement and Mapping: Survey professionals accurately measure and map the land parcels involved in the consolidation process. This includes determining the area, shape, and layout of each

parcel. Precise mapping allows for efficient planning, resource allocation, and the creation of contiguous farm units.

Legal and Regulatory Compliance: Survey professionals ensure that all consolidation activities adhere to legal and regulatory requirements. They assist in verifying land ownership, obtaining necessary permits, and ensuring compliance with local zoning and land use regulations. This ensures that consolidation processes are carried out within the legal framework, protecting the rights and interests of landowners involved.

Data Management and Analysis: Survey professionals collect and analyze data related to land parcels, boundaries, and topographic features. They utilize advanced surveying tools, such as Geographic Information Systems (GIS), to manage and interpret spatial data effectively. This data forms the foundation for making informed decisions during the consolidation process and helps in developing comprehensive land-use plans.

Subdivision and Land Exchange: In cases where landowners need to exchange or redistribute their land holdings, survey professionals play a vital role. They assist in subdividing larger parcels, ensuring equitable distribution and fair compensation. Survey professionals also help in establishing new property boundaries and updating land records to reflect the changes resulting from the consolidation process.

Communication and Stakeholder Engagement: Survey professionals often act as intermediaries between landowners, government authorities, and other stakeholders involved in farm land consolidation. They communicate technical information, address concerns, and ensure that all parties understand the process and its implications. Effective communication and stakeholder engagement contribute to a smooth and collaborative consolidation process.

In summary, the involvement of survey professionals is essential for accurate mapping, boundary determination, compliance with regulations, and effective data management during farm land consolidation. Their expertise and technical knowledge contribute to the successful implementation of consolidation plans, ensuring fairness, efficiency, and legal compliance throughout the process.

Experience in “Isuru” farmer organization area in Nachchaduwa Major Irrigation Scheme, Anuradhapura - (Year 2021 - Year 2022)

The project was initiated and conducted by the Irrigation management division (IMD) of the Irrigation Department (ID). In addition to ID, numbers of other government organizations have given their contribution to this project success. Those were

- Department of Agriculture
- Department of Agrarian Development
- Land Commissioner General Department
- National Planning Department
- Ministry of Irrigation
- Ministry of Finance
- Ministry of Foreign Affairs
- Survey Department
- Legal Draftsman

- Divisional Secretary- Nachchaduwa
- Land Use Planning and Project Department

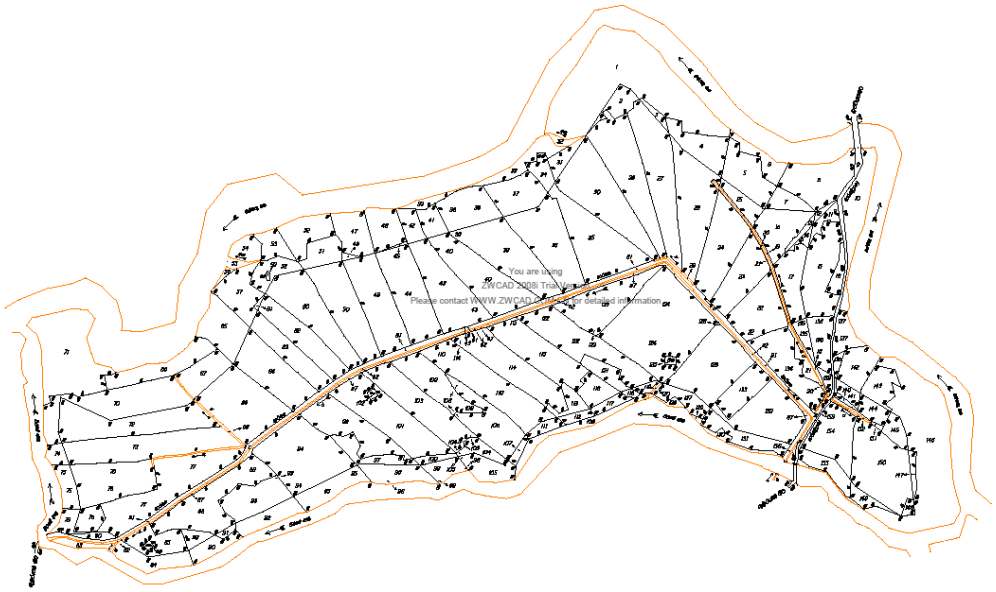
It can find more information regarding the Project and how it became fruitful, through the manual published by the Irrigation Management Division of Irrigation department. Here it is mainly focusing to the involvement of survey department to the project. As described in above it is really important to involved survey professional to the project from the initiative stage of the project.

In this project, it prepared preliminary survey plan for the area selected for the Land Consolidation project to be established. It was done in year 2018 and prepared a tracing and a topographical map (contour plan) according to request from the irrigation department. Since then the survey department was silent in this regard and they came in to the role once they received an invitation letter to the inauguration ceremony of the project (construction work) at the site. At that time everything has finalized and IMD requested to setting out the proposed plan in the ground for the construction. All the blocking out work has been finalized and just only the IMD wants to setting out the boundary in the ground. I was the superintendent of surveys who received the job and assigned to one surveyor to do the project. At that time, covid-19, problem was big challenge and whole country was closed number of times, and the survey team also victims of the virus. The assign another survey team and both together plays a great effort to finish the job.

Due to many defects of the proposed BOD plan given from the ID, we faced big challenge to overcome the issues generated through the proposed plan. Finally SD prepared new BOD as requested through Nachchaduwa Divisional Secretary (DS) and rectified and solved all the problems arisen through previous BOD prepared by ID. Finally proposed BOD was approved by the Isuru Farm Organaization and approved to proceed with it. Then set out the BOD and continue the construction work. In the meantime SD prepared a Cadastral Map for the project area under a request through DS Nachchduwa. As usually, involvement of the SD would finish in this stage, but I was attended all the meeting arrange through zoom and updated required parties. As a team, by the good effort of all parties involved the project was successfully completed and the “Farmland Consolidation Project Manual for Irrigation Schemes of Sri Lanka – 2022” has published by the IMD of the ID.

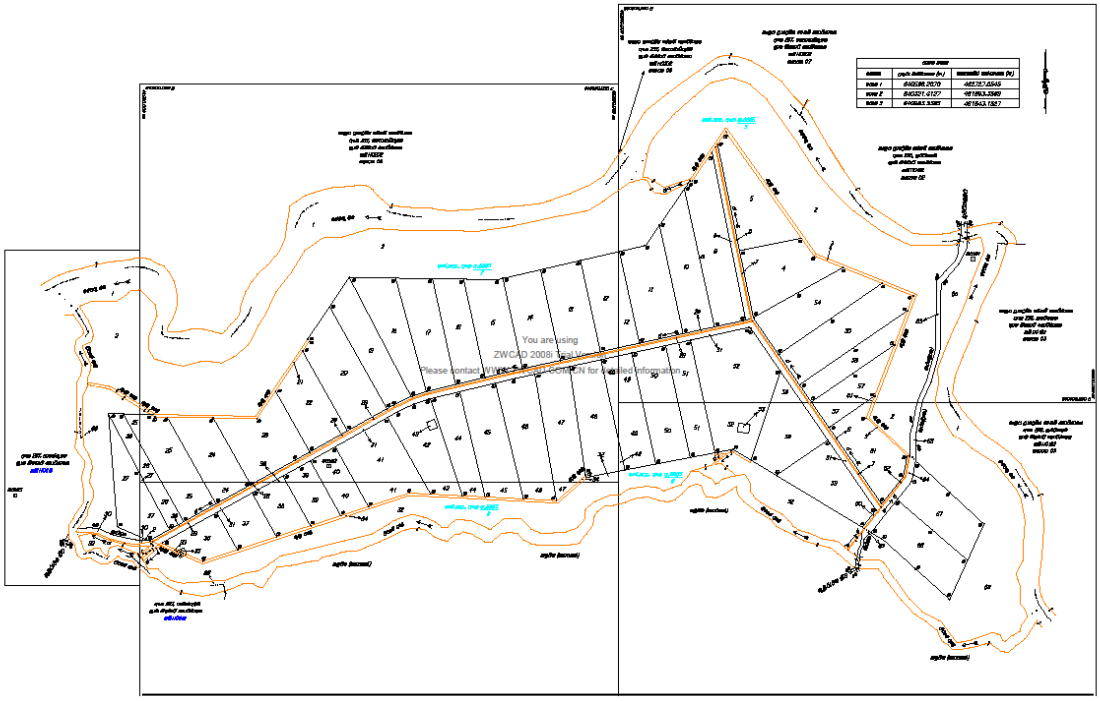
Before

After



As built survey on Project Site

Topographical Map on Project Site



Final Cadastral Map for Project Site

“සර්ව අසුබවාදියා රෝස පඳුරේ කටු ඇතැයි දකිනු ඇත.නමුත් සුබවාදියා, කටු පඳුරේ රෝස මල් ඇතැයි කියනු ඇත.”
සියල්ල තීරණය කරන්නේ ඔබේ දැක්මයි...

ඒබ්‍රහම් ලින්කන්

“NEVER STOP LEARNING,
BECAUSE LIFE NEVER STOPS TEACHING”

GNSS Technology, Sharping the Future

Ms. K.A. Pushpakanthi - Government Surveyor
Divisional Survey Office, Kalutara

In the era of the Internet of Things, location information is being used in many applications of day today life. So the Geo positioning and Information technology are inseparable topics. Everything what you need will be in your doorsteps with just one finger print.

The future will go something like this. No worries of forgetting to send flowers to your mom on Mother's Day, as your phone will send an automatic reminder and provide your autonomous car with directions to the nearest floral shop. No worries if you don't have time to go to the floral shop, a Drone will deliver the flowers to your mom with just a simple command.

If the positioning systems provides the followings, that type of future can actually become a reality.

Global positioning. The ability to choose the best combination of sensors and networks witch provide indoor and outdoor positioning and navigation at any time.

Automation and ambient intelligence. Sufficient reliability to enable such autonomous operations as driving, sailing, parking, landing, etc., by sensing the environment and adapting to it in real time.

Security. Not only in the sense of a solution's reliability and safety, but also by responding to growing concerns about privacy. If the positioning system knows where you and your assets are at all times, it better keep this information to itself.

GNSS technology evolution raises few questions on us.

Which GNSS/ RNSS use? All systems, both GNSS and Regional Navigation Satellite Systems (RNSS) are designed to be interoperable and use the same frequency bands. Their signals, however, are different. As a result some have a better immunity to multipath or measurement accuracy, while others provide faster acquisition or require less processing power. In other words, there is no "best" signal or combination of signals. Only signals better suited for a particular use case or context.

How many satellites? There will be many satellites broadcasting signals on L1/E1, with even more on L5/E5 meaning a GNSS receiver could potentially receive signals from as many as 50 satellites. Having this many visible satellites allows for further improvements, including the possibility to reject low quality measurements (non-line of sight, multipath contamination, low elevation, etc.) without compromising Geometric Dilution Of Precision (GDOP). The net overall effect is better position accuracy, and the key to achieving this is the capability to properly assess the quality of observations. To cope with this reality, GNSS receivers will have to implement selection (or rejection) strategies.

Which frequencies to use? For many low to medium accuracy applications, one frequency is sufficient. This single-frequency is currently L1/E1, but as can be seen in the table, L5/E5 could be a viable iterative in the future. High accuracy applications, however, often require the use of dual-frequency

observations in order to compensate the ionospheric propagation delays and/or to resolve "carrier phase ambiguities" encountered in such specific processing strategies as Real Time Kinematic (RTK) or Precise Point Positioning (PPP). Currently, L1 + L2 observations are used, but L5 may soon become the second frequency of choice as it will be present on more satellites and is less prone to interferences. High accuracy applications can also benefit from a third frequency to facilitate the ambiguity resolution through techniques known as Three Carrier Ambiguity Resolution (TCAR). For safety critical applications, where redundancy and resistance to jamming is important, dual frequency (L1/E1 + L5/E5) is undoubtedly the best choice.

Devices such as smartphones and tablets will increasingly serve as the primary interfaces for interacting with each other and with connected smart devices. The location information plays a key role in this scenario and for this, precise and truly ubiquitous positioning systems are still needed.

The need for safety, reliable performance and accuracy will drive to increase the commercial use of Drones whose backbone is GNSS. Many new features are under development, including collision avoidance, the return home function and autopilot systems in drones. Depending on their specific payload and other characteristics, drones can enable a vast array of different applications. Whilst the list of drone use cases is almost endless. Currant technologies such as Drone telemetry, Detect and avoid, E-identification, Tracking/surveillance, Go-home/Return to Launch (RTL), Altitude hold and Loiter are used for drone positioning and navigation.

Along with the evolution of other technologies, such as 5G-powered ubiquitous connectivity or ultra-secure quantum communications, there is little doubt that GNSS will remain an indispensable utility, continuing to provide users and society with countless benefits.

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Photogrammetry vs LiDAR

Ms. Ayoma Kumarawadu - Superintendent of Surveys (Air Survey)

1) Introduction:

In Aerial Surveying and Mapping, several remote sensing methods are available today, and each one comes with strength and limitations. LiDAR and Photogrammetry (Figure 1.0) are most accurate and efficient remote sensing technologies. In this article will provide a comparison between LiDAR and Photogrammetry with key differences, advantages, drawbacks, of each technology. With comprehensive standing about these two methods, can get correct decision which technology is best suited for specific projects with requirements.

Figure – 1.1 Aerial Photography vs LiDAR

2) Overview of Photogrammetry vs LiDAR

- **What is Photogrammetry**

Photogrammetry is the most popular technique of topographical data collection and creating 3D Models from photographs. In aerial survey, analogue or digital camera mounted in aircraft collect stereo images of the area of interest.

This technology involves capturing a series of overlapping aerial images, which are then processed using specialized software to create realistic and accurate models in various formats such as 2D and 3D Orth mosaic maps and models. Photogrammetry

relies on principle of triangulation and perspective geometry to determine the position of object in image and produce accurate 3D models.

These outputs can be used for a variety of purposes from construction planning to ongoing project management and even in the creation of marketing materials.

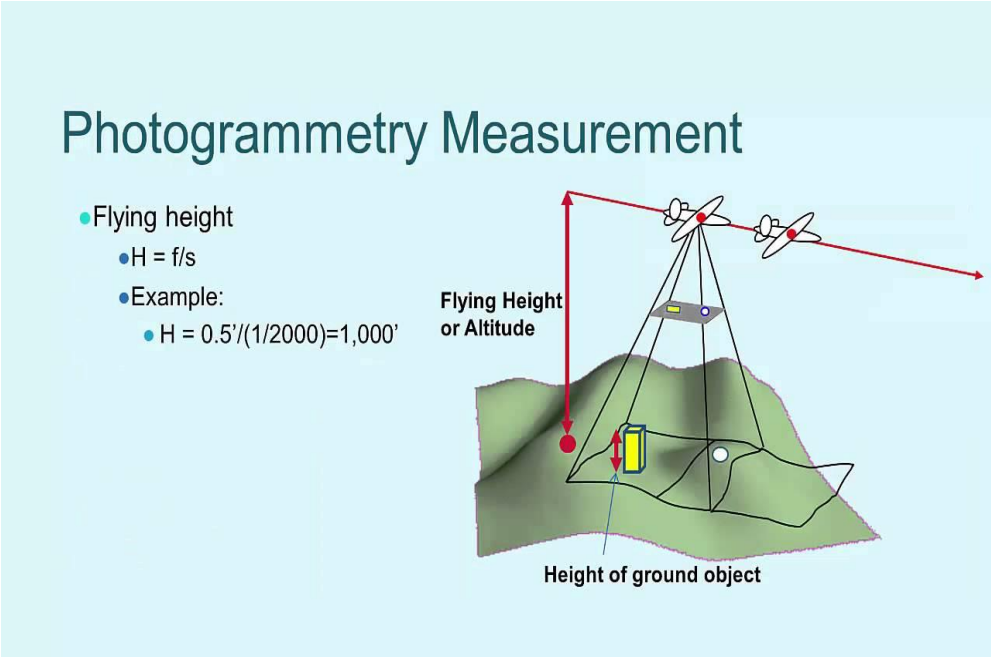

Figure – 1.2 Photogrammetry Survey

- ## What is LiDAR

LiDAR (Light Detection and Ranging) is a remote sensing technology that uses laser light to measure distances and generate accurate, high-resolution maps and 3D model of earth surface. LiDAR system typically consist of a laser source, a scanner and a GPS receiver, mounted on an aircraft or a drone. The technology emits laser pulses towards the ground and the reflected light is measured to calculate the distance between the sensor and the earth's surface.

A large number of these distance measurements are then combined to create a dense point cloud which can be used to generate a digital surface model. This technology is sometimes called 3D laser scanning, since it's ultimately used to generate a 3D point cloud.

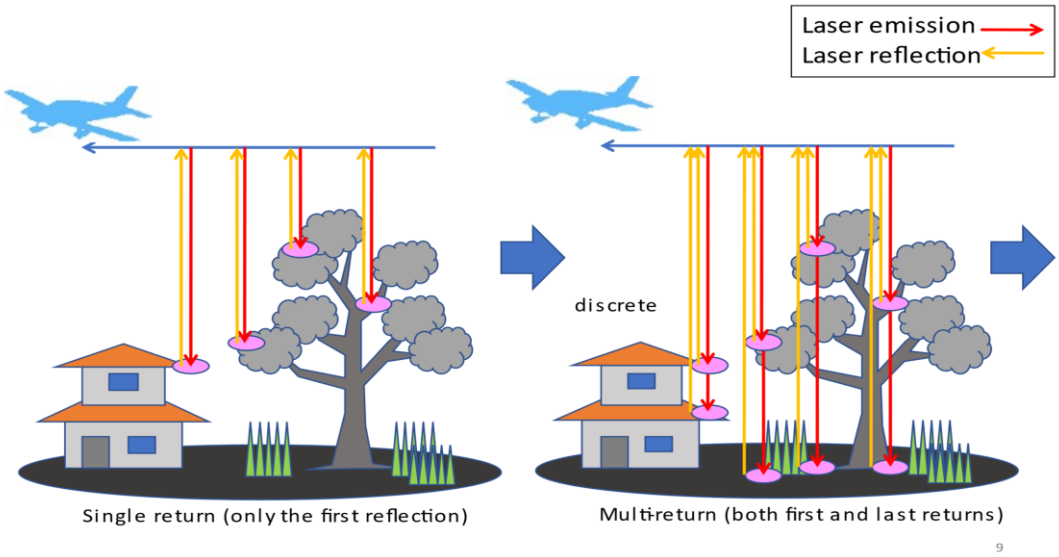

Figure – 1.3 Pulse emissions from Aircraft scanner

3. Key differences with Photogrammetry vs LiDAR

- **Data Acquisition Method**

  Primary difference between LiDAR and Photogrammetry lies in data acquisition method. LiDAR uses laser pulses to measure distances while Photogrammetry relies on images captured by camera. LiDAR can provide more accurate elevation data and is better suited for surveying area with complex terrain or dense vegetation.

- **Data Output Formats**

  LiDAR generates point clouds which are set of data points representing earth surface. Theses point clouds can be further processed to create various type of maps and models, including digital elevation model (DEM), digital surface model (DSM) and 3D models of structures. On the other hand, photogrammetry uses photos of the real site to create a fully 3D visual model of actual terrain.

- **Applications**

  LiDAR technology has wide range of application in various industries due to its high accuracy, precision and ability to penetrate dense vegetation. Photogrammetry due to its visual appeal and lower cost compared to LiDAR is widely used various industries.

Both LiDAR and Photogrammetry have their unique advantages and disadvantages, and the choice between these technologies depend on factors such as project requirements, budget and desired level of accuracy

4. Accuracy between Photogrammetry vs LiDAR

- LiDAR is high accuracy and precision providing elevation data with a vertical accuracy of up to 5-15 centimeters and horizontal accuracy of up to 10-30 centimeters. This high level of accuracy is achieved because LiDAR uses laser pulses to directly measure the distance between the sensor and ground or object, eliminating potential errors that might arise from manual measurements.

- Photogrammetry relies on overlapping images from different angles to create 3D models and orthophotos. The accuracy of photogrammetry depends on factors such as image quality, camera calibration and the precision of ground control points. Generally, photogrammetry can achieve a horizontal accuracy of up to 1-3 meters and vertical accuracy of up to 2-5 meters. How ever it is important to note that the accuracy of photogrammetry can be affected by factors like shadows, occlusions and the texture of the object being surveyed.

5. Advantages and Drawbacks with Photogrammetry vs LiDAR

- **Advantages and Disadvantages of LiDAR**

No.	Advantages	Disadvantages
1.	High accuracy and precision	High cost
2.	Rapid data collection	Limited color information
3.	Ability to penetrate dense vegetation	Affected by atmospheric conditions
4.	Works in different lighting conditions	Less effective in water
5.	Versatility	

- **Advantages and Disadvantages of Photogrammetry**

No.	Advantages	Disadvantages
1.	Low cost	Low accuracy
2.	More color information	Sensitive to lighting and weather conditions
3.	Ease of use	Required ground control points
4.	Versatility	Less effective in water

6. Which is the best? Photogrammetry vs LiDAR

It is essential to consider following factors when starting with project

- **Accuracy:** If that project requires high accuracy and precision LiDAR is best, but project where color information is more critical photogrammetry is more suitable.
- **Data Type:** Determine type of data need for project, if requires color information photogrammetry is best, more accurate and detailed elevation data need then LiDAR is best.
- **Environment:** Have to consider specific environment and condition of project. LiDAR is better suited for dense vegetation and can operate in varying light conditions while photogrammetry is more sensitive lighting and weather conditions.
- **Budget:** Photogrammetry is more cost-effective option for required project.

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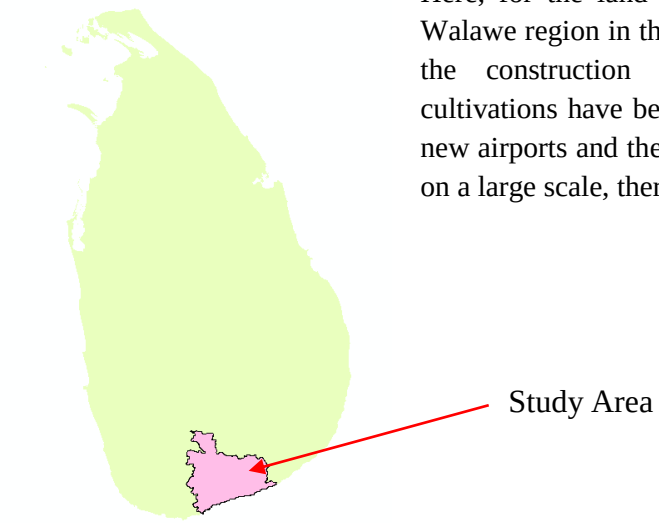
LANDUSE AND LAND COVER CHANGE DETECTION OF PART OF HAMBANTOTA AND RATNAPURA DISTRICT

Mr. Amila Madushan Manamperi - Map Technological Officer (GIS Branch)

Studies have shown that there remain only a few landscapes on Earth that are still in their natural state. Due to anthropogenic activities, the Earth's surface is being significantly altered in some manner and man's presence on the Earth and his use of land has had a profound effect on the natural environment thus resulting in an observable pattern in land use/land cover over time.

The land use/land cover pattern of a region is an outcome of natural and socio–economic factors and their utilization by man in time and space. The land is becoming a scarce resource due to immense agricultural and demographic pressure. Hence, information on land use/land cover and possibilities for their optimal use is essential for the selection, planning and implementation of land use schemes to meet the increasing demands for basic human needs and welfare. This information also assists in monitoring the dynamics of land use resulting from changing demands of the increasing population.

Land use land cover (LULC) change detection based on remote sensing data is an important source of information for various decision support systems. Information derived from land use and land cover change detection is important to land conservation, sustainable development, and management of water resources.



Here, for the land change study, the land area belonging to the Walawe region in the southern part of Sri Lanka was selected. With the construction of the Udawalawa Reservoir, large-scale cultivations have begun in this area. Also, with the construction of new airports and the construction of houses, highways and factories on a large scale, there has been a great change in land use.

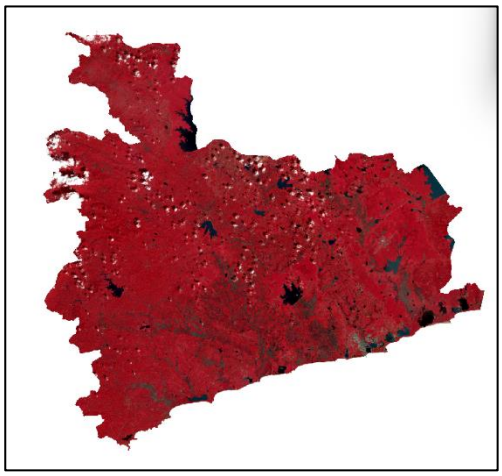
The USGS Earth Explorer database was chosen to retrieve satellite images for two years. The data of the Landsat 8 satellite was downloaded from that database, and they are the images on 2013.12.20 and 2022.02.28 respectively. https://earthexplorer.usgs.gov/

False Colour Composite (FCC) Image

A false colour image is one in which the R, G, and B values do not correspond to the true colours of red, green, and blue. The most seen false-colour images display the very-near infrared as red, red as green, and green as blue. Here the FCC image of each image was created using ArcGIS software. The composite band tool in the software was used for that. Here the bands are aligned in the following manner to capture the FCC image.

Red – Layer5, Green – Layer4 and Blue – Layer3

The main purpose of this is that it is easy to identify features during image classification.



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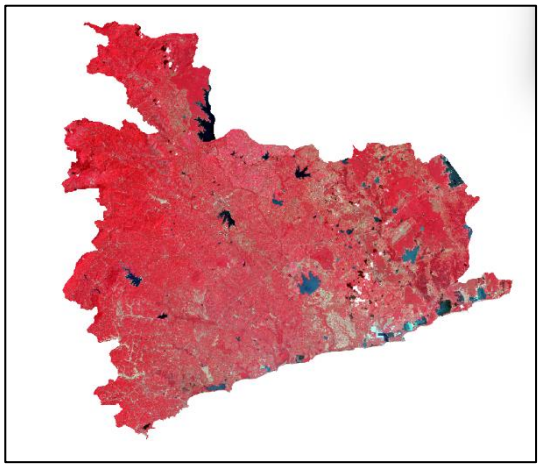

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Image Classification

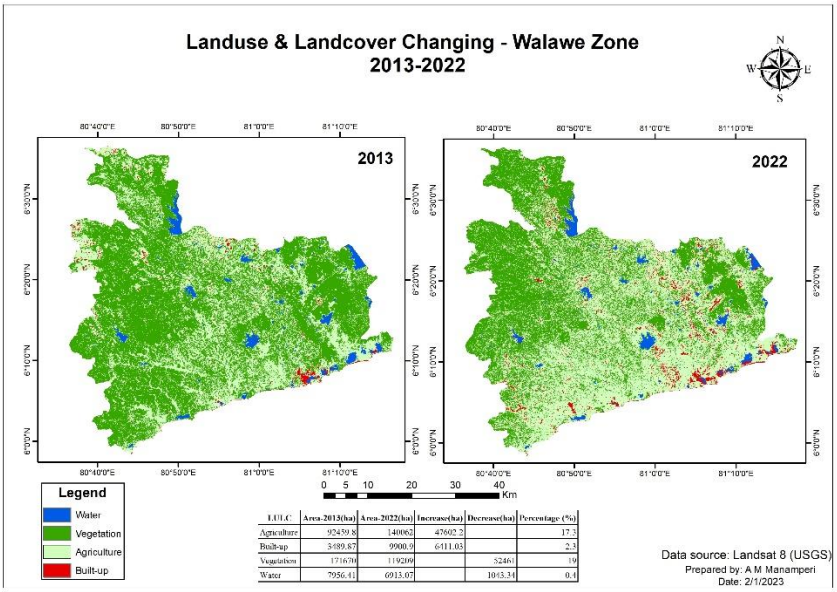
Based on the idea that different feature types on the earth's surface have different spectral reflectance and remittance properties, their recognition is carried out through the classification process. In a broad sense, image classification is defined as the process of categorizing all pixels in an image or raw remotely sensed satellite data to obtain a given set of labels or land cover themes (Lillesand, Keifer 1994).

Supervised classification uses the spectral signatures obtained from training samples to classify an image. With the assistance of the Image Classification toolbar, it can easily create training samples to represent the classes we want to extract. It can also easily create a signature file from the training samples, which is then used by the multivariate classification tools to classify the image.

Unsupervised classification finds spectral classes (or clusters) in a multiband image without the analyst's intervention. The Image Classification toolbar aids in unsupervised classification by providing access to the tools to create the clusters, the capability to analyse the quality of the clusters and access to classification tools.

The supervised classification method is selected. Both images are classified into four main land use types. The four classes are as follows.

- Vegetation
- Water
- Built-up
- Agriculture



In this study, the identification of LULC in the Walawe area during the last ten years has been analyzed. The result of the study showed that significant change detection was observed during the study period.

LULC	Area-2013(ha)	Area-2022(ha)	Increase(ha)	Decrease(ha)	Percentage (%)
Agriculture	92459.8	140062	47602.2		17.3
Built-up	3489.87	9900.9	6411.03		2.3
Vegetation	171670	119209		52461	19.0
Water	7956.41	6913.07		1043.34	0.4

Agriculture and built-up areas have experienced significant increases of 17.3% and 2.3% respectively. In contrast, vegetation and water areas have shown decreases of 19% and 0.4% respectively. These results highlight the conversion of forested, bushland, and grassland regions into agricultural and residential areas, which can lead to various issues including changes in streamflow, soil degradation, and disruptions in the hydrological system within the basin.

"Ends are not bad things, they just mean that something else is about to begin."