



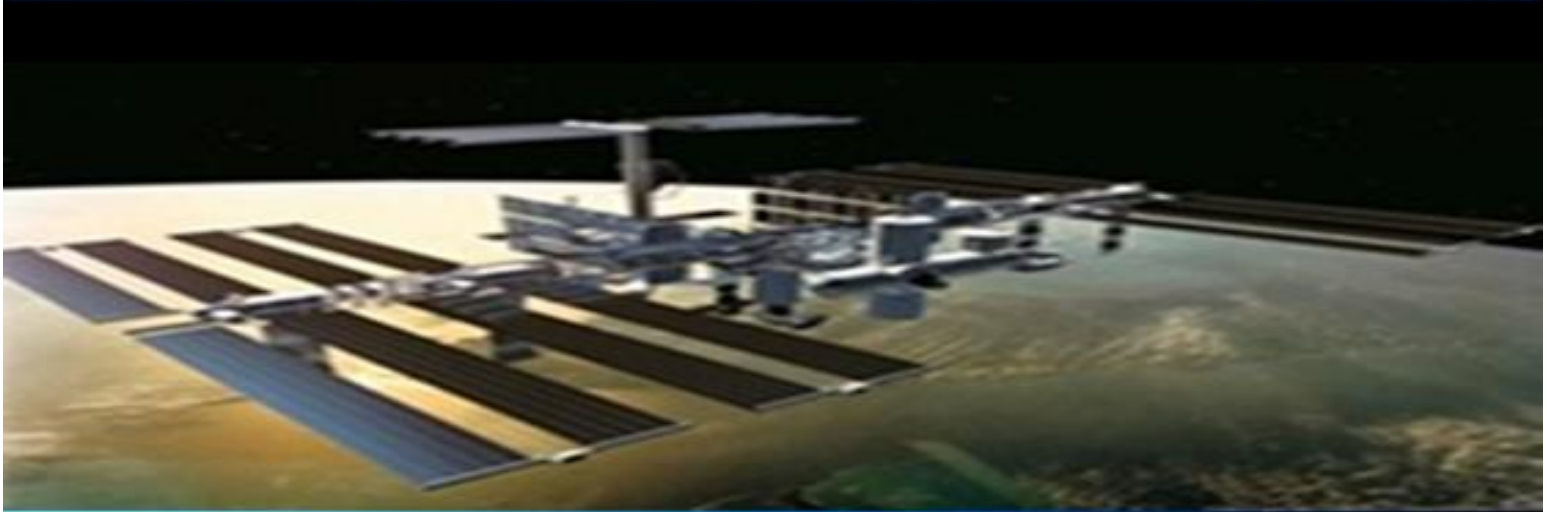
# මැනුම් සඟරාව

நில அளவைச் சஞ்சிகை

# SURVEY JOURNAL

# 82

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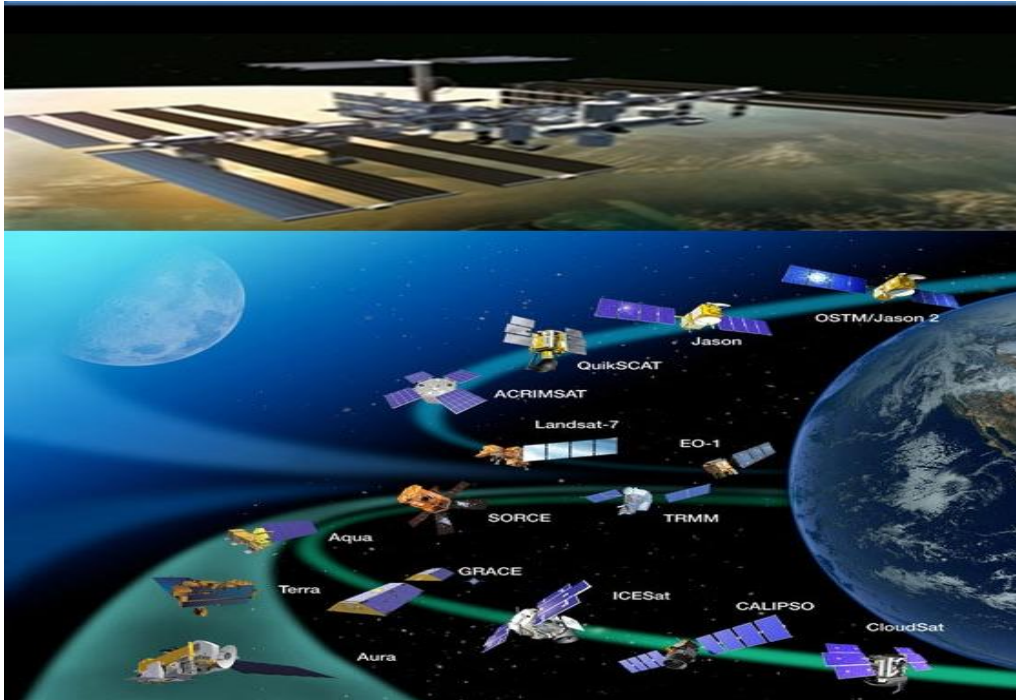




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**நில அளவைச் சஞ்சிகை**  
**SURVEY JOURNAL**

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Upper part of the photo shows a close picture of a satellite scanning the earth while the lower part shows number of satellites employed to provide various information required for different different purposes. Existence of those are very much essential in this modern world to cater the needs of present day IT world.

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TABLE OF CONTENTS

PAGE

1. Stakeholder Management & Analysis, Dr.K.Thavalingam, Surveyor General	1
2. Introduction to Standardization of Geographical Names, S.K. Wijayasinghe, Snr. DSG (Mapping)	6
3. යහපත් කළමනාකරුවකු වීමට නම්, A.M.N.Bandara, Snr. SS( Anuradhapura )	12
4. Cloud Computing and its Application, B.D.A. Chandraguptha, Snr. SS (IT)	17
5. Good Land Governance, U.K.S.P.Wijesinghe, Snr. SS/Snr. Lecturer, ISM, Diyatalawa	23
6. Broadcast of GIS, K.R. Sarath, Snr. SS (Title Registration Surveys)	26
7. Map Revision by Changing and Adding Attributes to Shapefiles through Mobile Devices in a Distributed System Environment, N.K.U. Rohana, Snr. SS (Research & Development)	31
8. Flash back of survey journals 47-65, Dr. K.Thavalingam, Surveyor General & M.T.M. Rafeek, SS (Akkaraipattu)	36
9. Criteria Adapted for Registering a Surveyor in Different Countries, P.Sivananthan, Snr. SS/Snr. Lecturer, ISM, Diyatalawa	43
10. Geo-Spatial Forum 2013 and National Spatial Data Infrastructure, P.D.Anurasiri, Snr. SS/ Snr. Lecturer, ISM, Diyatalawa	47
11. පරිපාලනයේ විවිධ භාගකතව ශෛලීන්, A.A.K.N. Dias, Snr. SS (Trincomalee)	50
12. Super Resolution Mapping Using Markov Random Fields for Land Use Classification, N.M.A. Wijeratna, SS/Lecturer, ISM, Diyatalawa	52
13. Google Earth, P.H.N. Nimalaweera,SS (Elpitiya)	59
14. LIS – Corporation and Sustainability, Nelson Wijenayake, Snr. SS (LIS)	67
15. "අම්මා" , Peshala Sumanapala, Management Assistant	72
16. Pictures of Special Activities in Survey Department	74

# Stakeholder Management & Analysis

by

Dr. K. Thavalingam, Surveyor General

## 1.0 Introduction:

Stakeholders of an effort are those who have a vested interest in it, either as those who develop and conduct it, or as those whom it affects directly or indirectly. Identifying and involving stakeholders can be a large part of ensuring the effort's success. In order to gain stakeholder participation and support, it's important to understand not only who potential stakeholders are, but also the nature of their interest in the effort. With that understanding, you'll be able to invite their involvement, address their concerns, and demonstrate how the effort will benefit them.

Managing stakeholders – keeping them involved and supportive – can be made easier by stakeholder analysis, a method of determining their levels of interest in and influence over the effort. Once you have that information, you can then decide on the appropriate approach for each individual and group. Depending on your goals for the effort, you may either focus on those with the most interest and influence, or on those who are most affected by the effort.

## 2.0 How Stakeholders are classified based on characteristics?

Based on the Characteristics, the Stakeholders could be classified into five Categories as follows

### a. Supporters or Opponents

**Supporter** is in favour of the project and **Opponent** is a stakeholder with negative interest in the project.

### b. Primary and Secondary Stakeholders

**Primary stakeholders** have a major interest in the success of a project because they are directly affected by the outcome. Customers, end users, some project sponsors, project managers, and team members are primary stakeholders. **Secondary stakeholders** also help to complete the project. Though their role isn't primary, they assist with administrative processes, financial, and legalities. These groups include government agencies, money-lending institutions or monitoring agencies.

### c. Internal or External

Stakeholders are classified as Internal or External depending on Position relative to the organization **Internal Stakeholders** are the stakeholders within the organization and are directly involved in developing the project. **Project Managers and Team Members** fall into this category.



**External Stakeholders** are not a part of the organization but have an interest in the project. **Government agencies, Customers, Vendors, Suppliers and Competitors** fall in this category.

**d. Direct or Indirect**

**Direct Stakeholders** are affected by day-to-day Activities of the project - Typically **Team Members** fall in this category. **Indirect Stakeholders** are those who are ultimately affected by the project. **Customers and End users** fall into this category.

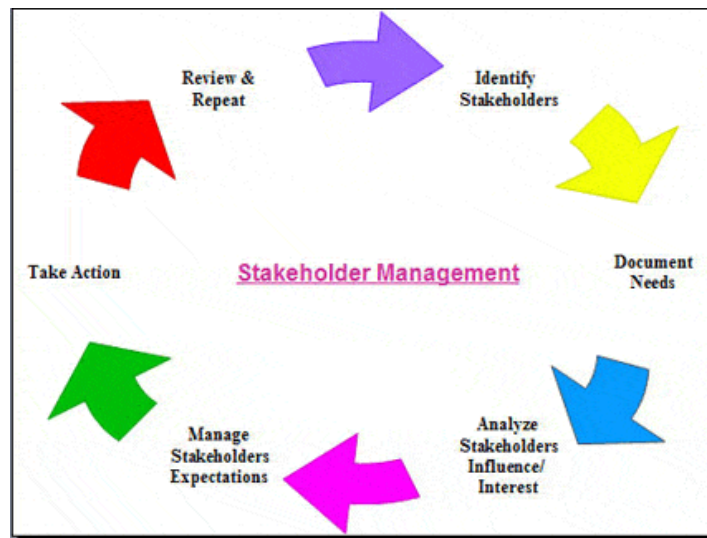
**e. Operational or Strategic**

Depending upon the level in the organization, Stakeholders are classified as Operational or Strategic. **Operational Stakeholders** are actively involved in executing the project – Example Team Members. **Strategic Stakeholders** influences the decision made. This group comprises of senior executives.

**3.0 Stakeholder Management :**

Stakeholder Management is an important discipline that successful people use to win support from others. Stakeholder Management processes for a project involves (but not limited to),

1. Identifying all stakeholders
2. Documenting stakeholders needs
3. Assessing & analyzing stakeholders interest/influence
4. Managing stakeholders expectations
5. Taking actions
6. Reviewing status & repeat



**4.0 Stakeholder Analysis / Stakeholder Mapping**

Stakeholder Analysis is the technique used to identify the key people who have to be won over. You then use **Stakeholder Planning** to build the support that helps you succeed. The benefits of using a stakeholder-based approach are that:

- You can use the opinions of the most powerful stakeholders to shape your projects at an early stage. Not only does this make it more likely that they will support you, their input can also improve the quality of your project
- Gaining support from powerful stakeholders can help you to win more resources – this makes it more likely that your projects will be successful
- By communicating with stakeholders early and frequently, you can ensure that they fully understand what you are doing and understand the benefits of your project – this means they can support you actively when necessary
- You can anticipate what people's reaction to your project may be, and build into your plan the actions that will win people's support.
- Ways to reduce potential negative impacts & manage negative stakeholders

#### 4.1 Identify Your Stakeholders

The first step in your Stakeholder Analysis is to **brainstorm** who your stakeholders are. As part of this, think of all the people who are affected by your work, who have influence or power over it, or have an interest in its successful or unsuccessful conclusion. Remember that although stakeholders may be both organizations and people, ultimately you must communicate with people. Make sure that you identify the correct individual stakeholders within a stakeholder organization.

#### 4.2 Prioritize Your Stakeholders

You may now have a long list of people and organizations that are affected by your work. Some of these may have the power either to block or advance. Some may be interested in what you are doing, others may not care. Map out your stakeholders on a Power/Interest Grid as shown in figure 1, and classify them by their power over your work and by their interest in your work.

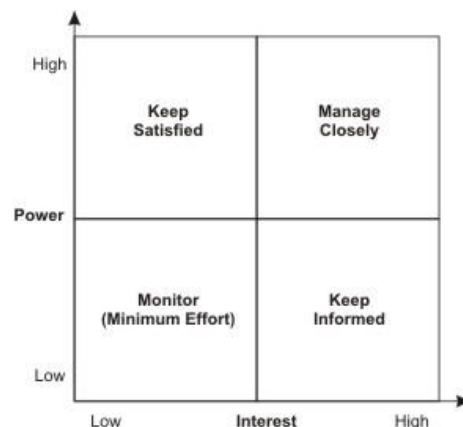


Figure 1: Power/Interest Grid for Stakeholder Prioritization

For example, your boss is likely to have high power and influence over your projects and high interest. Your family may have high interest, but are unlikely to have power over it.

Someone's position on the grid shows you the actions you have to take with them:

- High power, interested people: these are the people you must fully engage and make the greatest efforts to satisfy.
- High power, less interested people: put enough work in with these people to keep them satisfied, but not so much that they become bored with your message.
- Low power, interested people: keep these people adequately informed, and talk to them to ensure that no major issues are arising. These people can often be very helpful with the detail of your project.
- Low power, less interested people: again, monitor these people, but do not bore them with excessive communication.

### **4.3 Understand Your Key Stakeholders**

You now need to know more about your key stakeholders. You need to know how they are likely to feel about and react to your project. You also need to know how best to engage them in your project and how best to communicate with them.

Key questions that can help you to understand your stakeholders are:

- What financial or emotional interest do they have in the outcome of your work? Is it positive or negative?
- What motivates them most of all?
- What information do they want from you?
- How do they want to receive information from you? What is the best way of communicating your message to them?
- What is their current opinion of your work? Is it based on good information?
- Who influences their opinions generally, and who influences their opinion of you? Do some of these influencers therefore become important stakeholders in their own right?
- If they are not likely to be positive, what will win them around to support your project?
- If you don't think you will be able to win them around, how will you manage their opposition?
- Who else might be influenced by their opinions? Do these people become stakeholders in their own right?

A very good way of answering these questions is to talk to your stakeholders directly – people are often quite open about their views, and asking people's opinions is often the first step in building a successful relationship with them.

You can summarize the understanding you have gained on the stakeholder map, so that you can easily see which stakeholders are expected to be blockers or critics, and which stakeholders are likely to be advocates and supporters of your project. A good way of doing this is by color coding:



showing advocates and supporters in green, blockers and critics in red, and others who are neutral in orange.

#### **4.4 Communicating with Stakeholders**

The end product of a stakeholder analysis is a communication plan that forms part of the overall project plan. Communication effort, mode and frequency depend on the cost and the level of influence of the stakeholder. Some will require simple and infrequent updates; others will require regular, detailed and frequent communications. Information will need to be tailored to effectively communicate with, and sufficiently inform, different stakeholder groups. Communications tools and channels can include:

**Formal Meetings** – with powerful stakeholders

**Informal Meetings** – with interested people

**Mailing list** – to disseminate information to people on project progress

**Newsletters** – either through the mailing list, email or printed – more information

**Information displays** – visual representation of project progress in public venues

**Web site** – regular updates of project information for ‘self service’

**Individual briefings** – for those with more interest who are prepared to attend

**Tours and Demonstrations** – for interested external people and organisations

**Public forums** – more appropriate where there are community stakeholders

**Media releases** – report on achievement of significant project milestones

**Advertisements and Postings** – Newspapers, magazines, notice boards

**Liaison Committee** – Representatives of larger groups. Distribute minutes.

#### **4.5 Stakeholder Report**

You can then start to prepare your Project Stakeholder Analysis report using all the information you have collected to summarize stakeholder interests and recommend action.

For smaller projects a summary table is sufficient to capture the information on stakeholders.

Prepare a table with the following headings and contents:

**Stakeholder group** - broad heading for the group (e.g.: Executive, community, users)

**Specific groups** - List sub-groups within these (e.g.: Management team, Minister)

**Main issues/concerns** - Summarise what are the areas of interest you have learnt from your research. What are the key risks posed by each?

**Major communications channels** - List the media with which you will communicate with each group (e.g.: Formal meetings, email, fact sheet).

**Frequency** - State how often you will communicate with this group (e.g.: daily, weekly, quarterly, adhoc).

# Introduction to Standardization of Geographical Names

by

S.K.Wijayasinghe

Deputy Surveyor General (Geographical Names)

## *Abstract*

*The basic question that Geo information can answer in any application is the location. **Where is it?** or **What is at a particular location** ? Simple way of identifying a location is by the Name of the Place, Village, Town, Junction etc, called as Geographical Names. Consistent use of correct geographical names is an essential element in any Geo Information System.*

*This article attempts to identify and analyze few issues with regard to the usage of geographical names in Sri Lanka and try to establish the need for standardization of geographical names, with the objectives and the benefits.*

## **1.0 Introduction**

Geographical Name is defined as the name applied to a feature on Earth by the United Nations Group of Experts on Geographical Names (UNGEGN) - Glossary 2002

Geographical Name in simple terms is the proper name used consistently in language to refer to a particular place, feature or area having recognizable identity on the surface of the earth including:

- Populated Places (Cities, Towns, Villages)
- Administrative Divisions (Provinces, Districts, DS Divisions, GN Divisions, Land Parcels)
- Natural Features (Streams, Mountains, Lakes, Lagoons)
- Constructed Features (Reservoirs, Tanks, Bunds, Dams, Channels, Airports, Highways, Streets, Roads, Junctions)
- National Parks, or similar reserved areas.

A geographical name may also be referred to as topographical name or toponym.

What is the standardized way of writing geographical names in maps and other documents ? is a simple question that has to be addressed by all the national geo information management organizations.

The basic question that Geo information can answer in any application is the location. **Where is it?** or **What is at a particular location** ? Simple way of identifying a location is by the Name of the Place, Village, Town, Junction etc. Consistent use of correct place names is an essential element in any Geo Information System.

According to 1 inch topographic map series prepared and completed in 1924 by the Survey Department there are about 29,600 entries for places and features in the country. In 50K map series there are 23800 Village Names, 2500 Place Names, 4500 Estate Names, 2000 Trig (Mountain) Names.

## 2.0 Language bearing of Geographical Names

Animals who communicate via speech are human, because what sets us apart from other animals is the “gift” of speech’. All evolutionists admit that communication via speech is uniquely human - so much so that it often is used as the singular, and most important, dividing line between humans and animals.

This is because, human beings can make different sounds, and combination of different sounds is the basis for communication via speech, that naturally has evolved languages.

There are about 6000 languages worldwide (Crystal,1990). The world’s languages have evolved spontaneously. They were not designed. The following table indicates most mother tongue speakers in number of speakers in millions.

<b>Chinese</b>	<b>1,000</b>	Bengali	150	<b>French</b>	<b>70</b>	Korean	60
<b>English</b>	<b>350</b>	<b>Russian</b>	<b>150</b>	Punjabi	70	Telugu	55
<b>Spanish</b>	<b>250</b>	Portuguese	135	Javanese	65	Tamil	55
Hindi	200	Japanese	120	Bihari	65	Marathi	50
<b>Arabic</b>	<b>150</b>	German	100	Italian	60	Vietnamese	50

UN official languages marked in **bold** letters

All Geographical names have language origin. According to articles 18 and 19 – Chapter IV of the Constitution of the Democratic Socialist Republic of Sri Lanka (1978), Sinhala and Tamil is recognized as National Languages and English as the Link Language. Almost all the geographical names in Sri Lanka have the origin in one or more of those languages. Rarely used languages are the Language of Gypsies and the Language of Aborigines and the names originated from those two languages are even rare.

## 3.0 Analysis of Sri Lankan situation on Geographical Names

Following major issues that has been identified with regard to use of geographical names in Sri Lanka.

### 3.1 Variant Names

A name and the manner in which it is written and pronounced must be unique and unambiguous in order to identify the geographical location uniquely and unambiguously. In Sri Lankan situation, there are quite a number of names written and pronounced differently in three different languages Sinhala, Tamil and English. These are called “variant names”.

Eg. Kandy (kændi), මහනුවර(mahanuwara), கண்டி (kandi)

Negombo (nigambô), මීගමුව (mīgamuwa), நீர்கொழும்பு (nīrkolumpu)

One of the remedies to this situation is to write all three names in documents and maps. This is possible only if such situations are quite few and therefore we have to analyze the number of occasions at which this situation occurs.

Another example for variant names is that same feature is given different names in different areas eg. **Malwathu Oya** in Anuradhapura is named as **Aruvi Aru** in Mannar.

In another variant name situation, different people or different organizations call same place by different names in the same language.

Eg. The Department of Elections calls Digamadulla for Ampara District. The Department of Elections calls Vanni district for Vavunia, Mullaittivu, Mannar and Killinochchi districts for election purposes. The Railway Department calls கிரீடபොනේ for கිරුළපන.

### 3.2 Homonyms

Another situation is the same name is given to many places. These are called “Homonyms”.

The worse situation that has been noted is the geographical name called “Ihalagama” is found in 46 different places and “Pahalagama” is found in 43 different places in Sri Lanka. Similarly there are several “Temple Roads in Colombo making it difficult to refer which is which. The author’s home village “Henegama” of Gampaha district is found in three different places two in Gangaboda pattu, & Meda Pattu in Siyane Korale & the other in Udugaha Pattu in Hapitigam Korale and another one in Matara district, compelling the Postal Department to use Henegama (W.P) for the postal area of “Henegama” in Gampaha district for all practical purposes to clarify that this is in Western Province.

In western province, there are five GN divisions called “Medagama” as shown below, forcing the authorities to use a number to differentiate.

District	DS Division	GN Division
Kalutara	Bandaragama	Medagama
Gampaha	Gampaha	Medagama I
Gampaha	Gampaha	Medagama II
Gampaha	Gampaha	Medagama III
Gampaha	Gampaha	Medagama IV

The possible remedy for this situation is to add another number or code to these homonyms to indicate/ further describe the location. However in case of “Pahalagama”, there are 13 homonyms in both Anuradhapura & Kurunegala districts, so that another coding system has to be derived to differentiate one from the other.

### 3.3 Romanization

In Sri Lanka, majority of the names are originated from Sinhala Language, good percentage is originated from Tamil and certain amount is originated from English Language. However most of the official documents particularly the maps are published, and the databases are maintained in English Language.

This involves what is called “Romanization”, which is converting geographical names from non-roman writing systems to the roman alphabetic system by a process called “Transliteration”.

In theory, Romanization should be scientific, should have a single system across the world and should avoid difficulties in respect of communication.

It appears that there had been no scientific or logical system used in Romanization of geographical names in Sri Lanka. For example පොතුච්ඡේ is written as Pottuvil, මතුගම as Matugama, රත්නපුර as Ratnapura, මාවතගම as Mawathagama, කඩවත as Kadawatha, where the consonant “ත” in Sinhala alphabet is transliterated sometimes as “ta” and sometimes as “tha” thus making the reader confused as to whether “ta” means “ට” or “ත”.

Similarly, සීගිරිය as Sigiriya, Trincomalee, where සී as Si and ලී as lee making no uniformity for “ඪ” sound.

This kind of Romanization is completely arbitrary just like pronouncing PUT as පුට් and CUT as කුට් in English language.

Therefore, it is essential to use more scientific and more logical Romanization system for all the geographical names in order to achieve uniformity in writing and also in pronunciation.

#### **4.0 Standardization of Geographical Names**

##### **4.1 Need for Standardization**

So in geographical names, it is logical and most useful if:

- Spellings are clear, consistent, unambiguous
- A name is clearly 'tied' to a location
- Difficulties with what names are correct are sorted out
- These names are recorded, stored and are easily available to governments and the public
- Everybody can use the same set of names to communicate.

It has been identified the need of standardization of geographical names in order to cater the requirements of Geo-Information community by providing correct names along with up to date high accurate maps to the geo information users.

It is often difficult to convince someone to devote time and money to an issue that has generally taken care of itself for so long.

What is not realized is that large amounts of time and money are being spent on efforts in a number of agencies to determine and use "correct" names for maps, legal documents and other publications.

The cost of such endeavors is generally hidden, as the work is thought of as constituting parts of other programmes. Mapping and charting organizations spend a great deal of time and production cost on the collection selection and application of up-to-date cartographic nomenclature.

Similar work in other offices and organizations are often being done without coordination. This leads to duplication of effort and resources, as well as to variation and conflicts in name usage.

A strong argument in favor of a national programme for standardization of geographical names focuses on consolidation of effort with less overall cost, more consistent results and greater benefit to a larger number of government and non-government organizations, and the general public.

The need for a national programme for standardization of geographical names would achieve an overall savings of government resources.



## **4.2 Objectives of Standardization**

The Goal is to achieve clear communication through maps and documents and thereby avoid ambiguity and confusion in spelling or name application

## **4.3 Who benefits from standardized geographical names?**

- Map makers and national surveying institutions.
- Regional and local authorities charged with administering to the needs of people identified by their address.
- Legal institutions such as offices which register land holdings that are usually tied to a named locality.
- Institutions which administer and conserve named natural and cultural heritage sites including antiquities, nature reserves and national parks.
- Statistical bureaus which base their population censuses and social surveys on named, populated places.
- Tourism authorities which cater to both domestic and international markets promoting named attractions, hotels, restaurants and other facilities
- Public works departments engaged in signposting along roads and other lines of communication.
- The manufacturers and users of automatic surface, air and sea navigation systems.
- Authorities of law and order such as the police and the armed forces who need to respond quickly to events at named locations
- The emergency services such as firefighting and ambulance networks as well as air and sea rescue
- Natural disaster control and humanitarian relief agencies
- The public media when dealing with events worldwide
- The corporate world in developing brand names
- Internet users in creating domain names and searching for geographically referenced information

## **5.0 Conclusion**

Geographical Names are part of our day to day personal life as well as in our professional life as Surveyors and Mappers. Therefore Standardization of Geographical names is part of all of our professional life.

References : UNGEGN web site

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වැරදි දෙය වැරදියට කිරීම

කළමනාකරණයක් නොවනබව ඔබට පැහැදිලි වනු ඇත.

**‘කලයුතු දෙය’ හෝ ‘නිවැරදි දෙය’** යන්න, පුද්ගලයන්ට කණ්ඩායම් වලට හෝ සංවිධාන වලට තම අරමුණු සහ පරමාර්ථ පිහිටුවා ගැනීම සහ ලභාකර ගැනීම ලෙස අදහස් වන අතර **“මනාලෙස කිරීම”** හෝ **“නිවැරදිව කිරීම”** යන්න, අරමුණු හා පරමාර්ථ ලභා කර ගැනීමට ක්‍රියා කිරීමේදී භාවිතා කරන භෞතික හා මානව සම්පත්වලින් උපරිම ප්‍රයෝජන ලැබෙන පරිදි කටයුතු කිරීම ලෙස අදහස් වේ. මේ දෙයාකාරය පිලිවෙලින් **සපලදායිතාවය (Effectiveness)** හා **කාර්යක්ෂමතාවය ලෙස (Efficiency)** හැදින්වේ.

කිසියම් සංවිධානයක් හෝ කණ්ඩායමක් සතු අරමුණු සහ පරමාර්ථ මුදුන් පමුණුවා ගැනීමේදී පහත සඳහන් කටයුතු සිදු කල යුතු අතර, එය කළමනාකරණය ලෙස තවදුරටත් විග්‍රහ කල හැක.

1. සැලසුම්කරණය (Planning)
2. සංවිධානකරණය (Organizing)
3. නායකකරණය (Leading)
4. පාලනය කිරීම (Controlling)

මෙය නූතන හැදින්වීමයි

වර්ෂ 1841 - 1925 කාලය තුල **හෙන්රි ෆොයල් (Henry foyal)** විසින් හඳුන්වා දී තිබූ ක්‍රමය මීට මදක් වෙනස් වේ. එනම්

1. සැලසුම්කරණය (Planning)
2. සංවිධානකරණය (Organizing)
3. අණ කිරීම (Commanding)
4. සම්බන්ධීකරණය (Coordinating)
5. පාලනය කිරීම (Controlling)

වර්ෂ 1973 පමණ හෙන්රි මින්ස්ටබර්ග් (Henry Mintzberg) විසින් කළමනාකරණ භූමිකාවන් ලෙස ඔවුන්ගේ කාර්ය භාරයන් ප්‍රධාන වශයෙන් කොටස් තුනකට බෙදා වෙන් කර, ඒවාට අදාළ උප කාර්යයන් දහයක් හඳුනාගෙන ඇත.

1. අන්තර් පුද්ගල කාර්යයන් (Inter Personnel Roles)
2. තොරතුරු කාර්යයන් (Informational Roles)
3. තීරණ ගැනීම සම්බන්ධ කාර්යයන් (Decisional Roles)

උප කාර්යයන්

1. **නාම මාත්‍ර විධායක (Figure Head)**—  
 ආයතනයේ ප්‍රධානියා ලෙස කටයුතු කිරීම ( සමාජීය, නෛතික, උත්සව හා සැමරුම්).
2. **නායකයෙකු ලෙස කටයුතු කිරීම (Leader) -**  
 සේවකයින් අභිප්‍රේරණය, මග පෙන්වීම, පුහුණු කිරීම, මාංඛලීකරණය.
3. **සහයෝගීතාව ගොඩ නැගීම් නායය (Liaison) -**  
 ආයතනයට වාසිදායක අයුරින් බාහිර පුද්ගලයන් හා ආයතන සමග සම්බන්ධතා පැවැත්වීම.
4. **නියමුවකුගේ කාර්ය භාරය (Monitor)**  
 ආයතනය සහ පරිසරයට අදාළ, තොරතුරු ගැන උනන්දු වීම සහ අභ්‍යන්තර සහ බාහිර තොරතුරු වලට නාභිගතව කටයුතු කිරීම.
5. **තොරතුරු බෙදා හරින්නකුගේ කාර්යය (Disseminator)**  
 ඉහත තොරතුරු සාමාජිකයින් අතර බෙදා හැරීම, කාණ්ඩගත කිරීම, සම්බන්ධ කිරීම, අර්ථකතනය ලබා දීම.
6. **කතීකා කරන්නකුගේ කාර්යය (Spokesperson)**  
 ආයතනයේ සැලසුම්, ප්‍රතිපත්ති, ක්‍රියාමාර්ග ආදිය සම්බන්ධයෙන් බාහිර පාර්ශවයන්ට තොරතුරු ලබාදීම සහ ආයතනය සම්බන්ධ විශේෂඥයෙකු ලෙස කටයුතු කිරීම.
7. **ව්‍යවසායකයෙකුගේ කාර්යය (Entrepreneur).**  
 ව්‍යාපාරික අවස්ථාවන් සෙවීම, හඳුනා ගැනීම, වෙනස් කිරීම, වැඩි දියුණු කිරීම සඳහා මුල්වී කටයුතු කිරීම හා සුපරීක්ෂණය
8. **ආරවුල් සමනය කරන්නකු (Disturbance - Handler)**  
 ආයතනය මුහුණ දෙන වැදගත් හා අනපේක්ෂිත ගැටළු සඳහා ක්‍රියාමාර්ග ගැනීමේ වගකීම්
9. **සම්පත් බෙදා හරින්නකු ලෙස කටයුතු කිරීම (Resource - Allocator)**  
 භෞතික හා මානව සම්පත් බෙදා හැරීම හා ඒවාට අදාළ තීරණ ගැනීම.
10. **කථිකා කරන්නකු ලෙස කටයුතු කිරීම. (Negotiator)**  
 ආයතනය නියෝජනය කරමින් ප්‍රධාන සාකච්ඡා පැවැත්වීම හා එකඟතාවයකට පැමිණීම.

කළමනාකරුවන් ප්‍රධාන වශයෙන් කොටස් තුනකි.

1. **ඉහළ මට්ටමේ කළමනාකරුවන් (Top Managers)**  
 ආයතනයක සංවිධාන ධුරාවලියේ ඉහළම මට්ටමේ සිටින අය මෙම ගනයට වැටේ. මොවුන්ගේ වගකීම වන්නේ සමස්ථ ආයතනය සඳහා වන අතර, මහජනතාව, බාහිර

පාර්ශව සඳහාද වගකීමට බැඳේ. මොවුන්ගේ අරමුණු වන්නේ ආයතනය සඳහා නිෂ්ඨාව තීරණය කිරීම, ඊට අදාළ අරමුණු හා පරමාර්ථ සහ උපකම තීරණය කිරීමයි.

**2. මධ්‍යම මට්ටමේ කළමනාකරුවන් (Middle Managers)**

ආයතනයක මධ්‍යම මට්ටමේ කළමනාකරුවන් මෙයට අයත් වේ. ඔවුන්ගේ ප්‍රධාන වගකීම, ඉහල මට්ටමේ කළමනාකරුවන් එසේ තීරණය කරනු ලබන අරමුණු සහ පරමාර්ථ පහල මට්ටම වෙත ගෙන ගොස් දන්වා හරි හැටි ක්‍රියාත්මක කර ප්‍රතිඵල ඉහත කළමනාකරණය වෙත ගෙන යවයි.

**3. පහළ මට්ටමේ කළමනාකරුවන් (Low Level Managers)**

ක්‍රියාකාරී හෝ මෙහෙයුම් සේවකයන්ගේ කාර්යයන් පිළිබඳව මධ්‍යම හෝ ඉහල කළමනාකරණය වෙත වගකීමට බැඳී ඇති අය පහල මට්ටමේ කළමනාකරුවන් වේ. මෙවැනි කළමනාකරුවන් තුළ ශිල්පීය හා මානව දක්ෂතා ප්‍රධාන වශයෙන් ඉහල මට්ටමක තිබිය යුතුයි. සන්නිවේදනය, තීරණ ගැනීම වැනි දක්ෂතාද ඉතා වැදගත් වේ. එමෙන්ම අනෙකුත් සේවකයන්ට මග පෙන්වන ආදර්ශමත් සහ පහසුකම් සපයන පුද්ගලයෙකුද විය යුතුයි.

මූලිකවම රොබර්ට් එල් කර්ට්ස් (Robert L. Kertz) විසින් කළමනාකරුවන් විසින් ප්‍රගුණ කල යුතු කාරණා තුනක් ගැන අවධානය යොමු කර ඇත.

**1. සංකල්පනාත්මක හෝ මනෝභාවාත්මක දක්ෂතා (Conceptual Skills)**

ඉදිරි දැක්ම පිළිබඳ හැකියාවක් හා විග්‍රවන හැකියාවක් ගැන මින් අදහස් වන අතර, ආයතනයේ විවිධ අංශ සහ ඒවායේ ක්‍රියාකාරිත්වය සහ සහසම්බන්ධතාවයන් පිළිබඳව දැනීමට ඇති හැකියාවද වේ.

**2. මානව දක්ෂතා (Human Related Skills)**

ආයතනයේ සිටින පුද්ගලයන් හා කණ්ඩායම් බලා ගැනීම ඔවුන්ගේ රටාවන් තේරුම් ගැනීම, පුරෝකථනය හා පාලනය, අභිප්‍රේරණය වැනි කටයුතු මින් අදහස් කෙරේ.

**3. ශිල්පීය දක්ෂතා (Technical Skills)**

ආයතනයක, මෙහෙයුම් හා ප්‍රධාන ශ්‍රිතකාර්යය ක්ෂේත්‍රයන් සම්බන්ධව ක්‍රියා කිරීම සහභාගි වන සේවාදායකයින් විසින් ප්‍රගුණ කල යුතු ශිල්පීය කාරක දැනුම.

කළමනාකාරිත්ව ක්‍රියාවලියේදී නිසි **නායකත්වය (Leadership)** ඉතා වැදගත් අංගයකි. සේවකයන්ට බලපෑම්කිරීමේ අංගයක් ලෙස නායකත්වය දැකිය හැකිය. මෙය සංවිධානයේ අරමුණු හා පරමාර්ථ ඉටු කර ගැනීමේ අභිලාශයෙන් සිදු කරන්නකි.

නායකයෙකු සතුව පහත සඳහන් ගුණාංග තිබිය යුතුය.

1. කුසලතා පූර්ණ වීම.
2. ආදර්ශවත් වීම.
3. අපක්ෂපාතී වීම.
4. දරා සිටීමේ හැකියාව.
5. නොසැලී සිටීම.
6. අන් පුද්ගලයින්ගේ අදහස් වලට ගරු කිරීම.

- 7. විවක්ෂණශීලී වීම.
- 8. තීරණ ගැනීමේ හැකියාව.

**නායකත්වය වර්ග කීපයකි. (Leadership Style)**

**1. ඒකාධිකාරී නායකත්වය. (Autocratic Leadership)**

මෙහිදී සියළු බලතල හා පාලනය තමා සතුව තබා ගනිමින් සියළුම කාර්යයන්ගේ වගකීම පවරා ගනී. සියළු තීරණ ඔහුම ගනී. නායකත්වයට කිකරු වන්නන්ට අමතර ප්‍රතිලාභ සැලැස්වීමක්, එසේ නොවන පුද්ගලයින්ට දඩුවම් දීමත් සිදු කරයි.

**2. සහභාගීත්ව නායකත්වය (Participative Leadership)**

මෙම නායකයින් තීරණ ගැනීමේදී යටත් සේවකයින්ගේ අදහස්ද සලකා බලනු ලබයි. යටත් සේවක අදහස් සහ තම දැනුම උපයෝගී කර වැදගත් තීරණ වලට එළඹේ.

**3. නිලධාරිවාදී නායකත්වය (Bureaucratic Leadership)**

මෙහිදී සම්ප්‍රදායයන්, සිරිත් විරිත්, නීති රීති, රෙගුලාසි සම්බන්ධයෙන් වඩාත් සැලකිල්ල යොමු කරයි. යටත් සේවක අදහස් හෝ නිර්මාණශීලී කුසලතා වලට අඩු සැලකිල්ලක් දක්වන අතර තමන් යටතේ පාලනය වන අයගෙන් ඇත්ව සිටී.

**4. නිදහස් සාමකාමී නායකත්වය (Free Reign Leadership)**

මොවුන් නාමික නායකයින් පමණි. අරමුණු කරා ලගාවීමට අවශ්‍ය තීරණ ගැනීම යටත් සේවකයින් විසින් සිදු කරනු ලබයි. මෙහිදී වැරදි නිවැරදි කිරීම මෙම නායකත්වය යටතේ සිදුවන ක්‍රියාවකි.

විවිධ කළමනාකරන නායකයින්ගේ විවිධ ක්‍රියා පිලිවෙලයන් පිළිබඳව විවිධ පර්යේෂණ සිදු වී ඇති අතර, ඩග්ලස් මැග්ග්‍රේගර් (Douglas MacGregor) විසින් එක්ස් (X) හා යයි (Y) න්‍යායන් ඉදිරිපත් කර ඇත. එය පහත දක්වමි.

<u>X න්‍යාය</u>	<u>Y න්‍යාය</u>
1. සේවකයන් ස්වභාවයෙන්ම වැඩට අකමැති බව.	සේවකයන් විවේකයට, විනෝදයට කැමතිවා සේම ස්වභාවයෙන්ම වැඩට කැමැති බව.
2. අනුන් විසින් තමන්ව මෙහෙයවීමේ තත්වයට බව	කොන්දේසි සාධාරණ නම් සේවකයන් කැමති සේවක වගකීම් භාර ගන්නවා පමණක් නොව ඒවා අපේක්ෂාද කරන බව.
3. සේවකයන් සෑම විටම වගකීම් භාර ගැනීමට හා පැහැර හරින බව	සේවකයන්ට ආයතනයේ අරමුණු අකමැති බව පෙන්වා දෙන්නේ නම් ඔවුන් ඒවා ඉටු කර ගැනීම දෙසට ක්‍රියා කරන අතර ඒවා පාලනය කිරීමක්ද කරන බව.

4. සේවකයන්ගේ අපේක්ෂා ඉතා සුළු සහ සීමිත ඒවා බව

සිය කාර්යයන් හරිහැටි ඉටු කිරීමෙන් ආයතනය පමණක් නොව සේවකයන්ද තෘප්තිමත් වන බව.

5. සේවකයන්ගෙන් වැඩ ගැනීම සඳහා දැඩි විනය පාලනයක් සහ නීති රීති අවශ්‍ය බව.

සංවිධානයේ අරමුණු වල සාර්ථකත්වය සඳහා සඳහා සේවකයන් ඔවුන්ගේ නව අදහස්, වින්තනයන් සහ නිර්මාණශීලී හැකියාවන් ඉදිරිපත් කිරීමට කැමති බව.

6. සේවකයන්ගෙන් වැඩ ගැනීම සඳහා ඉතා දැඩි (Strict) හෝසෘණ (Negative) ආකාරයේ අභිප්‍රේරණ වන ක්‍රමයන් යොදා ගත යුතුබව (තර්ජනයන්, දඬුවම්, සේවයෙන් පහ කිරීම, වැටුප් වර්ධක නතර කිරීම, උසස් වීම් නතර කිරීම යනාදිය.)

ඉහත ආකාරයට අනුව සිතන කළමනාකරුවෝ තම සේවකයන්ගෙන් වැඩ ගැනීමේදී ධන හෙවත් යහපත් ආකාරයේ (Positive/Carrot) අභිප්‍රේරණ ක්‍රම යොදා ගනිති. උදාහරණ; ප්‍රශංසා කිරීම්, ත්‍යාග දීම්, අමතර පහසුකම් ලබාදීම, ඉහළට යාමේ අවස්ථා උදාකර දීම යනාදිය වේ.

ඉහත සඳහන් කරුණු සැලකිල්ලට ගත් කල ඔබ කුමන මට්ටමේ කළමනාකරුවෙක්ද, ඔබගේ කාර්යභාරය කුමක්ද, ඔබ අයිති කුමන දක්ෂතාවයටද, ඔබගේ ගුණාංග මොනවාද හා ඔබ X හෝ Y කළමනාකරුවෙක්ද එසේත් නැත්නම් එහි සංකලනයක්ද එසේත් නොවන්නේ නම් ඊට හාත්පසින් වෙනස් වූ රටාවක්ද යන්න ඔබටම තීරණය කළ හැක.

අවසාන වශයෙන්,කාර්යක්ෂම වූත් ඵලදායීවූත් කාර්ය භාරයන් රටේ ජනතාවගේ සුභ සිද්ධිය උදෙසා සිදු කිරීම ඔබ අප සැමගේ යුතුකම සහ අරමුණ බව පසක් කරමි.

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1. අනිල් වන්ද්‍ර කුමාර ; කළමනාකරණය ; දෙවන සංස්කරණය ; නුගේගොඩ ; 1999
2. සේනක මායාදත්තගේ ; ව්‍යාපාර කළමනාකරණය ; ප්‍රථම මුද්‍රණය ; කොළඹ 2003
3. Peter F Drucker ; The Practise of Management ; Wellington ; 1994



බිරිඳ : ඔයාට මාත් එක්ක ඉන්න අවුරුදු 10ක් කොයි වගේද?  
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# Cloud Computing and Its Application

by

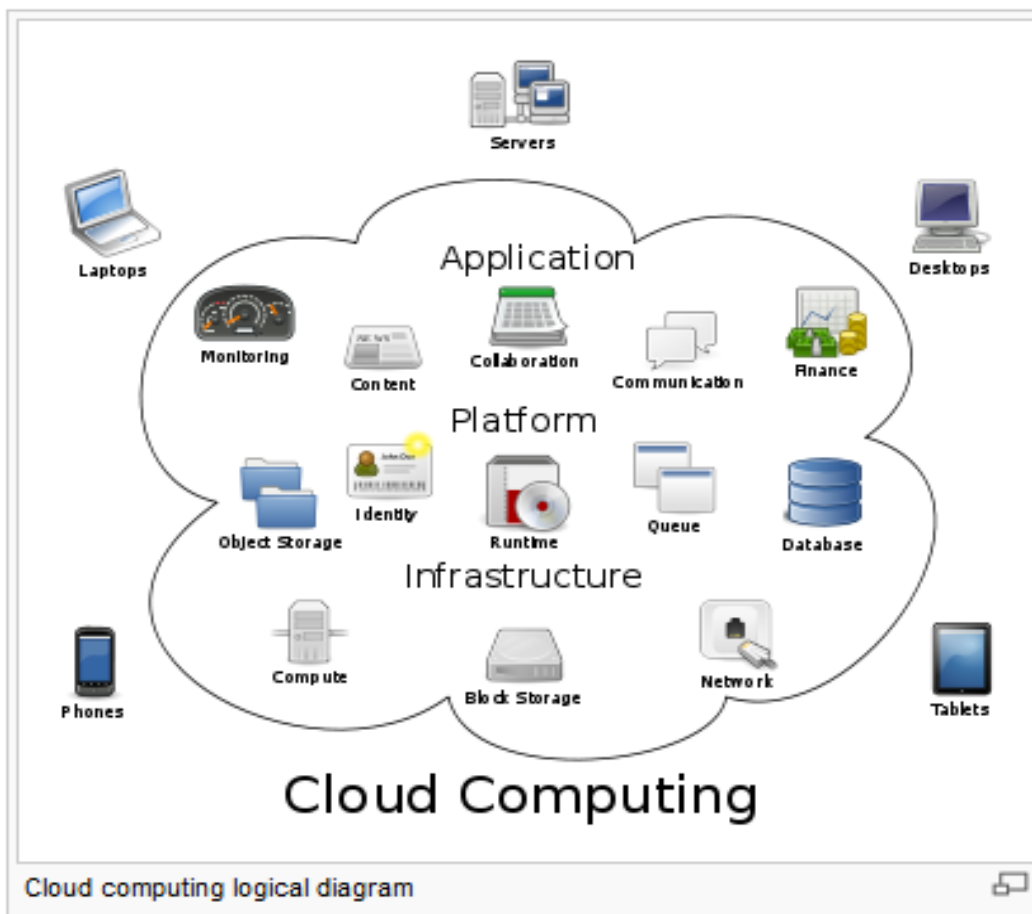
B.D.A.Chandraguptha

Senior Superintendent of Surveys (IT)

## 1. Introduction to cloud computing

**Cloud computing** is the delivery of [computing](#) and [storage capacity](#) as a [service](#) to a community of end-recipients. The name comes from the use of a cloud-shaped symbol as an abstraction for the complex infrastructure it contains in system diagrams. Cloud computing entrusts services with a user's data, software and computation over a network.

Typical diagram of cloud computing can be shown as follows.



## 2. Cloud computing types

There are three types of cloud computing:

- Infrastructure as a Service (IaaS)
- Platform as a Service (PaaS)
- Software as a Service (SaaS)

Using Infrastructure as a Service, users rent use of servers (as many as needed during the rental period) provided by one or more cloud providers. Using Platform as a Service, users rent use of servers and the system software to use in them. Using Software as a Service, users also rent application software and databases. The cloud providers manage the infrastructure and platforms on which the applications run.

End users access cloud-based applications through a web browser or a light-weight desktop or mobile app while the business software and user's data are stored on servers at a remote location. Proponents claim that cloud computing allows enterprises to get their applications up and running faster, with improved manageability and less maintenance, and enables IT to more rapidly adjust resources to meet fluctuating and unpredictable business demand.

Cloud computing relies on sharing of resources to achieve coherence and economies of scale similar to a utility (like the electricity grid) over a network (typically the Internet). At the foundation of cloud computing is the broader concept of converged infrastructure and shared services.

## 3. Characteristics of Cloud Computing

Cloud computing exhibits the following key characteristics:

- **Agility** improves with users' ability to re-provision technological infrastructure resources.
- **Application programming interface (API)** accessibility to software that enables machines to interact with cloud software in the same way the user interface facilitates interaction between humans and computers. Cloud computing systems typically use REST-based APIs.
- **Cost** is claimed to be reduced and in a public cloud delivery model capital expenditure is converted to operational expenditure.<sup>[29]</sup> This is purported to lower barriers to entry, as infrastructure is typically provided by a third-party and does not need to be purchased for one-time or infrequent intensive computing tasks. Pricing on a utility computing basis is fine-grained with usage-based options and fewer IT skills are required for implementation (in-house).<sup>[30]</sup> The e-FISCAL project's state of the art repository<sup>[31]</sup> contains several articles looking into cost aspects in more detail, most of them concluding that costs savings depend on the type of activities supported and the type of infrastructure available in-house.

- **Device and location independence**<sup>[32]</sup> enable users to access systems using a web browser regardless of their location or what device they are using (e.g., PC, mobile phone). As infrastructure is off-site (typically provided by a third-party) and accessed via the Internet, users can connect from anywhere.<sup>[30]</sup>
- **Virtualization** technology allows servers and storage devices to be shared and utilization be increased. Applications can be easily migrated from one physical server to another.
- **Multitenancy** enables sharing of resources and costs across a large pool of users thus allowing for:
  - **Centralization** of infrastructure in locations with lower costs (such as real estate, electricity, etc.)
  - **Peak-load capacity** increases (users need not engineer for highest possible load-levels)
  - **Utilisation and efficiency** improvements for systems that are often only 10–20% utilized
- **Reliability** is improved if multiple redundant sites are used, which makes well-designed cloud computing suitable for business continuity and disaster recovery.<sup>[33]</sup>
- **Scalability and Elasticity** via dynamic ("on-demand") provisioning of resources on a fine-grained, self-service basis near real-time, without users having to engineer for peak loads.<sup>[34][35]</sup>
- **Performance** is monitored, and consistent and loosely coupled architectures are constructed using web services as the system interface.<sup>[30]</sup>
- **Security** could improve due to centralization of data, increased security-focused resources, etc., but concerns can persist about loss of control over certain sensitive data, and the lack of security for stored kernels.<sup>[36]</sup> Security is often as good as or better than other traditional systems, in part because providers are able to devote resources to solving security issues that many customers cannot afford.<sup>[37]</sup> However, the complexity of security is greatly increased when data is distributed over a wider area or greater number of devices and in multi-tenant systems that are being shared by unrelated users. In addition, user access to security audit logs may be difficult or impossible. Private cloud installations are in part motivated by users' desire to retain control over the infrastructure and avoid losing control of information security.
- **Maintenance** of cloud computing applications is easier, because they do not need to be installed on each user's computer and can be accessed from different places.

#### 4. Deployment Models

Deployment methods of cloud can be divided into four main categories, such as Public Cloud, Community Cloud, Hybrid Cloud and Private Cloud.

- **Public cloud**

Public cloud applications, storage, and other resources are made available to the general public by a service provider. These services are free or offered on a pay-per-use model. Generally, public cloud service providers like Microsoft and Google own and operate the infrastructure and offer access only via Internet (direct connectivity is not offered).

- **Community cloud**

Community cloud shares infrastructure between several organizations from a specific community with common concerns (security, compliance, jurisdiction, etc.), whether managed internally or by a third-party and hosted internally or externally. The costs are spread over fewer users than a public cloud (but more than a private cloud), so only some of the cost savings potential of cloud computing are realized.

- **Hybrid cloud**

Hybrid cloud is a composition of two or more clouds (private, community or public) that remain unique entities but are bound together, offering the benefits of multiple deployment models.

By utilizing "hybrid cloud" architecture, companies and individuals are able to obtain degrees of fault tolerance combined with locally immediate usability without dependency on internet connectivity. Hybrid Cloud architecture requires both on-premises resources and off-site (remote) server based cloud infrastructure.

Hybrid clouds lack the flexibility, security and certainty of in-house applications. Hybrid cloud provides the flexibility of in house applications with the fault tolerance and scalability of cloud based services.

- **Private cloud**

Private cloud is cloud infrastructure operated solely for a single organization, whether managed internally or by a third-party and hosted internally or externally.<sup>[8]</sup> Undertaking a private cloud project requires a significant level and degree of engagement to virtualize the business environment, and it will require the organization to reevaluate decisions about existing resources. When it is done right, it can have a positive impact on a business, but every one of the steps in the project raises security issues that must be addressed in order to avoid serious vulnerabilities.<sup>[42]</sup>

They have attracted criticism because users "still have to buy, build, and manage them" and thus do not benefit from less hands-on management, essentially "[lacking] the economic model that makes cloud computing such an intriguing concept".

## 5. Use of cloud computing for various application

- ***Accounting: Phreebooks***

This [Web-based](#) accounting and [enterprise resource planning \(ERP\)](#) package for small businesses compares favorably with Sage and QuickBooks. It's available on a SaaS basis from Phreebooks hosting partner UniMatrix. Operating System: OS Independent.

- ***Business Intelligence: Palo BI Suite***

The first open source, software as a service, business intelligence solution, Palo's SaaS edition can help companies reduce their hardware, maintenance and installation costs. It offers planning, analysis and reporting capabilities that are a step up from using a [spreadsheet](#) application. Operating System: OS Independent.

- ***Cloud Infrastructure: Open Stack***

Backed by Nasa, Rack space and many other notable technology companies, Open Stack is building two separate cloud technologies: Compute, which provides the technology necessary to set up a cloud environment, and Object Storage for cloud-based storage. The goal is to develop standards that will promote interoperability among cloud offerings. Operating System: N/A

- ***Customer Relationship Management (CRM): SugarCRM***

An alternative to Salesforce.com, Sugar CRM, has an impressive client list, which includes Coca-Cola, Avis, H&R Block and Go Daddy. Both the professional and enterprise editions are available on-site or on-demand. Operating System: Windows, Linux, OS X.

- ***Email/Collaboration/Groupware: Zimbra***

Positioning itself as an alternative to Microsoft Exchange, Zimbra offers cloud-based email and groupware functionality. It offers a wide array of editions and deployment options, including an SaaS edition and a VMware appliance for easy deployment on a private cloud. Operating System: Linux, Unix, OS X.

## **6. Advantages of cloud computing**

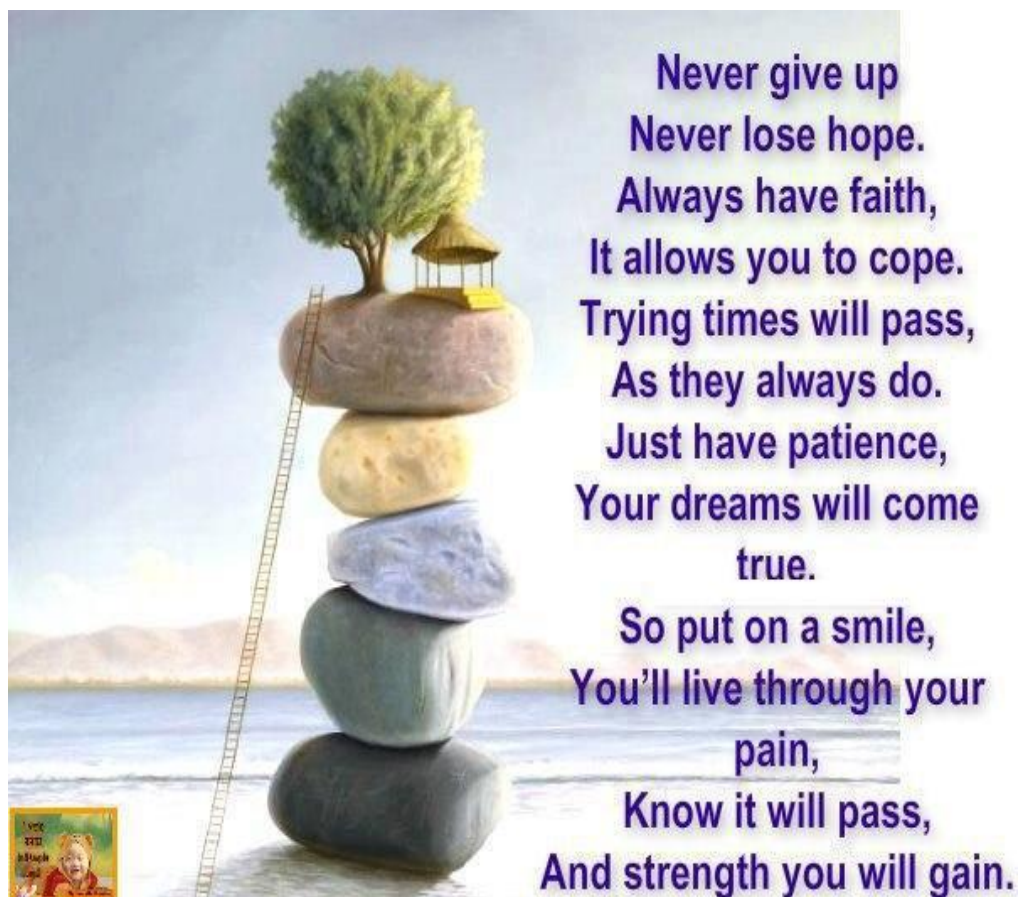
Main advantages of cloud computing can be classified as follows.

- Cloud can enhance productivity by providing the infrastructure or application platforms and related tools to respond to customer needs quickly, giving organizations an edge over others that have not assessed such mechanisms, and the on-demand capabilities can lead to efficient utilization of resources.
- It can reduce capital expenditures - hence technology resources are able to spend more time on innovation.
- Cloud also facilitates mobility services since such services are available at a cheaper cost to the enterprise.
- Cloud integration provides data transfer should occur efficiently across services and applications and the integration architecture should leverage standards and reuse.

- Hybrid Cloud solutions provides facility to develop seamless connections across applications and services.

## 7. Conclusion

Cloud computing is fast development technology in IT industry. ICTA in Sri Lanka is planning to establish Government Cloud in near future to cater all IT infrastructure needs of Government Organizations in cheap monthly rental basic. It will reduce all burdens related to IT infrastructure purchase, maintain and connectivity problem from Government Organizations. Only, Government Organizations have to pay relevant cost according to usage of Cloud facility in ICTA, Sri Lanka. Therefore, cloud based computing is more secure, efficient and effective method for citizen centric eService deployment in the Government Organization as well as private enterprises.





## **Good Land Governance**

by

**U.K.S.P.Wijesinghe**

**Senior Superintendent of Surveys/ Senior Lecturer (ISM)**

### **Definition**

Land governance is about the processes, policies and institutions which helps in making decisions on access to land, land use, land rights and land development for implementing sustainable policies and establishing strong bond between the land and the people (World Bank 2011)

### **Current definition:**

‘Land Governance’ concerns the rules, processes and structures through which

- Decisions are made about access to land and its use,
- The manner in which the decisions are implemented and enforced,
- The way that competing interests in land are managed.

### **Characteristics of land :**

- Land is more than just asset.
- Multiple rights over land.
- Rights, restriction and responsibilities are expressed through a socially constructed system of land tenure.
- Land rights have different sources of legitimacy.
- Land tenure itself is an Institution.

### **Concepts of ‘governance’:**

- Broader than ‘government’
- Emphasizes processes and institutions
- Recognizes the importance of power and politics.
- Conceptually neutral.

## Effects of weak and benefits of good governance'

<b>Weak governance leads to:</b>	<b>Good governance ...</b>
<ul style="list-style-type: none"><li>▪ Insecurity of tenure</li><li>▪ Land conflicts</li><li>▪ Social and political instability</li><li>▪ Erosion of ethics and standards of behavior</li><li>▪ Inequitable land distribution</li><li>▪ Reduced private sector investment</li><li>▪ Limited local revenues</li><li>▪ Unsustainable natural resources management</li></ul>	<ul style="list-style-type: none"><li>▪ Protects the poor from illegitimate evictions</li><li>▪ Allows for just resolution of land disputes</li><li>▪ Brings the rule of law within the reach of the poor</li><li>▪ Reduces fraud and bribery</li><li>▪ Allows for more equitable access to land</li><li>▪ Provides incentives for investment</li><li>▪ Allows the state to benefit from land taxation</li><li>▪ Creates incentives for landowners to use their land in a sustainable manner</li></ul>

### Principles of good land governance:

#### 1. Transparency

- Acting visibly
- Acting understandably
- Acting predictably

#### 2. Access to Information

#### 3. Accountability

- Culture of impunity

#### 4. Civic Engagement – public participation

- Dialogue and consensus building orientation
- Facilitating active participation of all groups; participate actively

#### 5. Effectiveness and Efficiency

- Simplified rules and procedures
- Service orientation

#### 6. Rule of Law

- Respect for legal pluralism
- Laws, rules and procedures consistently and impartially enforced
- Traditional and alternative dispute resolution included

## 7. Equity

- Pro-poor
- Exclusion: gender, inter-generational, ethnic & etc.

## 8. Security

- Security of tenure for all
- Eminent domain: prompt and adequate compensation
- No forced evictions / negotiated process

## 9. Sustainability

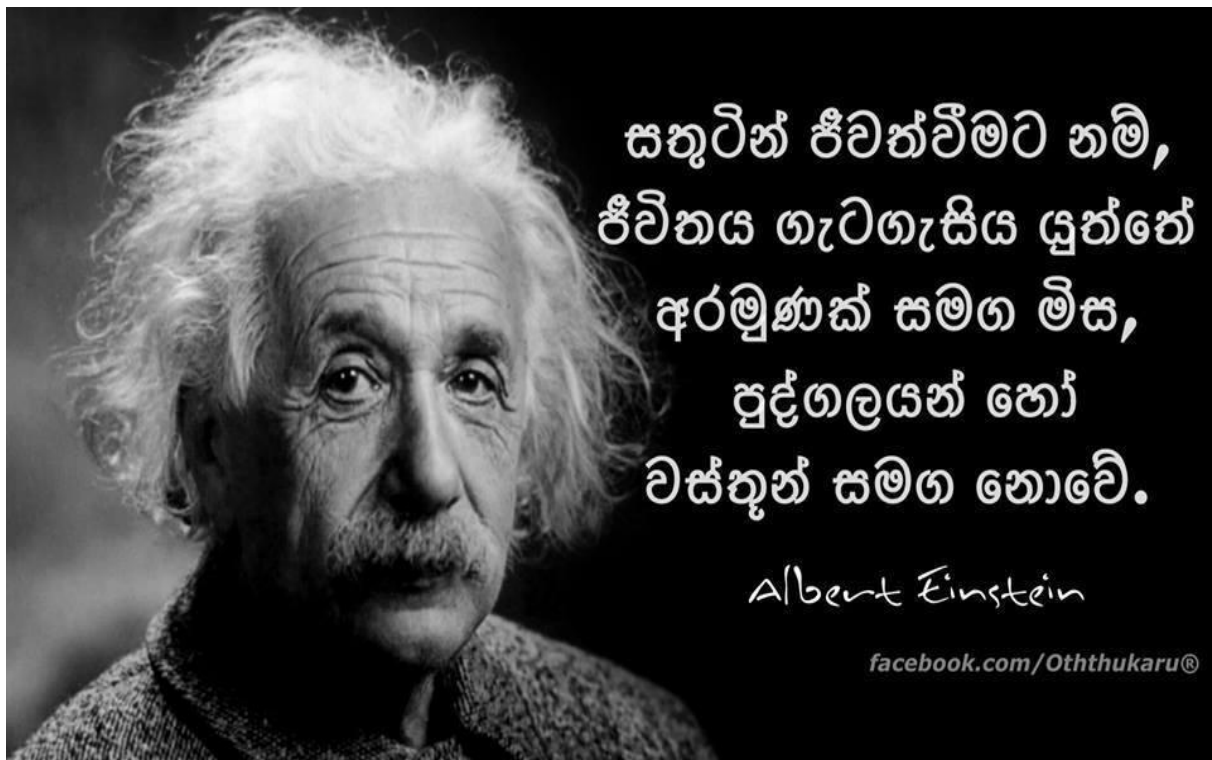
- Land use balances social, economic and environmental needs
- Land administration systems are affordable, accessible to all, can be maintained and updated over time

## 10. Subsidiarity

- Decentralization of decision-making and management.

Reference:

1. Lecture notes of Prof. Arbind Thuldar)



## **Broadcast of GIS**

by

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**Senior Superintendent of Surveys (Title Registration Surveys)**

Considerable changes in both expectations and capabilities have been taken place since GIS's birth in the late 1960s. Here a brief history and a probable future of this rapidly maturing field are mentioned.

Information has always been the cornerstone of effective decisions. Spatial information is particularly complex as it requires two descriptors as Where is what. For thousands of years the link between the two descriptors has been the traditional, manually drafted maps involving pens, rub-on shading, rulers, planimeters, dot grids, and acetate sheets. Its historical use was for navigation through unfamiliar terrain and seas, emphasizing the accurate location of physical features.

More recently, analysis of mapped data has become an important part of understanding and managing geographic space. This new perspective marks a turning point in the use of maps from one emphasizing physical description of geographic space, to one of interpreting mapped data, combining map layers and finally, to spatially characterizing and communicating complex spatial relationships. This movement from "where is what" (descriptive) to "so what and why" (prescriptive) has set the stage for entirely new geospatial concepts and tools.

Since the 1960's, the decision-making process has become increasingly quantitative, and mathematical models have become commonplace. Prior to the computerized map, most spatial analyses were severely limited by their manual processing procedures. The computer has provided the means for both efficient handling of voluminous data and effective spatial analysis capabilities. From this perspective, all geographic information systems are rooted in the digital nature of the computerized map.

### **Computer Mapping (1970s, Beginning Years)**

The early 1970's saw computer mapping automate map drafting. The points, lines and areas defining geographic features on a map are represented as an organized set of X, Y coordinates. These data drive pen plotters that can rapidly redraw the connections at a variety of colors, scales, and projections with the map image, itself, as the focus of the processing.

The pioneering work during this period established many of the underlying concepts and procedures of modern GIS technology. An obvious advantage with computer mapping is the

ability to change a portion of a map and quickly redraft the entire area. Updates to resource maps which could take weeks, such as a forest fire burn, can be done in a few hours. The less obvious advantage is the radical change in the format of mapped data— from analog inked lines on paper, to digital values stored on disk.

### **Spatial Database Management (1980s, Adolescent Years)**

During 1980's, the change in data format and computer environment was exploited. Spatial database management systems were developed that linked computer mapping capabilities with traditional database management capabilities. In these systems, identification numbers are assigned to each geographic feature, such as a timber harvest unit or ownership parcel. For example, a user is able to point to any location on a map and instantly retrieve information about that location. Alternatively, a user can specify a set of conditions, such as a specific forest and soil combination, and then direct the results of the geographic search to be displayed as a map.

Early in the development of GIS, two alternative data structures for encoding maps were debated. The vector data model closely mimics the manual drafting process by representing map features (discrete spatial objects) as a set of lines which, in turn, are stores as a series of X,Y coordinates. An alternative structure, termed the raster data model, establishes an imaginary grid over a project area, and then stores resource information for each cell in the grid (continuous map surface). The early debate attempted to determine the universally best structure. The relative advantages and disadvantages of both were viewed in a competitive manner that failed to recognize the overall strengths of a GIS approach encompassing both formats.

By the mid-1980's, the general consensus within the GIS community was that the nature of the data and the processing desired determines the appropriate data structure. This realization of the duality of mapped data structure had significant impact on geographic information systems. From one perspective, maps form sharp boundaries that are best represented as lines. Property ownership, timber sale boundaries, and road networks are examples where lines are real and the data are certain. Other maps, such as soils, site index, and slope are interpretations of terrain conditions. The placement of lines identifying these conditions is subject to judgment and broad classification of continuous spatial distributions. From this perspective, a sharp boundary implied by a line is artificial and the data itself is based on probability.

Increasing demands for mapped data focused attention on data availability, accuracy and standards, as well as data structure issues. Hardware vendors continued to improve digitizing equipment, with manual digitizing tablets giving way to automated scanners at many GIS facilities. A new industry for map encoding and database design emerged, as well as a marketplace for the sales of digital map products. Regional, national and international organizations began addressing the necessary standards for digital maps to insure compatibility

among systems. This era saw GIS database development move from project costing to equity investment justification in the development of corporate databases.

### **Map Analysis and Modeling (1990s, Maturing Years)**

As GIS continued its evolution, the emphasis turned from descriptive query to prescriptive analysis of maps. If early GIS users had to repeatedly overlay several maps on a light-table, an analogous procedure was developed within the GIS. Similarly, if repeated distance and bearing calculations were needed, the GIS system was programmed with a mathematical solution. The result of this effort was GIS functionality that mimicked the manual procedures in a user's daily activities. The value of these systems was the savings gained by automating tedious and repetitive operations.

By the mid-1980's, the bulk of descriptive query operations were available in most GIS systems and attention turned to a comprehensive theory of map analysis. The dominant feature of this theory is that spatial information is represented numerically, rather than in analog fashion as inked lines on a map. These digital maps are frequently conceptualized as a set of "floating maps" with a common registration, allowing the computer to "look" down and across the stack of digital maps. The spatial relationships of the data can be summarized (database queries) or mathematically manipulated (analytic processing). Because of the analog nature of traditional map sheets, manual analytic techniques are limited in their quantitative processing. Digital representation, on the other hand, makes a wealth of quantitative (as well as qualitative) processing possible. The application of this new theory to mapping was revolutionary and its application takes two forms—spatial statistics and spatial analysis.

Meteorologists and geophysicists have used spatial statistics for decades to characterize the geographic distribution, or pattern, of mapped data. The statistics describe the spatial variation in the data, rather than assuming a typical response is everywhere. For example, field measurements of snow depth can be made at several plots within a watershed. Traditionally, these data are analyzed for a single value (the average depth) to characterize an entire watershed. Spatial statistics, on the other hand, uses both the location and the measurements at sample locations to generate a map of relative snow depth throughout the watershed. This numeric-based processing is a direct extension of traditional non-spatial statistics.

Spatial analysis applications, on the other hand, involve context-based processing. For example, forester's can characterize timber supply by considering the relative skidding and log-hauling accessibility of harvesting parcels. Wildlife managers can consider such factors as proximity to roads and relative housing density to map human activity and incorporate this information into habitat delineation. Land planners can assess the visual exposure of alternative sites for a facility to sensitive viewing locations, such as roads and scenic overlooks.

Spatial mathematics has evolved similar to spatial statistics by extending conventional concepts. This "map algebra" uses sequential processing of spatial operators to perform complex map analyses. It is similar to traditional algebra in which primitive operations (e.g., add, subtract, exponentiate) are logically sequenced on variables to form equations. However in map algebra, entire maps composed of thousands or millions of numbers represent the variables of the spatial equation.

Most of the traditional mathematical capabilities, plus an extensive set of advanced map processing operations, are available in modern GIS packages. You can add, subtract, multiply, divide, exponentiation, root, log, cosine, differentiate and even integrate maps. After all, maps in a GIS are just organized sets of numbers. However, with map-ematics, the spatial coincidence and juxtaposition of values among and within maps create new operations, such as effective distance, optimal path routing, visual exposure density and landscape diversity, shape and pattern. These new tools and modeling approach to spatial information combine to extend record-keeping systems and decision-making models into effective decision support systems.

In many ways, GIS is "as different as it is similar" to traditional mapping. Its early expressions simply automated existing capabilities but in its modern form it challenges the very nature and utility of maps. The next section focuses on contemporary GIS expressions (2010s) and its probable future directions.

### **Multimedia Mapping (2010s, Full Cycle)**

The new processing environment is the full integration the global positioning system and remote sensing imagery with GIS. GPS and the digital map bring geographic positioning to the palm of your hand. Toggling on and off an aerial photograph provides reality as a backdrop to GIS summarized and modeled information. Add ancillary systems, such as robotics, to the mix and new automated procedures for data collection and on-the-fly applications arise.

In addition to the changes in the processing environment, contemporary maps have radical new forms of display beyond the historical 2D planimetric paper map. Today, one expects to be able to drape spatial information on a 3D view of the terrain. Virtual reality can transform the information from pastel polygons to rendered objects of trees, lakes and buildings for near photographic realism. Embedded hyperlinks access actual photos, video, audio, text and data associated with map locations. Immersive imaging enables the user to interactively pan and zoom in all directions within a display.

4D GIS (XYZ and time) is the next major frontier. Currently, time is handled as a series of stored map layers that can be animated to view changes on the landscape. Add predictive modeling to the mix and proposed management actions (e.g., timber harvesting and subsequent

vegetation growth) can be introduced to look into the future. Tomorrow's data structures will accommodate time as a stored dimension and completely change the conventional mapping paradigm.

The technical hurdles surrounding GIS have been aggressively tackled over the past four decades. Comprehensive spatial databases are taking form, GIS applications are accelerating and even office automation packages are including a "mapping button." So what is the most pressing issue confronting GIS in the next millennium?

**Next time you're stressed:**

**take a step back, inhale and laugh.**

**remember who you are and why you're here.**

**you're never given anything in this world that**

**you can't handle. be strong, be flexible,**

**love yourself, and love others.**

**always remember, just keep moving forward.**



# Map Revision by Changing and Adding Attributes to Shapefiles through Mobile Devices in a Distributed System Environment

by

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## 1. INTRODUCTION

Map revision is a challenging task for the Survey Department as the field keeps on changing rapidly. Periodic update of maps is very much essential to meet customer requirements. The time taken for field revision, verification and processing is exceedingly high. Therefore the innovative techniques should be introduced to cut short this process and thereby accelerate the whole task. Today mobile devices are available where we can run our own applications which are written to meet specific departmental requirements in updating maps.

The objective of this paper is to show that a mobile application can support functionalities such as changing the attribute name in shapefile or adding the attribute to shapefile by the help of mobile device. Mobile GIS (M-GIS) has made the expansion of GIS technology from the office into the field. M-GIS enables to capture, store, update, manipulate, analyze, and display geographic information directly in the field. The spectacular growth of the use of digital Geo information in parallel with the advances in Information Technology (IT), collecting in-situ data have been dramatically improved using handheld devices. Due to recent developments in files of internet and M- GIS technology, spatial data collection, processing and dissemination are easily possible.

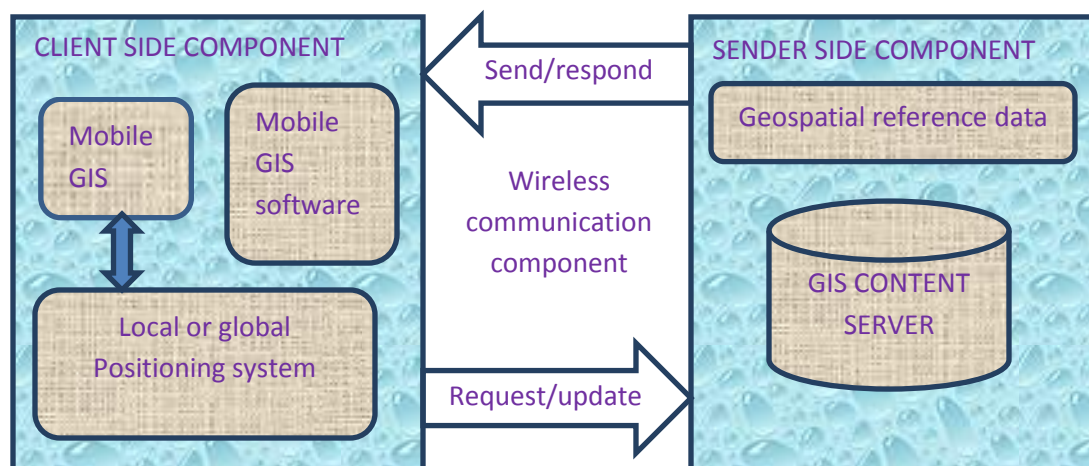


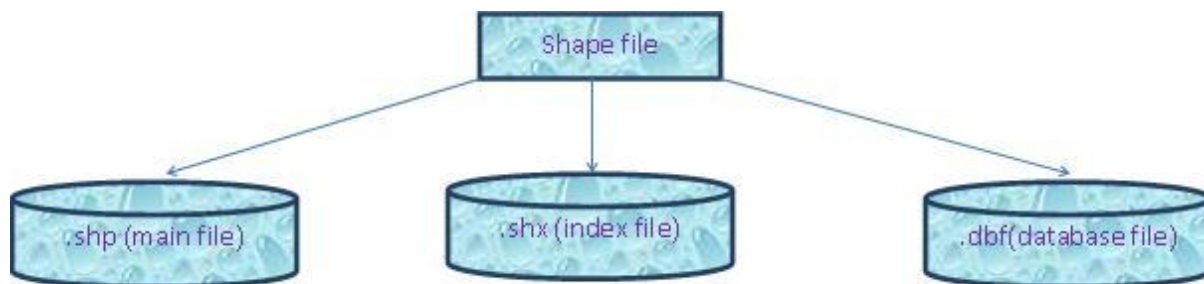
Fig 1 : Architecture of Mobile GIS

## 2. BASIC ASPECT OF ATTRIBUTES

Attributes, which describe qualities associated with features, are stored in tables. Data attribute type and field properties, such as precision, scale, or length, must be specified when creating fields for the attribute table of a new shapefile or when adding a new field to the attribute table for an existing shapefile. The choice of attribute data type and associated settings affect storage and display and can have serious consequences for the accuracy and efficiency of the underlying database. Attribute data in shapefiles are in the dBase (.dbf) file, and all you need to do is to edit that file and add more data fields. There is a one-to-one correspondence between the rows in this table and the shape records in the “.Shp “ file. A typical attribute field that you may find in a dBase table is a field that identifies the name of the corresponding shape.

## 3. BASIC ASPECT OF SHAPEFILE

A shape file is a popular geospatial vector data format for GIS software. A "shapefile" commonly refers to a collection of files with a main file with ".shp" extension, an index file with ".shx" extension and a dBase file with ".dbf" extension. The main file, with a .Shp extension, is the primary component and its structure begins with a fixed-length, header containing information about the total length of the file, the file version, and the type of shapes it contains. This file header is then followed by a list of variable-length records, with each record defining the geometry for a single shape. A shape might be a polygon that represents the political boundary of a country, a polyline that represents the path of a city street, or a point object that indicates the location of a city. The application runs on the user's mobile device and the required data will be changed or added to a database server on the wireless toolkit.



**Fig 2: Component of Shapefile**

## 4. DESIGNING A WEB MAP SERVICE

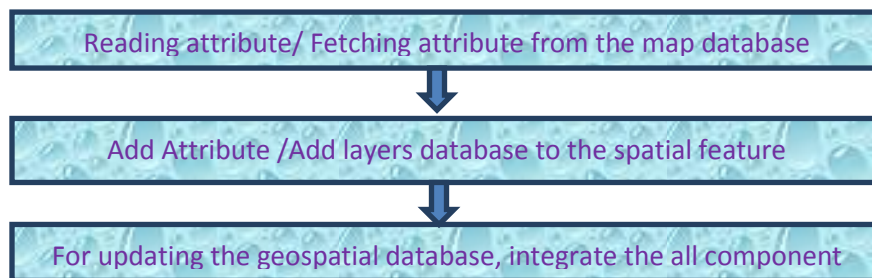
A Web Map Service (WMS) is a standard protocol for serving geo referenced map images over the Internet that are generated by a map server using data from a GIS database. WMS specifies a number of different request types, two of which required by any WMS server are:

- Get Capabilities - returns parameters about the WMS and the available layers
- Get Map - with parameters provided, returns a map image.

In ArcGIS, you can store a value for a feature attribute as one of seven data types—**short integer, long integer, float, double, text, date, and binary large object (BLOB)**. Attribute tables also contain predefined fields that hold data on geometry and the object ID. Float and double data types contain real numeric values and are used for continuous data that is measured or calculated. Short and long integer data types store data that represents numeric values that can be counted or that designate a coded value used for classification. Temporal aspects of a feature, such as when the data was captured, are stored as a date type. GIS applications are software applications that process large amounts of geospatial data, involving heavy computations.

## 5. CREATION OF GEO DATABASE

ArcGIS is built around the geodatabase, which uses an object-relational database approach for storing spatial data. A geodatabase is a "container" for holding datasets, tying together the spatial features with attributes. The geodatabase can also contain topology information, and can model behavior of features, such as road intersections, with rules on how features relate to one another. When working with geodatabases, it is important to understand about feature classes which are a set of features, represented with points, lines, or polygons. With shape files, each file can only handle one type of feature. A geodatabase can store multiple feature classes or type of features within one file.



**Fig 3: Creation of Geospatial Database**

The integrated geographic database created in GIS consists of spatial database and non-spatial database. These two databases have been linked together by common identifiers. The spatial database consists of various thematic maps consisting of point, line and polygon features. The point features have control points. The line features have the road network classes and the polygon features have the buildings, ground, and parks etc. Thematic layers that are required to be incorporated should be identified for the creation of spatial database of the Survey Department.

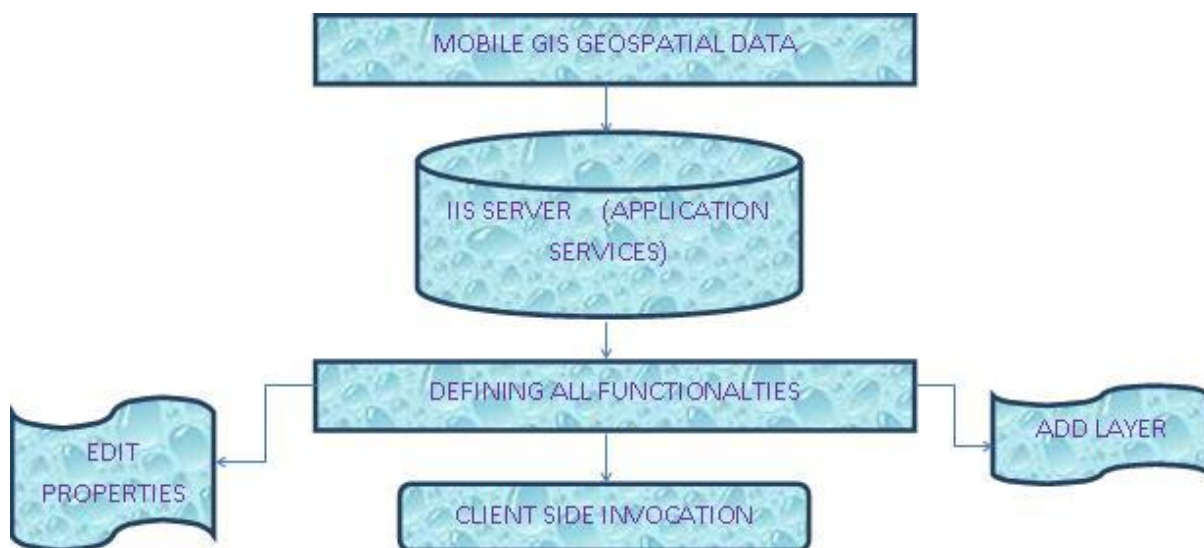
The approach is defined by the above flowchart in section. This flowchart indicates the process of work been carried out. Basis for the work comprises of the literature review which is done to develop a methodology. This literature review helps to find out the objectives of the work and further far. The Web Feature Service defines interface for describing data manipulation operations of geographic features. Data Manipulation operations include the ability to

- Query feature based on spatial and non-spatial constraints.
- Create, Delete and Update a new feature instance.

## 6. INTEGRATING GEOSPATIAL AND MOBILE GIS

The mobile web services are designed and geospatial database are created. If shape files in the distributed environment have already been imported then it has to be worked only on the Internet Information Server (IIS) where the geospatial information is stored. Work on IIS server as a database for fetching the geospatial information. The IIS server deploys and defines all the functionalities of M-GIS such as changing attribute name, adding attribute and adding layers in hand-held device or in a distributed environment on the client side innovation.

Spatial data have been created in the form of shape files. Each individual layer of the map has initially converted to shape files. When a layer is converted to shape file, the three numbers of flat files are generated with extensions .dbf, .shx and .shp, each feature id and name have been added to the layer itself, apart from the automatically generated default shape-id, for easy linking across spatial and non-spatial data.



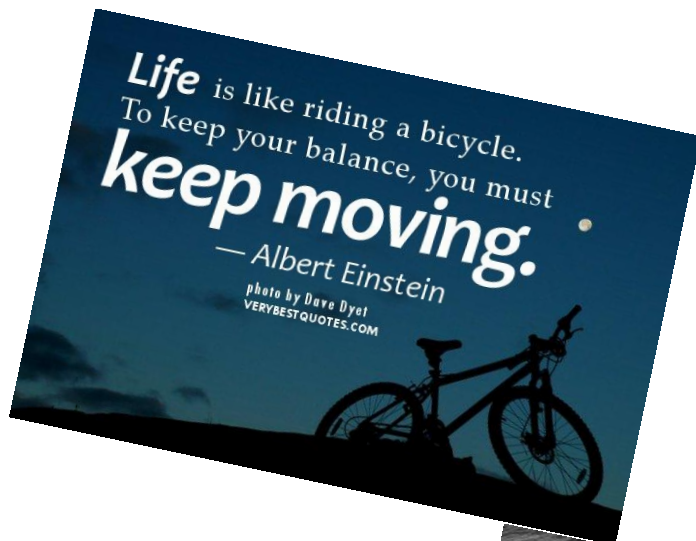
**Fig 4: The Overall Methodology can be Adopted**

## 7. CONCLUSION

M-GIS enables field-based personnel to capture, store, update, manipulate, analyze, and display geographic information directly in the field. The whole work is done on maps or shapefiles. An extension of Geographical Information System so as to deploy map and data on the Mobile Devices is known as M-GIS. This paper describes a spatial data set for mobile GIS and correspondingly a dynamic database. In mobile GIS the focus is only on to a particular scene or particular location at a particular time. Always the updated map is displayed in WMS. Therefore the new changes in field can easily be identified to update maps further. Since the main database is directly updated from the field the time required for the Map revision can be minimized.

## REFERENCES

1. Journal of Innovative Research in Computer and Communication Engineering



**Flash Back of Survey Journals**  
by  
**Dr. K.Thavalingam, Surveyor General**  
&  
**M.T.M. Rafeek, Superintendent of Surveys (Akkaraipattu)**

The first News Letter was published in April 1948. At that time it was a quarterly publications and the name was also “**Quarterly News Letter**”. The first Editor was Mr. R.L. Brohier. With issue of No. 18, the name was changed to “**News Letter**” and with 20<sup>th</sup> issue, the publication become a bi-annual one. The earlier issues contained a great deal of news of departmental activities, surveys done, articles of interest to surveyors such as encounters with wild animals, short stories with departmental setting, poems, photographs and cartoons.

From these publications some interesting experiences which were materialized in publications from 1 to 46 were summarized in last four consecutive Survey Journals to make awareness to new officers in the department as regards the ancient times history and experiences. This journal covers rest of the flash backs of these publications from 47 to 65.

**News Letter No. 47** was published in July 1968 by order of C.T.Gunawardana, Surveyor General of Ceylon and edited by R.A. Goonawardena. As usual many administrative matters and few technical articles were published on this issue. Further, a story was published by Newton de Silva, Govt. Surveyor under heading of “**ELEPHANT, ELEPHANT**”. This story gives thought for the past to know how surveyors hold their so called “**Bottle Party**” in their jungle camps during the weekends with thin the scared of wild animals such elephants, leopards, etc. Due to the unavailability of sufficient of space that story was not fully published in this article.

**News Letter No. 48** was published in January 1969, by order of C.T.Gunawardana, Surveyor General of Ceylon and edited by R.A. Goonawardena. In this issue an interesting poem was published by S. Wijeyaratnam, Govt. Surveyor under the heading of “**MY EXPERIENCE OF MAHAWELY TRIANGULATION**’ and particular poem re publish here for young surveyors to get to know those days life style of surveyors.

Up came the Diversion of the MAHAWELI  
Down came Seniviratne, Uduwawela and Herath ST

My fate was one of speculation  
I had to join the trio in triangulation.

A jeep 5 Sri ..... was mobilised  
And in two days a tough reconnaissance finalised  
Trigs were restored by day

Geodimeter Lines measured by night.  
Work was very fast; never slow  
Labourers to manage and post I had a score  
Observations to start we went with the T3  
First climbing; 5,000 feet high Hunasgiri  
There, day light was dark with mist  
Trigs visible, were none from our list.  
For the mist to miss, we even made vows  
And awaited all day like grazing cows  
A Smithsonian explorer and a Planter for company  
But for them; we would have felt hectic agony.

We came away and climbed again  
Our efforts, could not have been finer  
Remember King Bruce and the Spider.

Morning till evening we were going about with the T3  
Making observations, until by rain or bad light we could not see  
My correspondence, Journals and Vouchers, there was no time to write  
Coming home, wet or dry, and so late in the night.

Whilst at a Garage with the jeep, a bespectacled Surveyor I met  
He said to Matale he came a house to get  
To oust me and I to dry Dambulla go,  
It was sure; something had been done very low.  
About this I did not yet worry  
So engrossed was I in the MAHAWELI

Sun observations by day; Star observation by night  
Triangulation was being done with all our might  
A General Strike was in the offing.  
“ST to Head Office “SG was calling.

Only two days had passed  
My journals were just being cast  
Screaming came wife in a scurry  
To find ST draw up in a hurry  
Said he “MAHAWELI” is Essential Services Category”

Traverses through garden, under my supervision were picketed

By owners through, the labourers and I were hated  
Trees had to go for Mahaweli to flow  
This was my only devoted motto.

Then, at one end came Jayapalan; Master of the Tellurometer,  
Godwin Jayasuriya and I at the other end had Cronwall as Tutor.

Dawn to dusk, high and low lines were measured  
Our back aches and spine pains could never be bettered  
Lunch, tea, bath and rest had no time or place  
In this almighty Mahaweli race.

Now a traverse, I was asked to run with the T2  
Not yet was there time to spend with wife and children two  
My wife said on every Poya day  
“Mahaweli will not run away”.  
Next I was called to Head Office to compute and ‘close’; verify  
On my return to station, Triangulation omissions I had to verify  
Then a message ‘by hand’ instructed me; to have a another traverse afresh done  
To work again at full steam and be damned with any thought of family fun  
Finally, with Angle Books, I rushed to S.G.O,  
To verify whether co-ordinates closed to near zero.

It was after all this urgent work for the Mahaweli  
That I quietly told Madame “Shall we ..... on a small spree”  
She, with me is yet so angry,  
Saying “By Mahaweli all the Matale Town Survey arrears have come to be”

Wife: “Triangulation is not a good occupation  
For husband, wife and children have no salvation”  
Children: “Morning to evening by jeep you ran up and down  
You never one day took us to village or town”  
I told them this is all, the work of ST,  
They say, “About this Mahaweli, complain to your Big Boss, the S.G”.

**News Letter No. 49 & News Letter No. 50** were published in July 1969 & January 1970 respectively, by order of C.T.Gunawardana, Surveyor General of Ceylon and edited by R.A. Goonawardena. Few administrative matters and many technical articles were published on these issues but there are no interesting events to memorise.



**News Letter No. 51 & News Letter No. 52** were published in July 1970 & January 1971 respectively, by order of C.Vanniasingam, Acting Surveyor General of Ceylon and edited by R.A. Goonawardena. Few administrative matters and many technical articles were published on these issues but there are no interesting events to memorise.

**News Letter No. 53, News Letter No. 54 & News Letter No. 55** were published in July 1971, January 1972 & July 1972 respectively by order of R.A. Goonawardena, Acting Surveyor General of Ceylon and edited by S.T.Herat. Few administrative matters and many technical articles were published on these issues but there are no interesting events to memorise

**Survey Journal 56** was published in January 1973, by order of A.M.Cumaraswamy, Acting Surveyor General of Sri Lanka and edited by T.Somasekaram. From this issue onwards News Letter name was changed as **Survey Journal** and this name is being continued until now. There are no interesting events to memorise on this issue.

**Survey Journal 57** was published in July 1973, by order of S.J.Munasinghe, Acting Surveyor General of Sri Lanka and edited by T.Somasekaram. Administrative matters and many technical articles were published on these issues but there are no interesting events to memorise. From this issue onwards administrative matters were too published in all three languages including Tamil.

**Survey Journal 58** was published in January 1974, by order of S.J.Munasinghe, Surveyor General of Sri Lanka and edited by T.Somasekaram. There are no interesting events to memorise on this issue

**Survey Journal 59, Survey Journal 60 & Survey Journal 61** were published in January 1975, October 1975 & January 1976 respectively, by order of S.J.Munasinghe, Surveyor General of Sri Lanka and edited by N.G.R.Fernando. Few administrative matters and many technical articles were published on these issues but there are no interesting events to memorise.

**Survey Journal 62** was published in January 1977, by order of S.J.Munasinghe Esq., Surveyor General of Sri Lanka and edited by N.G.R.Fernando. On this issue an article was written by T.Sunthalingam (O.C.P.) under the topic of “The Magic of Happiness”. In this article as he shared his experience as surveyor of doing reference pole observation at Gunners Coin Trig Station at Manampittiya. That story is given below to young surveyors to understand the difficulties face by the surveyors those days and to know the work sincerity of those days’ surveyors.

“My party included my Head Labourer, Instrument Labourer, a shikkari, who also acted as our guide, and two other men. On this eventful day we had a light breakfast and commenced our journey at 5.30 a.m. armed with rope, cattles and shot gun. We took with us our lunch packets

and drinking water. Five men were detained with instructions to position themselves at the traverse points with mirrors. We reached the base of the hill at 7.30 a.m. The climb was perilous from the start itself Rocks loosened by rain started rolling down the moment one set his foot on them and those in the rear had to be extra careful to guard themselves from imminent danger. A barking-deer and then a full grown Elk crossed our path and the shikari's hands reacted automatically to aim his gun at the fellow. But I had to caution him against such temptations as only two cartridges were available and they were required for an emergency. Others might have had visions of a sumptuous meal. It was 11 a.m. before we reached our destination. Thus it took 4 hours to climb to the top from the base of the hill. Judging from this time lapse one can imagine the tortuous nature of the route. By some ingenuity the Trig station was located on a structure with just sufficient space for the Instrument and the observer. A look from this point down below nonplussed me for a while and the fear of the possibility of being blown away by the wind also crept into my mind. It took about half an hour or more to steady my nerves. It was 4.00 p.m. before I finished observations and boxed the instrument. For the first time in the day an intense hunger stirred me. To our utter dismay we found our lunch sticky and unfit for consumption. We ran short of drinking water too. By 4.30 p.m. we started descending with all the eagerness to get back to camp and satisfy our hunger and thirst. But no! As fate would have it, we lost our track as every route we took ended in precipitous rocks. For two hours we attempted in vain to find some access and finally gave up the struggle in favour of ascending the hill again and spending the night there. In spite of these deprivations luck had not altogether deserted us. Our immediate problem was to light a fire so as to keep away the wild animals. One of men had one long match stick in his bulath mulla and another had a fragment of the striking edge of a box of matches. With these we lit a fire and kept it burning the whole night. Through it was mid December it did not rain that day. Instead the sky was clear and a three-quarter moon was steadily rising on the sky. By 7.30 p.m. with neither food nor water for the whole day, I reposed on a flat rock spreading the canvas cover of the Instrument as bed-sheet. I lay there facing the sky with happy memories of the day and of home. A gentle breeze soothed my body and the music caused by the rustle of foliage soon lulled me into deep slumber. The rock on which I lay that night gave all the comport of a spring mattress. The sound of birds at twilight woke me up the next day and by this time my men had finished their early morning ablutions (without water of course) and were ready to commence their journey back. In the mean time we were reported lost and a search party armed with cattles and shot guns was organized by the O.C.P. But before the search party could get at us we were safely back in our camp.

A word of appreciation by the O.C.P and a financial benefit of Rs. 8 by way of subsistence allowance were the only material rewards. There, however, was a big reward and that was the unalloyed happiness created in my mind which cannot be measured in terms of money, commendation or even a promotion. The moral to be drawn from this is clear. One need not, for that matter, scale the mountains or burrow the earth to encounter happiness. One can meet it

anywhere and at any time if only one is mindful of his duty and does not deliberately go after it. The Surveyor has all the opportunities to be in this happy lot.

**Survey Journal 63** was published in July 1977, by order of S.J.Munasinghe Esq., Surveyor General of Sri Lanka and edited by T.Somasekaram. In this article U.G.Weerapura, Asst.S.S. had supplied an article under heading of “WHAT IS SIRVAYUR?” which was published in The Canadian Surveyor Magazine No.5 in December 1970. Even though it was funny definition for a surveyor it is given here to get to know how society is being looking on surveyor profession.

#### WHAT IS SIRVAYUR?

A Sirvayur? is something that grubs around in the woods looking for little sticks and stones. When he finds them, he does some kind of weird dance around them with a funny looking 3- leg crutch which he leans on and looks at. When he doesn't find them he walks around all day like he's lost. Sometimes you see them squashed big cars along roads, especially in the summer when all other bugs are out. A Sirvayur has one big eye and one little eye like popeye. He usually walks bent over all the time which is why he always looks so stooped. His face looks like old lather. He cusses terrible. He can't read because he measures between things and then puts down a number in a little book which is different than what little map says. He always measures to a stick or stone, stop near it, and puts in another stick or stone. He is not too bright because he is always making marks on side-walks and roads to find his way home. His pants are always tore from rock salt and his shoes look like they was made of mud. People stare at him, dogs chase him and he always looks wore out. I don't know why anyone wants to be a sirvayur.

**Survey Journal 64** was published, by order of S.J.Munasinghe Esq., Surveyor General of Sri Lanka and edited by T.Somasekaram. As usual administrative matters and technical articles were published on these issues but there are no interesting events to memorise. However under the administrative matters there was an announcement of 13 new appointments of Probationary Assistant Superintendent of Surveys which include some key figures of the department such as S.M.W.Fernando (Retired SG), K.Thavalingam (Present Surveyor General) & K.W.N.D.Karunaratne (Present Adl.S.G.) and so on.

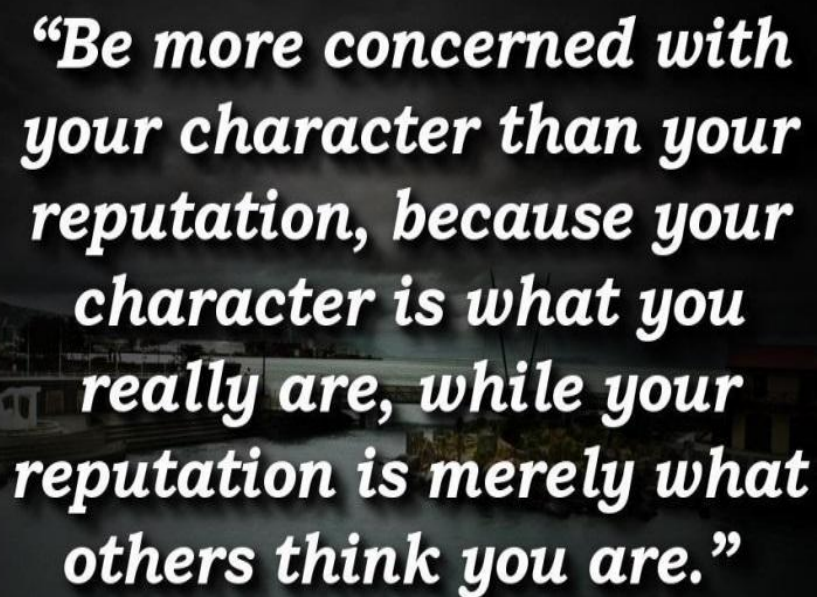
**Survey Journal 65** was published by order of S.J.Munasinghe Esq., Surveyor General of Sri Lanka and edited by T.Somasekaram. Until the year of 1980 there is no women in surveyor profession in Sri Lanka but first time in the history 26 women surveyors were recruited in T-11 batch to remark this event T.Somasekaran, Ret. SG had written an article on this publications under heading of “Women Surveyors”. Part of the article is given below:

“At the time of writing, in August 1980, the Survey Department has completed 180 years of existence in its present form, through our ancient irrigation works show that the skills of

surveying must have been known to our ancestors for many centuries. For 179 of these 180 years, the Surveyors were all men. The batch of 100 Surveyors recruited for training on 01.01.1980 included 26 women. Indeed a remarkable change for a Department that was practically “Men only” when I joined it 23 years ago with even the typists and stenographers being men. Gradually women have been making inroads in to this man only enclave, first as typists, stenographers, then as clerks, computer operators, photogrammetric technicians and now as Surveyors. At present, applications have been called for 5 vacancies in the carder of Assistant Superintendent of surveys from Graduates and women may also apply. It will not be surprising if a woman gets selected; in which case, in all probability, by 2010, we might have a woman Surveyor-General”.

But so far it was not happened by near future we will have woman Surveyor General! But question would be how would be that first lucky lady?

*(Rest of the interesting flash back will continue in the next journal)*



***“Be more concerned with  
your character than your  
reputation, because your  
character is what you  
really are, while your  
reputation is merely what  
others think you are.”***

***– John Wooden***

## **Criteria Adapted for Registering a Surveyor in Different Countries.**

by

**P.Sivananthan**

**Senior Superintendent of Surveys/Senior Lecturer ( ISM)**

A Surveyor is a professional person with the academic qualification as well as technical expertise to do practice as a Licensed Surveyor. Licensing to the surveying professionals is not a new phenomenon in the world. George Washington and Abraham Lincoln of United States of America had possessed Surveyor's Licenses. Today Survey professionals of the developed countries of the world must obtain licenses before they make practice land Surveying and Mapping. Asian continent also have a system of licensing / registering the Surveyors. In the developing countries, the government organizations doing the routine surveying and mapping works and facing difficulties to cater the surveying and mapping activities related to large development purposes. In this juncture, this article presents the registration requirements for Surveyors in different countries.

### **Sri Lanka**

The Land Survey Council (LSC) which was established under, "Survey Act No: 17 of 2002" is empowered to register a Registered Surveyor or a Registered Licensed Surveyor in Sri Lanka. To qualify as a Registered Surveyor or a Registered Licensed Surveyor one must have the following qualifications.

#### 1. Academic Qualifications:

- a. Post Graduate Diploma in Surveying or a higher qualification in Surveying from a university or an institute recognized by the LSC; or
- b. Bachelors' Degree in Surveying from a university or an Institute recognized by the LSC.

#### 2. Practical Experience

- a. For category 1 (a) above  
Minimum of Two years practical experience (to the satisfaction of the LSC).
- b. For category 1 (b) above  
Minimum of Three years practical experience (to the satisfaction of the LSC).

## **Singapore**

The application should be submitted to the Land Surveyors Board, Singapore which is under the Ministry of Law. To qualify as a Registered Surveyor one must have the following qualifications.

- ✓ Graduate with educational qualifications recognized by Land Surveyors Board (LSB).
  - Final examination leading to a Degree of Bachelor of Surveying, Bachelor of Geomatics and Bachelor of Land Information conferred by a recognized by a university; or
  - Any other examination regarded by the Board as an equivalent to the examinations specified above
- ✓ Fulfill one year's practical survey work experience under the supervision of a Surveyor with a practicing certificate.
- ✓ Pass the professional practice examination.

## **Washington State –USA**

The application should be submitted to the Board of Registration for Professional Engineers and Land Surveyors, department of Licensing, Washington. To qualify as a Professional Land Surveyor one must have the following qualifications.

- ✓ Must have a minimum of 8 years approved land surveying experience. A minimum of 4 years' education may be credited towards experience.
- ✓ Successfully complete the Fundamentals of Land Surveying (FLS) and the Principles and Practice of Land Surveying exam (PLS).
- ✓ Must sit and pass the Washington Law and Ethics examination and successfully complete a 2 hours state specific examination.
- ✓ If applying by comity (inter-state registration) you must be currently licensed in another state.

## **Victoria, Australia**

To practice cadastral surveying in Victoria, Australia it is necessary to register as a Licensed Surveyor under the Surveying Act 2004. To qualify as a Licensed Surveyor one must have the following qualifications.

- ✓ Successfully complete a university degree in surveying, geomatics or an equivalent qualifications approved by the board.
  - University of Melbourne

- Bachelor of Geomatics Engineering
- Bachelor of environments + Master of Engineering (Geomatics)
- Bachelor of Science + Master of Engineering (Geomatics)
- Royal Melbourne Institute of Technology
  - Bachelor of Applied Science (Surveying)
  - Bachelor of Applied Science (Geomatics)
- ✓ Obtain practical training in cadastral surveying, following graduation under the supervision of a Licensed Surveyor.
- ✓ Pass examinations in cadastral surveying set by the board.

## **Japan**

The GeoSpatial Information Authority of Japan (GSI) is placed in the Ministry of Land, Infrastructure, Transport and Tourism. The Survey Act (1949 Law No. 188) explaining the procedure for registration as a surveyor and assistant surveyor in Japan.

- Surveyor
  - ✓ A person who has completed a course pertaining to the survey at a university, junior college, or a college of technology, and after graduation therefrom has obtained practical experience in surveying.
  - ✓ A person who has acquired the concerned professional knowledge and skill at a technical training school\* registered with the competent minister for not less than one year, and has had practical experience in surveying.
  - ✓ An assistant surveyor who has acquired highly advanced technical knowledge and skill at a technical training school registered with the competent minister.
  - ✓ A person who has passed the examination for the surveyor\*\* done by the Director General of the GSI.
- Assistant Surveyor
  - ✓ A person who has completed a course pertaining to the survey at a university, junior college, or a college of technology, and has graduated therefrom.
  - ✓ A person who has acquired the concerned professional knowledge and skill at a technical training school registered with the competent minister.
  - ✓ A person who has passed the examination for the assistant surveyor done by the Director General of the GSI.

\* Technical Training School

Technical training school registered with the minister of Land, Infrastructure, Transport and Tourism Surveying college as incorporated school, etc.: 16 (of which two are surveyor training schools)

National Government's educational and training school: 2 (College of Land, Infrastructure, Transport and Tourism; Japan Coast Guard School)

\*\* Examination for surveyor, assistant surveyor

Written examination done once in every year in the middle of May throughout the nation

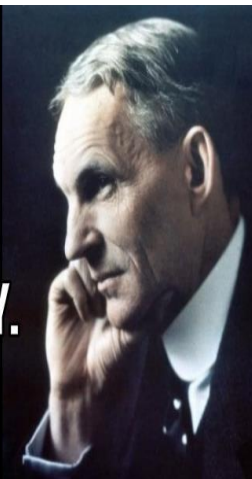
**References:**

1. Survey Act No: 17 of 2002, Sri Lanka
2. Survey Act (1949 Law No. 188), Japan .
3. <http://www.surveyorsboard.vic.gov.au>
4. <http://www.mlaw.gov.sg>
5. NCEES website

**Failure** is not  
falling down but  
refusing to get  
up. *-Chinese proverb*

**FAILURE IS THE  
OPPORTUNITY  
TO BEGIN AGAIN  
MORE INTELLIGENTLY.**

*~ Henry Ford*





## **Geo-Spatial Forum 2013 and National Spatial Data Infrastructure.**

by

**P.D.Anurasiri.(B.Sc special in Physics)**

**Snr. Superintendent of Surveys/ Senior Lecturer (ISM)**

The Geo Spatial forum was held on 10<sup>th</sup> June 2013 at Cinnamon grand hotel, Colombo, Sri Lanka. This was presided by Prof. Ranjith Premalal De Silva, Vice Chancellor of Uva Wellassa University. Plenty of speakers addressed the meeting and it was obvious that the contribution of Geo-Spatial technologies towards various fields leads to the growth of any nation.

Also this meeting reveals that the private sector in this regards has many resources and capabilities than the public sector.

Senior Deputy Survey General Mapping, Mr. P.M.P. Udayakantha described at his speech about the importance of data sharing and many more things. Therefore National Spatial Data Infrastructure is becoming essential in the country.

What is National Spatial data Infrastructure?

This has various subjective definitions as the definition of Geographic Information System.

- National Spatial Data Infrastructure can be defined as the technologies, policies, and people necessary to promote sharing of geospatial information throughout all disciplines of the government sector, the private sector, non-profit or service oriented sectors, and the academic community or research Institutes.

### **Advantages of Geo-Spatial Information**

Reduce duplication

Improve quality

Reduce costs

More accessible to the public

Increase data availability



**Figure 1:** Railway and roads and expressway assets management and map production

Sri Lanka underwent a great Tsunami on 26<sup>th</sup> Dec 2004 due to the earth quake in Indonesia of magnitude approximately 8.9. This caused big fatalities and loss lives and properties.

There was a great demand of land information. Hence the power of GIS acknowledges for disaster responses and revolutionizing government administrative work especially in the act of resettlement and designing of evacuation roads and places at a disaster. With this, various institutions which are related to development works understood that there were no efficient GIS based maps which can be utilized for disaster management and development acts. Hard copy map did not play efficient role for these works. Therefore people were emphasized a prompt need of an information system to the country.

As the Principal data collector and the national mapping organization in Sri Lanka, The Survey Department has the main responsibility of originating and mandating a NSDI. Therefore it is time to create a NSDI in Sri Lanka.

This needs a long term plan in a few phases

- Inter-Ministerial Committee on GIS must be organized
- National program for GIS and NSDI have to be formulated (2014)
- GIS Long-term Plan (Phase I expedited, To create NSDI draft.2014-2015)
- GIS Long-term Plan (Second Phase, 2016-2018)
- Action Program.((Since SD has vector digital maps) To make effective structure for NSDI from 2015)
- New Legislation-NSDI Act for the country. (Basic Act on the Advancement of Utilizing Geospatial Information)



**Figure 2:** Road intersection linked to 3D view where image is draped over LiDAR image

Therefore all professionals in the country must understand and come together as a society to overcome difficulties which encounter with NSDI. If this is planned to be started in 2014, it is much helpful to generate a NSDI by 2018. Otherwise these forums are merely just another infertile annual meeting which does not lead to zero result. The Sri Lanka Survey Department has the main responsibility to create a NSDI to the country.



## පරිපාලනයේ විවිධ නායකත්ව ශෛලීන්

එ.ජ.කේ.එන්.ඩයස්

ජ්‍යෙෂ්ඨ මිනිත්වෝරු අධිකාරී (ත්‍රිකුණාමලය)

කිසියම් ආයතනයක කාර්ය මණ්ඩලය කාර්යක්ෂමව හා සජීව්‍යව මෙහෙයවීම තුළින් ආයතනයේ අරමුණු හා පරමාර්ථ ලගාකර ගැනීමට කටයුතු කිරීම පරිපාලනයේ ප්‍රධානතම වගකීමයි. මේ සඳහා බලපාන ප්‍රධාන සාධකයක් වනුයේ පරිපාලනයේ නායකත්වයයි. සාර්ථක නායකයෙකුට ප්‍රධාන වශයෙන් පහත ලක්ෂණ තිබිය යුතුය.

1. බාහිර පරිසරයේ වෙනස්වීම් වලට සාර්ථකව මුහුණ දීමට හැකිවීම.
2. අවස්ථාවලින් උපරිම ප්‍රයෝජනය ආයතනයට ලබාගත හැකිවීම.
3. ආයතනයට සම්බන්ධ වෙනස්වීම් කල්තියා හඳුනාගත හැකිවීම.
4. ඉහළ ඵලදායිතාවයක් සඳහා යටත් සේවකයින් අභිප්‍රේරණය කළ හැකිවීම.
5. අවසාන වශයෙන් ආයතනයේ අරමුණු හා පරමාර්ථ ලගාකර ගැනීම.

ආයතනයක පුද්ගලයන්ගේ වර්ගව සහ ඔවුන්ගේ අභ්‍යන්තරික සාධක කෙරෙහි නායකත්ව ශෛලිය විශාල බලපෑමක් ඇතිකරන බව විවිධ අධ්‍යයනයන් හා පර්යේෂණ අනුව සොයාගෙන ඇත. ඒ අනුව පුද්ගලයන්ගේ ආයතනය තුළ කාර්යයන් වලට මෙන්ම ඔවුන්ගේ බාහිර කාර්යයන් වලටද නායකත්වයේ බලපෑම ඇතිවේ. පර්යේෂකයන් රාශියක් නායකත්ව ශෛලීන් විවිධ ආකාරයට විග්‍රහ කර ඇති අතර මාවසින් තෝරාගත් එක් පර්යේෂකයෙකුගේ විග්‍රහයක් පහත සඳහන් කර ඇත.

රෙන්නිස් ලිකර්ට් විසින් නායකත්ව ශෛලීන් හතරක් ඉදිරිපත් කර ඇත.

### 1. උපරිම සුරාකෑමේ ඒකාධිපතිත්වය

මෙහිදී සියලුම තීරණ ගැනීම් තමාට උරුමයක් ලෙස සලකන නායකයා ඒවා ක්‍රියාත්මක කිරීමට තම සේවකයන්ට අණකරයි. අදාළ අරමුණු කරා යටත් සේවකයින් ලගා නොවූයේ නම් දඬුවම් හා තර්ජනය කිරීම කරන අතර සේවක ශ්‍රමය උපරිම වශයෙන් සුරාකෑම නායකත්වයේ අභිලාෂයවේ. නායකයාට තම යටත් සේවකයා පිළිබඳ විශ්වාසයක් නොමැති අතර සේවකයාද තම නායකයා සමග සාකච්ඡා කිරීමට බියවේ.

මෙවැනි නායකයන් විනාශයට පත්වීමට පෙර අවසාන තත්පරය දක්වාම තමා සාර්ථක යැයි සිතන පාලකයන් වශයෙන් අර්ථකතනය කළ හැක. මෙම ශෛලිය නිසා යටත් සේවකයන් ආයතනය කෙරෙහි ලැදියාවක් නොමැති සැමවිටම කැලඹුණු මනසකින් යුතු පිරිසක්වේ. ආයතනයට හානිකර තත්වයක් පිළිබඳ හේඛුචාවක් ලැබුනද කපාකිරීමට ඇති බිය නිසා බොහෝවිට ඒවා නායකයාට හෙළි නොකරයි. මෙහිදී නායකයාගේ පැවැත්මේ ආවදානමද වැඩිය.

### 2. හිතකාමී ඒකාධිපතිත්වය

මෙහිදී නායකයා තීරණ ක්‍රියාත්මක කිරීමට සේවකයන්ට අණකරන නමුත් ඔවුන්ටද ඒ සම්බන්ධ අදහස් ඉදිරිපත් කිරීමට සීමිත නිදහසක් ඇත. සමහර තීරණ ගැනීමේදී සේවකයන්ගේ අදහස් විමසන නමුත් ඔවුන්ට සේවකයා පිළිබඳ ඇත්තේ අවම විශ්වාසයකි.

මෙම අවම විශ්වාසය නිසා සේවකයාගේ සියලුම වැඩ පිළිබඳව දැඩි අධීක්ෂණයක් නායකයා විසින් කරනු ඇත. මේනිසා සේවකයන් නිර්මාණශීලී නොවන අතර ඔවුන්ට පවරන සීමාව තුළ පමණක් සේවය සපයනු ඇත.

### 3. සහභාගිත්ව නායකත්වය

මෙවැනි නායකයන් තීරණ ගැනීම් සහ අනුකිරීම කරනු ලබන්නේ යටත් සේවකයන් සමග සාකච්ඡා කර අදහස් ලබා ගැනීමෙන් පසුවය. සේවකයා කෙරෙහි සීමිත විශ්වාසයක් තබන මෙවැනි නායකයන් ඔවුන් අභිප්‍රේරණයට ප්‍රතිලාභ යොදා ගනී.

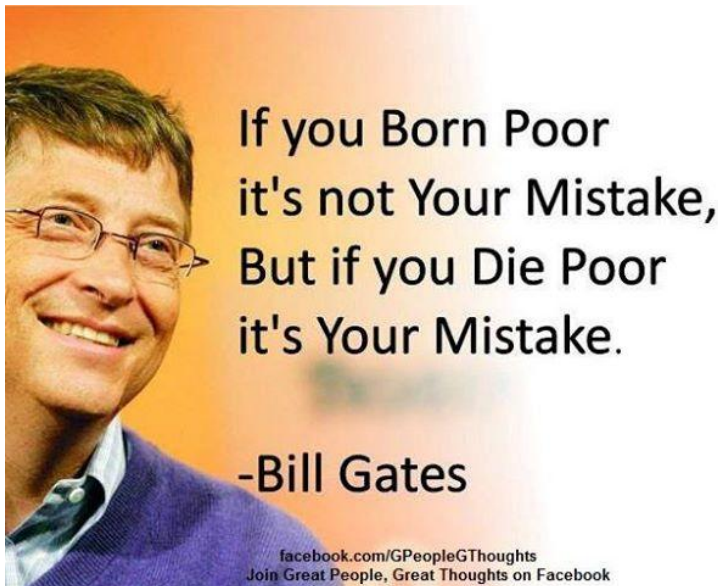
### 4. ප්‍රජාතන්ත්‍රවාදී නායකත්වය

මෙය හොඳම නායකත්ව ශෛලිය ලෙස හඳුන්වා දී ඇත. නිතරම යටත් සේවකයන් සමග සාකච්ඡා කරන අතර අරමුණු හා කාර්යයන් සම්බන්ධ තීරණ ගැනීමේදී සාමූහික තීරණ වලට එළඹේ. සේවකයාට බියක් නොමැතිව නායකයා සමග සාකච්ඡා කල හැක. නායකයාට සේවකයා කෙරෙහි ප්‍රමාණවත් විශ්වාසයක්ද ඇත.

ඉහත දැක්වෙන විවිධ නායකත්ව ශෛලීන් අධ්‍යයනය කර වඩාත් සුදුසු ක්‍රමයක් තෝරා ගැනීමට ඔබට නිදහසක් ඇත. නමුත් නිසි නායකත්වය වැදගත් තීරණ ගැනීමේදී පහත කරුණු පිළිබඳවද අවධානය යොමුකරනු ඇත.

1. තම සේවකයින්ගේ අලුත් අදහස් වලට ගරු කිරීම.
2. අත්දැකීම් ඇති පුද්ගලයන්ගෙන් තොරතුරු රැස්කිරීම.
3. පවතින හිතීර්ති පිළිබඳව සැලකිලිමත් වීම.
4. ප්‍රායෝගිකව දියත්කල හැකි තීරණ ගැනීම.
5. වැඩි පිරිසකගේ අදහස් වලට සවන්දී වඩාත් ගැලපෙන තීරණය ගැනීම.

එවිට තම ආයතනයේ එදාදීනාව ඉහල යන අතර එමගින් සේවකයින්ට උපරිම සේවාවක් සැලසිය හැක. යටත් සේවකයින්ද ආයතනයට ලැදි මානසික සතුටකින්ද පිරී පිරිසක් වනු ඇත.



# **Super Resolution Mapping using Markov Random Fields For Landuse classification**

by

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## **Abstract**

Super resolution mapping is a method in the remote sensing area where mixed pixels are divided into sub-pixels and for which every sub-pixel will be classified. Several methods are available for generating a super resolution image as well as several methods are available for optimizing the image. This paper focuses on Super Resolution mapping based on Markov random field for the creation of thematic image. The prior energy, dependent on the neighbouring pixels, and the likelihood energy, dependent on the class distribution over the bands, both determine the final result. The distribution between the two energy functions, the smoothing parameter, has to be found to give a close to optimal result. The results of the classification prove that the super resolution is better than the conventional classification techniques available in commercial software.

## **Introduction**

In the process of creating maps one has to transform the available data to groups of the same class. Satellite images are commonly used for this classification in land cover mapping. Every land cover class has a different spectral representation. Because the satellite imaging system can measure multiple bands with every sensor having their own specific spectral resolution, it can be used for generating land cover/landuse maps. The spatial resolution of the satellite imaging system, known as the size of one pixel represents, is of great importance. The lower the resolution the bigger the area one pixel represents, which can create difficulties in classifying. One pixel can easily contain multiple land cover classes and therefore information can be lost when that pixel is classified as one single class.

Current imaging techniques represent such a mixed pixel with only the best fitting land cover class. This results in a further generalization of the area measured. Super resolution mapping can be used to divide a mixed pixel into multiple sub-pixels, each sub-pixel representing a land cover class. Because this sub-pixel has no spatial information, the location of this class is unknown. Optimization methods need to be executed to ensure positioning the sub-pixels as good as possible.

## Principle in Super Resolution mapping

Suppose a satellite image is available for land cover class mapping. This particular satellite can measure 8 bands of the electromagnetic spectrum, so for every pixel there are 8 different values available. Of the 6 interesting bands for land cover mapping the CCD sensors are capable of measuring the ground with a spatial resolution of 30 meters. Within these 30 meters, a residential area could be present, but also a piece of farmland, or a piece of forest (figure 1.(a)).

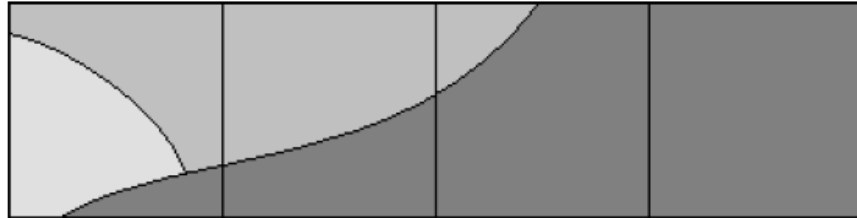


Figure 1.a: Schematic view of an original measured area

Because of hard classification every pixel will be assigned one class, so in this case an area of 30 meters will have one class. Using all the spectral band images the classification algorithm chooses the class best fitted to the pixel as a whole. This often results in a pixel showing the land cover class which is mostly represented within the measured area. In figure 1.(b) the result of this method is shown.

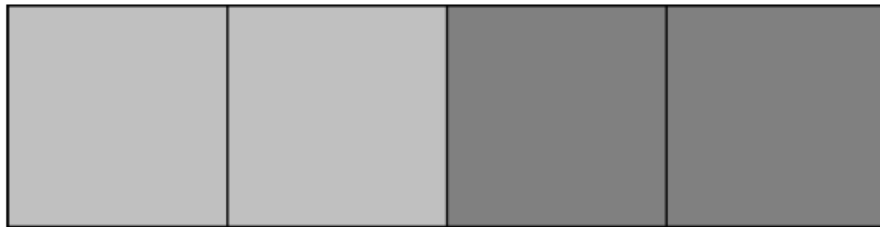


Figure 1.(b): Land cover mapping using current techniques

An improved method would be to include parts of the classes present within the single measured pixel. This can only be achieved by sub-pixel classification, also referred to as super resolution mapping, of which a simple possible result is shown in figure 1.(c).



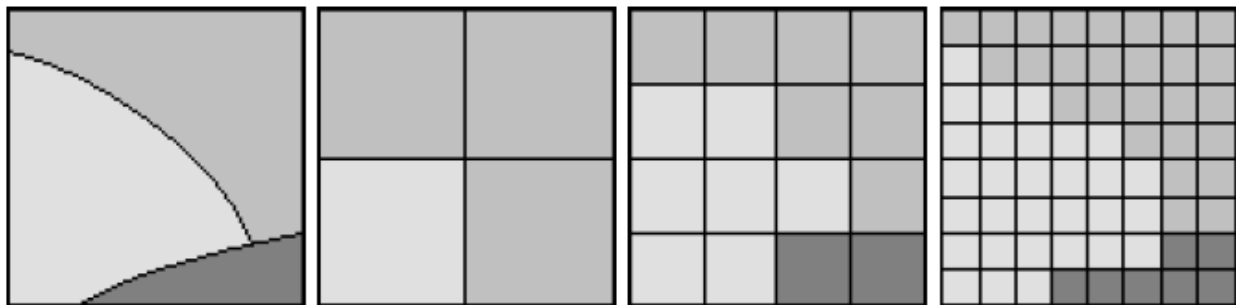
Figure 1.(c): Simple sub-pixel mapping



With sub-pixel classification first the amount of the present classes within the pixel needs to be determined. Because every class has its own specific spectral representation, pure pixels, also called training pixels, can be used to determine which classes and the amount of classes present in a mixed pixel, and the covered percentage of that class. These pure pixels are an important measure in both conventional mapping and super resolution mapping, because they only cover one class thus the mean spectral reflectance and its variance for that particular class is known. Then if for every class a pure pixel can be found, the percentages of class availability within other pixels can be calculated. Fourth pixel in above figures is a perfect training pixel: only one land cover class is present.

With the available data, also coming from the earlier described classification methods, the programme then looks for the pixels closest to the given spectral reflectance representation. With these pure pixels for each class, the classes and class fractions of the other pixels can be determined. Because the commonly used mapping techniques don't use super resolution mapping, the original image will result in a map, showing the highest percentage of the found class type at each pixel.

For super resolution mapping the choice for the amount of sub-pixels needs to be made. The more sub-pixels are chosen, depending on the scaling factor, the closer a depiction of reality the image will be. The larger the scale factor will be, the more storage space and computation power will be required. Figure 2 shows the potential of the sub-pixel classification theory.



(a) Schematic view of an original measured area (b) Subpixel map with scale 2 (c) Subpixel map with scale 4 (d) Subpixel map with scale 8

Figure 2: Sub-pixel class mapping

### Markov Random Fields

When a pixel is subdivided into several sub-pixels, the spatial location of the sub-pixels is unknown. To be able to position these sub-pixels correctly one needs prior information for which a model can work in finding an optimal solution. Markov Random Fields (MRF) is based on the Bayesian probability theory, and includes this knowledge in the two key elements: the prior and



Conditional probability density functions. These functions will be combined so classification can be expressed in terms of maximum a posteriori criteria.

Let  $y$  be a multispectral remote sensing image containing  $K$  spectral bands. The pixel locations are denoted as  $b_i \in B$ , where  $B$  is the pixel matrix with size  $M \times N$ . The spatial resolution is denoted with the pixel size  $R$ , so that every pixel  $b_i$  is assumed to correspond with a square area on the ground of size  $R^2$ . The result of super resolution mapping is a classified map  $c$ , defined on a set of pixels  $A$ . The area the pixels in  $A$  cover is the same as  $B$ , but a higher spatial resolution, so a lower pixel size  $r$  is present. The original image with pixel size  $R$  will be referred to as the course resolution image, while the super resolution image with pixel size  $r$  will be referred to as the fine resolution image.

The ratio of the course and fine resolution is known as the scale and can be denoted as  $S = R/r$ . In this research  $S$  will only be an integer, as floating values for  $S$  are hard to work with, but not impossible. Each pixel  $b_i$  therefore will contain  $S^2$  fine resolution pixels  $a_{ji}$ , in this research also denoted as  $a_j$ . This will give pixel matrix  $A = \{a_{ji}\}$  the size of  $(SM) \times (SN)$  pixels.

Assuming a multispectral image  $x$  having the same spectral bands as  $y$  as well as the spatial resolution of  $c$ , image  $y$  can be seen as a degraded version of  $x$ . Image  $y$  however is measured by satellites or other measuring equipment, while image  $x$  is not. Furthermore it is assumed that every pixel in image  $x$  can be assigned to a unique class:  $c(a_j) = \alpha$ , where  $\alpha \in \{1, 2, \dots, L\}$ . For convenience the class of pixel  $a_j$  will be referred to as  $c_j$ . The relation established between image  $y$  and  $x$  can be described by:

$$y(b_i) = \frac{1}{S^2} \sum_j x(a_{i|j})$$

### Comparison of Results

For this article the high resolution panchromatic and multispectral KOMPSAT 2 satellite images of newly built housing scheme was used. The images of the area are shown in figure 3(a) and 3(b).



(a)



(b)

Figure 3: (a) Panchromatic image (b) Multispectral Satellite image

The image was classified for the detection of building footprint using Maximum likelihood classification common in all commercial image processing software and same image was classified using the super resolution mapping techniques explained above. The results of the two methods are shown in Figure 4 (a) and (b).

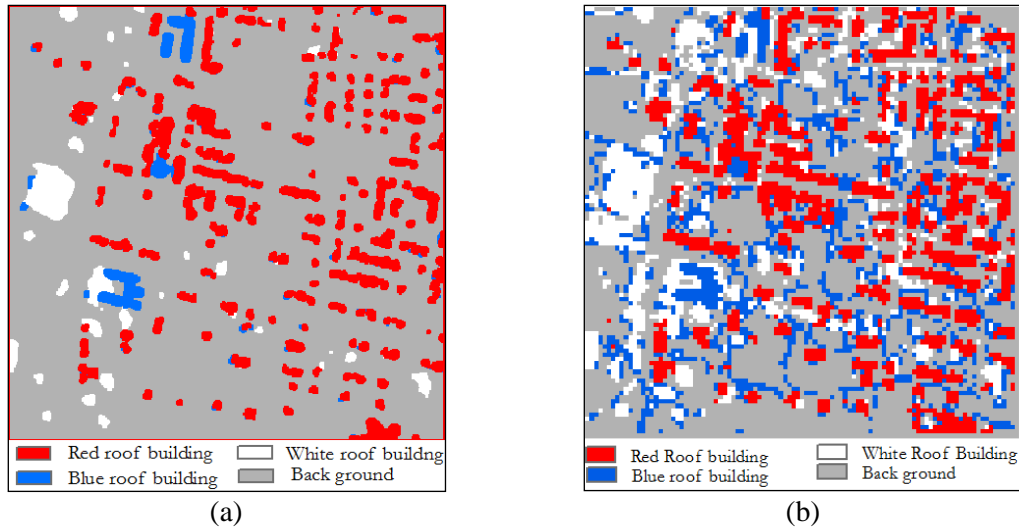


Figure 4: (a) Building footprint map from Super Resolution Mapping  
 (b) Building footprint map from Maximum likelihood classification

The pixel based accuracy assessments of both classifications are given in table I and table 2. According to Table 1, over all accuracy of the super resolution classification is 87% while that of Maximum likelihood classification is 52.73%. So the super resolution mapping with Markov Random field is better than the conventional image classification techniques available in most commercial software.

Table 1: The confusion matrix of building footprint detection from Super Resolution Mapping

Thematic map classes	Reference classes				
	Building	Back ground	Total pixel	commission	User accuracy
Building	20988	9770	30758	0.3176	68%
Back ground	11308	117934	129242	0.0875	91%
Total pixel	32296	127704	160000		
Error of omission	0.3501	0.0765			
Producer accuracy	65%	92%	Over all classification accuracy = 87%		

Table 2: The confusion matrix of building footprint detection from maximum likelihood classification

Class Name	Reference Total	Classified Totals	Number Correct	Producers Accuracy	Users Accuracy
Red roof building	33	50	27	81.82%	54.00%
Blue roof building	2	40	2	100.00%	5.00%
White roof building	9	35	5	55.56%	14.29%
Vegetation	70	74	50	71.43%	67.57%
Other	142	57	51	35.92%	89.47%
Total	256	256	135		
Over all classification accuracy					52.73%

## Discussion

The proposed approach for land cover or landuse classification in satellite image is more accurately than the MLC hard classification method as it identified most of the buildings. The shape of the buildings is preserved better than with the MLC method. On the other hand, the total number of buildings in the study area is 292. Out of 292 buildings 276 buildings or 95% are identified in Super Resolution mapping and it shows less false identification of the buildings compared to the conventional MLC building identification.

So the super resolution mapping techniques is more efficient for the land cover landuse classification than conventional classification. But the problem is that it is still not available in commercial software. That is because of the main drawback of the current super resolution mapping techniques is its speed.

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# Google Earth

by

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## 1.0 Abstract

This is an image based mapping product which facilitates to investigate geographic information especially explore places through out the world from space to street level three dimensionally. The user can simply tell the Google Earth what he wants and it will do a great job giving almost all required information to him. It lets the user to grab, spin, zoom down to any place and even view photo of 3D buildings etc. Rather than a search tool, it also facilitates to do some time series analyses and cartographic visualizations. Users also can export their own ArcGIS data to the Google Earth too.

## 2.0 Introduction

Are you going London next Sunday? Have you thought about how you are going to get there? Have you thought of what might be there when you arrive? Google Earth can answer these questions. It is three-dimensional desktop application that offers to you with Internet access geographic information, allowing users to virtually sight see exotic locations like London, Paris, and more. That is; Google Earth (GE) is a software program that combines satellite imagery, maps and the power of Google Search that puts the world's geographic information at our fingertips. It has a tool that allows users to search for addresses, enter coordinates for position accuracy, 3D visualization and zooming in and out for close up view on the earth, under the sea and in the sky.

This report explains in detail the description of GE, the reason why users use GE, how one can use GE for his/her own purpose and the functionality of this application. Then it describes how GE uses feature changes according to time (timeline) and cartographic symbolization using 3D view. Also, this report explains how we could export ArcGIS for visualization in GE.

## 3.0 Google Earth (GE)

Google Earth is a virtual globe which is one of the most popular Google products that can be freely downloaded in your computer. It was initially named as Earth Viewer. It stores a massive amount of data, and organizes it in a simple and accessible way. Also it has a combination of a downloadable program and online data. Google Earth provides a mechanism for users to

navigate and search for geospatial information in addition Google Earth provides a user friendly GIS platform and allows real-time sharing of data.

Its structure includes both public domain and proprietary data and has a foundation of high resolution satellite images with aerial photos. Additionally, it has vector and attribute layers such as transport, population, place names etc. Further more, Google Earth has a collection of World Heritage Sites that shows information of valuable geographical context that could help users to understand the structure of data in localised areas. Another advantage is that users can add new layers for their personal and general use. We could also enhance these existing maps with relevant data including photographs, Wikipedia entries and YouTube videos.

#### **4.0 The need for GE.**

Peoples always strived for information. Their thirst for information does not include what is going around them but around what is going around the globe. Also in recent time the users of information have become more and more demanding. Furthermore users don't only want to receive information but want to live and interact with it.

Traditionally maps have been used to conquer, build, and discover the information. Now day's communication and technology is playing a vital role in producing and sharing of information especially mapping websites which are available for free to the user. This means user can access and use geospatial data without the need to pay for the services.

These web mapping applications not only provide high quality maps over the web but also combine different services available over the internet. Considering other web mapping application, Google Earth is one of the most popular one.

Finally, there are some users that cannot travel to famous places such as Paris, London, Italy etc. due to financial or political reasons. Goole Earth is one tool that could help them fly virtually over such places and make their dream become reality.

#### **5.0 Usability**

GE is one of a GIS platform that runs on inexpensive hardware and is widely available through out the world. It allows easy real-time sharing of data thus making it a useful tool for data integration. The advantage of the using GE is that we do not require specialist in GIS or image processing software. Secondly, we do not need skilled people as the data is pre-processed and has already been geo-referenced. Thirdly, some of this data is not available under public domain licensing and lastly during emergency situation the integration of GIS information using GE is very useful.

GE is a rapidly growing technology. Since its release in 2005 had improved from texture mapping model to 3D building model on major cities in 2006. Recently, it is able to visualize the imaginary of urban space and simulate urban environment on one platform integrating the basic functions of computer graphics, virtual reality and geographic information system.

GE is recently being used by scientist for analysing and visualizing of glaciers. Since many glaciers are not easily accessible to the public, the significance of this glacier melting “in full view of residents, tourists, and scientists” is emphasized, though the photo pairs are much clearer than the Google Earth visualisation. It also leads viewers to compelling information about global warming than to add value via its own imagery.

## **6.0 Functional Features of GE**

GE can take you back in time to see historical imagery by sliding back and forth on a timeline of available aerial and satellite photography. It can take you for a tour around the virtual globe following a predetermined route or recording what you see as you zip around in real time. You can even add audio, text, and images to explain different landmarks.

GE can also take you deep under sea, by showing you the ocean floor around the world. This new functionality has a bit higher resolution and is dedicated to getting the best ocean floor surface data they can.

The following features are confirmed in the data implementation process. The total operationally is superior to other 3D systems that the user is often required the operational skill. The navigation in virtual urban space is very easy. User can move, rotate the viewpoint and manage layers and time scale on one window without special skill. The spatial data can be controlled by each object and group in KML scripting. Time management is possible as well. Further, hyperlinks in KML can dynamically connect to the files in remote or local network locations for updating or adding new spatial objects.

The addition of friends and family in Contact Navigator to instantly find them anywhere on Earth is one a very interesting feature of GE. Fly seamlessly through the landscape with new navigation controls, swoop seamlessly from outer space to street level and leap from one building top to another is another added bonus to the technology.

Create 3D models using Google SketchUp and add them to the 3D Buildings layer in Google Earth is another feature of GE.



The Wikipedia Entries that showcase interesting tools and features on local landmarks can definitely make someone learn a lot more about his/her area when clicking on the Wikipedia ‘W’ and have the page open within the application.

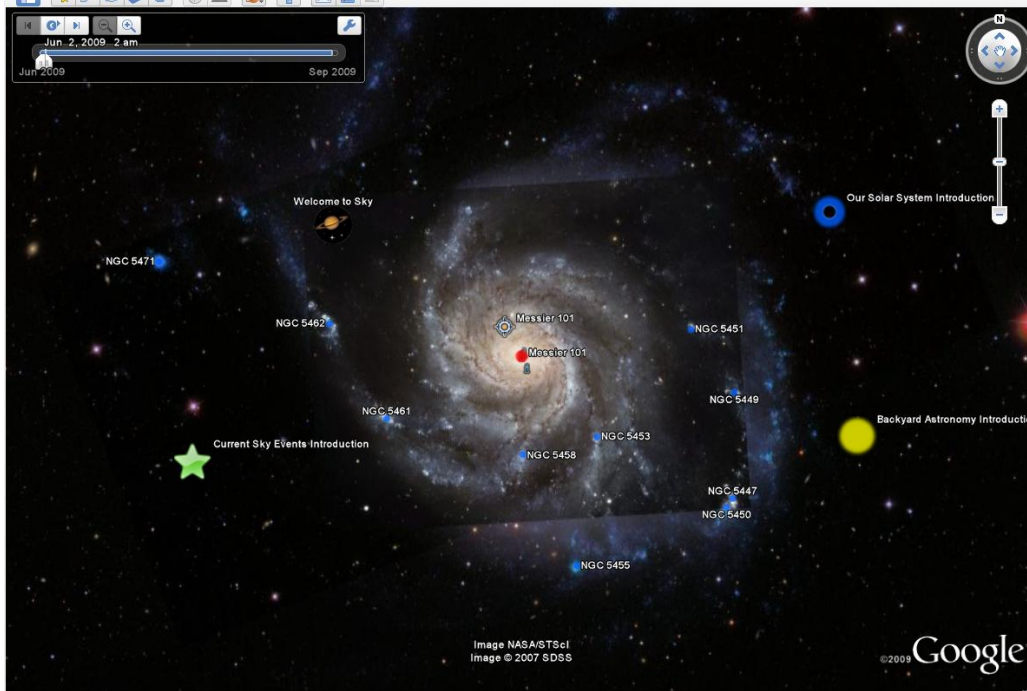


Figure 1: Google Sky view

Google Sky is another application which is best applicable for astronomical purposes. Moreover, it can predict the arrangement of stars and spheres in the globe. Google Sky offers a map of the heavens packed with Hubble Space Telescope imagery, and Google Mars lets you explore the Red Planet.

## 7.0 Visualization of Temporal data

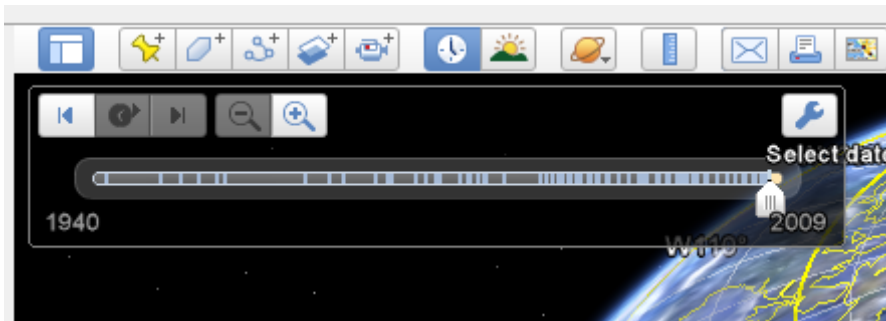


Figure 2 : Google Time Line





San Francisco in 1946

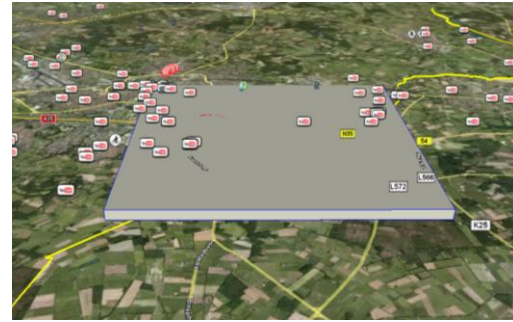


Figure 4: Time cube of Prof. Kraaks tracking of his training route in Enshede

Visualization of temporal data is done by using the timeline bar that is shown in months or years. The time span tags are presented in KML file on which GE displays scaled interactive timeline that enables the user to filter the display of data by time. The timeline can also be “played” allowing temporal structure to be shown through animation.

Figure 2 is an example developed and used by Lloyds, in which the timeline is used to show changes in the value of aggregate exposure over the course of a year. Such data can also be presented as symbols, as more appropriate area symbolism than perspective height or as continuous datasets.

Space time cube is also a type of visualization for temporal data. A famous example is the tracking of the movement of Napoleon soldiers by Professor Kraak. The visualization shows the time, space as movement, and other factors that affected the soldiers for example the weather. Figure 4 shows an example of Prof. Kraaks tracking of his training route in Enshede.

### 8.0 3D Visualisation in Google Earth.



Figure 5: Top down view

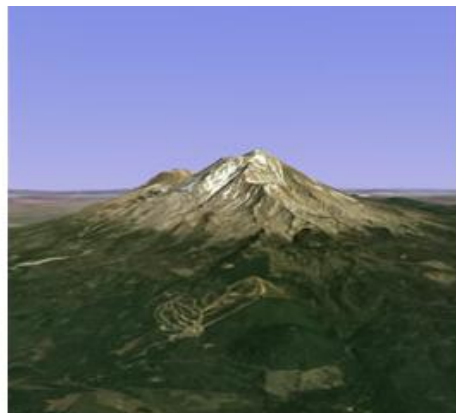


Figure 6: Titled view

The images above show Mt. St. Helens an active volcanic site. The image in GE can show a 3D view which has the height dimension if activated. In most of the major North American cities three dimensional city models exist and can be displayed. A combination of these data sets was recently used by news broadcasters to illustrate the Hurricane Katharina event.



Figure 7 - 3D Quantitative data



Figure 8: Prism Map (Quantitative & Qualitative Data)

Another use of 3D visualization is by displaying information using cartographic symbolization. The above images show examples of two types of symbolization and that is the quantitative (figure 7) and both the qualitative and quantitative data (figure 8).

## 9.0 ArcGIS Output exported for visualisation in Google Earth

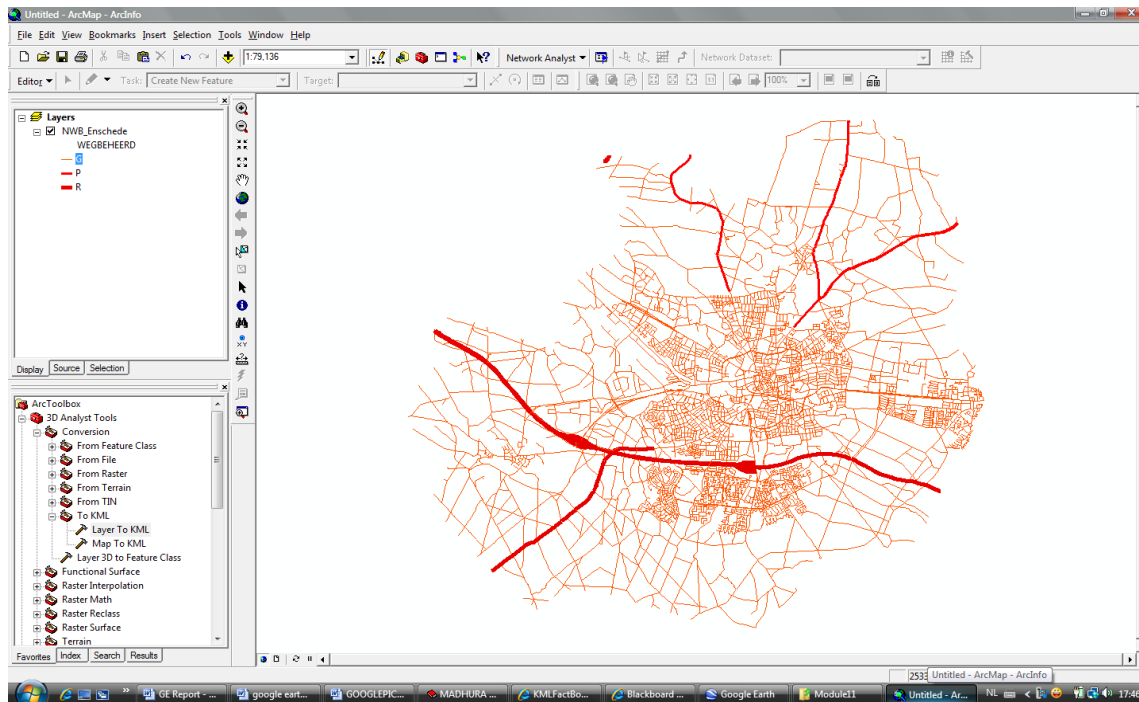


Figure 9 Enschede Road Display and Arrange in ArcGIS Environment

The process of exporting ArcGIS visualization in GE involves the conversion of shape file to Keyhole Markup Language (KML) file. The shape file should be symbolized; an example is shown above. That is the symbolization of state owned road, provincial road and municipal road in Enschede. However, the converted KML file needs datum transformation and map projection parameters to be overlapped with GE. If so, we can view our ArcGIS layer in GE, please see figure 10 (below) for an example.

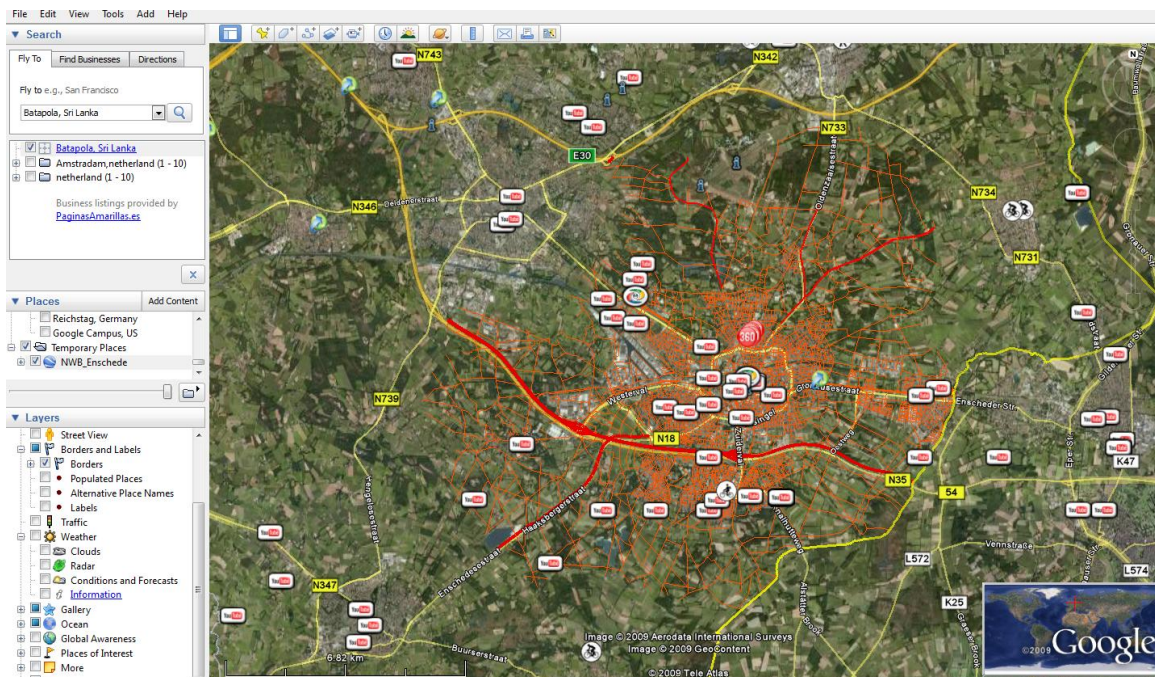


Figure 10: Enschede Road Display in Google Earth Environment

## 10.0 Conclusion

To conclude, GE is becoming increasingly important in ones day to day life as it raises awareness, inspire action, and affect positive change. The future of GE is very promising as it is venturing in other area that was never thought of before such as the sky and under ocean.

## 11.0 Recommendation

One area that needs to be further analysed and researched on is the possibility to show traffic pattern of major cities, also if GE could show dynamic movement of things. A tour inside a 3D building is also recommended as to help in evacuation purposes, tourist find hotel rooms etc. Lastly if GE could show high resolution images of all places in the world, currently it is showing high resolution images for major cities only.



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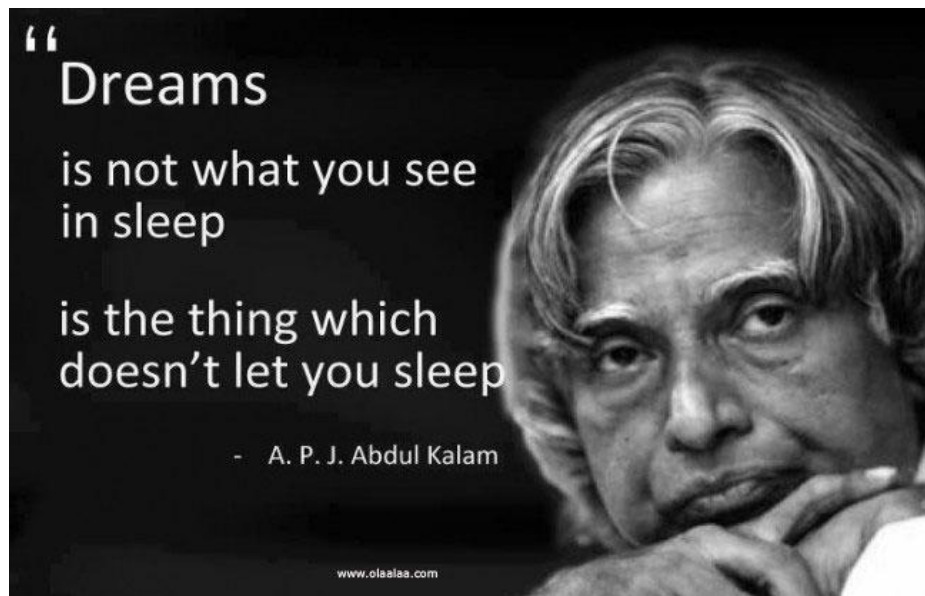
URL 5:

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# LIS – Corporation and Sustainability

by

Nelson Wijenayake

Senior Superintendent of Surveys (LIS)

## 1. Introduction

Land Information System (LIS) initiated in the Survey Department (SD) in 2007, with the idea of elaborating a user friendly information system for the spatial data community of the country. Since its inception, the cadastral survey data captured under the Land Title Registration Project (LTRP) had been taken as the LIS input source. The field survey data collected with electronic total station equipments and the tenement information as collected at field survey stage have been processed to develop the LIS. The data received in LIS office are mostly found to be erroneous and need to clean and re-structured prior to conversion and transformation into ESRI ArcInfo format. Finally the processed dataset in ArcInfo is archived in seven different layers as detailed in Figure-1, abbreviated as CM-Cad Map, K-Key, AD-Admin, BP-Boundary Points, CP-Control Points, LN-Lot Numbers and ST-Structures.

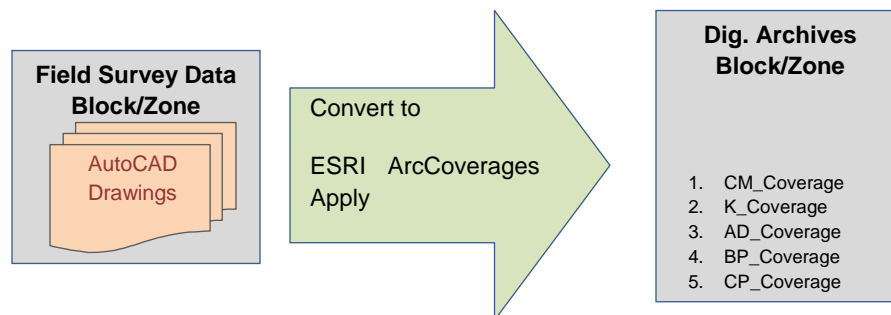


Figure-1 LIS Electronic Archives in ESRI ArcInfo Coverages

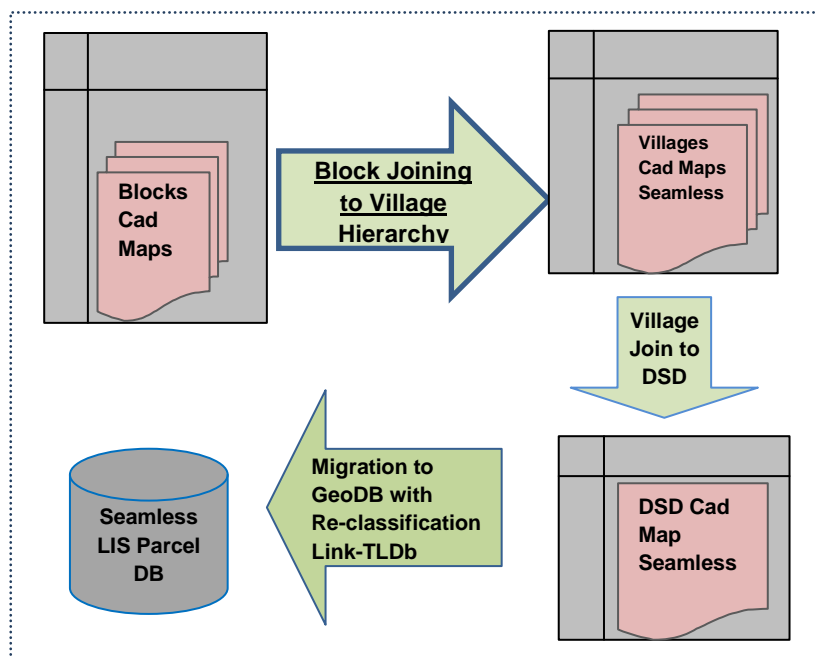
Further, as mandated by the Survey Act, No.17 of 2002, the Surveyor General is the principal authority responsible for receiving, storing and exchanging in any form land related data for maintaining the Land Information System. Hence, the responsibility of the Survey Department in maintaining the LIS is expanding continuously with the drastic improvement of the enabling technology of geo-spatial data environment.

The LIS, in its definition itself indicates the supportive information towards the sustainability of modern land administration. Achieving the system benefits is merely depends on system performance. Hence, each and every components of the system should be efficiently managed to result the ultimate system goal. This article describes

the LIS in different perspectives for achieving sustainability in land administration of the country.

## 2. Perspectives for Admin-LIS and Corporate LIS

Working on the concept that “Land Information has a greater value, especially when the related information are encapsulated into each land parcel, for user interaction through a seamless spatial data model based on country’s administrative forum”, a programme has been initiated to convert the existing digital electronic archives into LIS reality through seamless spatial Datasets. The steps followed to approach the seamless LIS for a respective DSD is illustrated in Figure-2.



**Figure-2. LIS Conversion - Digital Archives to LIS GeoDB**

## 3. Admin-LIS

Field survey data collected by the SD has an utmost legal authority so that the Surveyor General is responsible for their respective adjudication. Hence, the conventional survey records; field books and originals of hard copy plans are archived in respective district offices in secure manner. In digital environment, similar responsibility should be maintained in the Survey Department offices while a greater attention should be paid on data duplication and unauthorized alterations.

Furthermore, in the process of modeling the land parcel data, there are many specific regulations carried out to maintain the spatial data accuracy and consistency in which, general customers and the external organizations are not merely interested. Such a datasets should be properly maintained and updated by the SD within the organization. The Admin-LIS should mainly be consisted with following spatial entities and consistencies with relevant attribute information to explicitly describe, manipulate and updating of dataset in any location.

- Should be a seamless set of parcel data in a specific domain area of DSD.
- History records should be maintained as dead parcels with status date.
- Specific spatial entity (Polygon, Boundary and Nodes) related to attribute information should be maintained.

Table-1. Specific Feature Classes of Admin-LIS

Parcel	Feature Class	Entity Type
Live Parcel	Land Parcel	Polygon
	Parcel Boundary	Line
	Parcel Node	Point
Dead Parcel	Land Parcel	Polygon
	Parcel Boundary	Line
	Parcel Node	Point

In addition to the main feature classes and associated feature classes in the Table-1, Admin, Transport and Building feature classes are maintained as the supportive data layers. A spatial dataset view of Admin-LIS of Moratuwa DS division is illustrated in Figure-3.

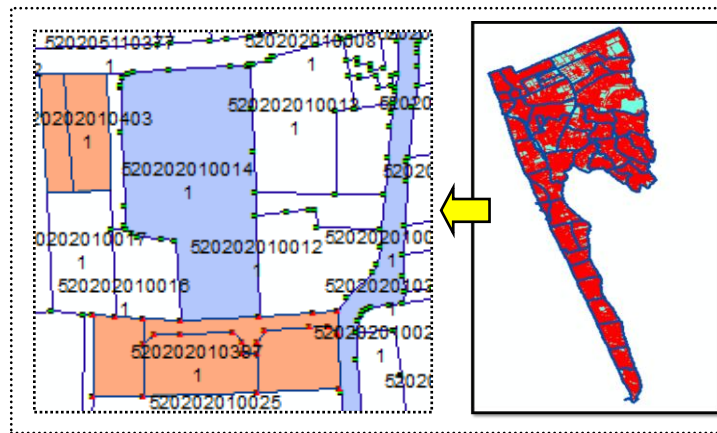


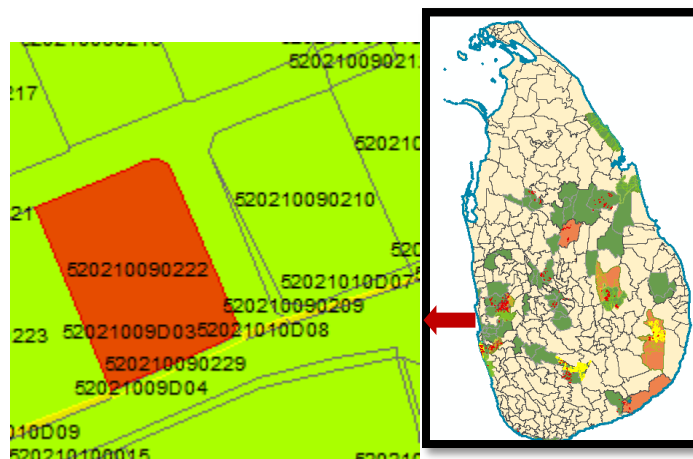
Figure-3. Spatial Dataset view of Admin-LIS of Moratuwa DSD

#### 4. Corporate LIS

As detailed under Admin-LIS, since the general customers and external organizations are interested in corporation with the LIS for their individual or organizational needs and interaction with their own data for elaborating towards value added products, there should be a simple and consistent dataset for collaborative interaction.

An up-to-date dataset which provides land parcels as closed polygon entities with relation to parcel information and privilege to interact with external users is considered as Corporate-LIS, which is explicitly a subset of Admin-LIS.

Gaining the reality of sustainable Corporate-LIS would not merely be SD's individual effort. However, the land parcel as the key object with its inherited attributes becomes the initiative and crucial beginning for Corporate-LIS. A quick look of spatial components of the Corporate-LIS is illustrated in Figure-4.



**Figure-4. Spatial Dataset view of Corporate-LIS of Sri Lanka**

#### 5. Concluding Remarks

The LIS as a total solution for the country's land administration has to be thorough for stakeholders' requirements. While the SD being a key organization for a corporate-LIS, who provides the system with spatial component of the LIS with parcel inherited attributes, collaboration of the external organizations is crucial for a sustainable system performance. Therefore, information & communication technology (ICT) as an essential component of a system has to be magically performed in all the activities of the LIS. However, while the SD faced a critical drawback in ICT applications since last two decades, the improvement of the LIS can be stated as a greater achievement for land administration of the country.



Hence, in the development process of the LIS, the main risk factor, which affects towards the system drawback, can be studied as the TLDB. This can be positively managed as discussed in the following paragraphs.

LIS, as an information provider should possess numerous entities related with non-spatial attributes to satisfy the system users. In the prevailing context, TLDB; the main info provider to LIS from field survey stage, has been developed aiming to archive the conventional Tenement List electronically. It has been resulted towards an ambiguous situation in LIS data analyzing and manipulation. Therefore sharing of parcel related information among client organizations may be affected with critical drawback in inconsistency of non-spatial information.

Hence, Tenement information related to each land parcel should be re-classified in order to elaborate an effective LIS and the paper prints (TL pages) may have to be redesigned to incorporate the respective information.

However, within improved LIS, land parcel as the main object of the system should be interactively related to its descriptive information so that a mechanism should be developed to update the system simultaneously at the stage of creating the parcel entity. TLDB approach may not sustain the long term LIS requirements and a complete solution has to be developed as an alternative mechanism.

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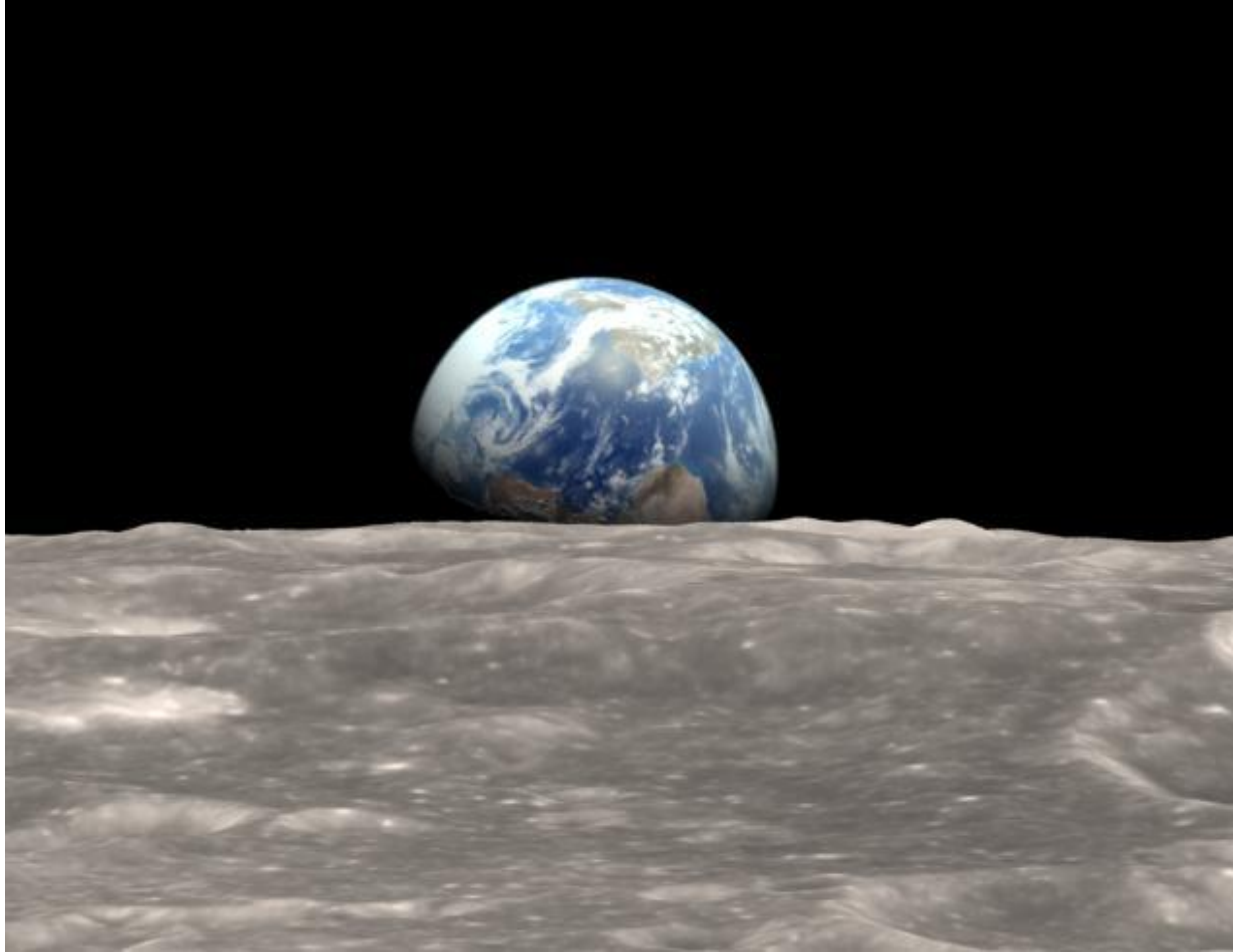
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## Earthrise Revisited



On December 24, 1968, Apollo 8 astronauts Frank Borman, James Lovell, and William Anders were coming around from the far side of the Moon on their fourth orbit. Borman began to roll the spacecraft, and as he did, the Earth rose into view over the Moon's limb. Anders, photographing the Moon from the right side window, caught sight of the view, and exclaimed: "Oh my God, look at that picture over there! There's the Earth coming' up. Wow, is that pretty!"

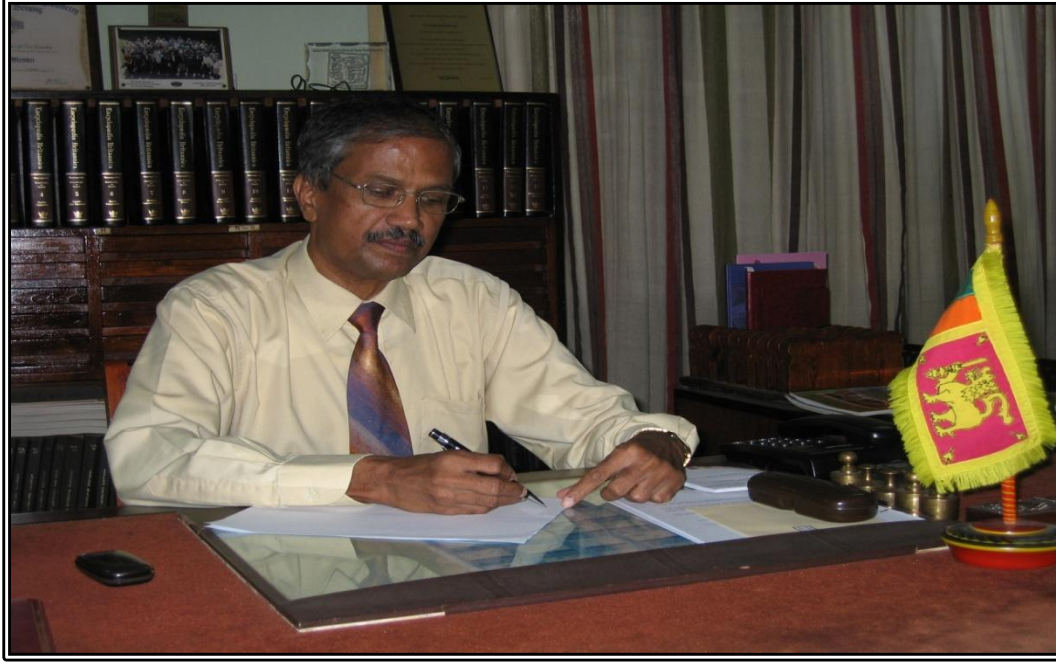
Anders put color film in the camera and took the iconic color photographs of a half Earth hanging over the lunar horizon.

## Pictures of Special Activities in Survey Department

1.0 Dr. K. Thavalingam assumed duties as the Surveyor General on 25<sup>th</sup> July 2013. He is the 45<sup>th</sup> Surveyor General in the Survey Department of the Democratic Socialist Republic of Sri Lanka. Following photographs will recall the memory of that remarkable occasion.







2.0 Deyatakirula programme gives the Survey Department a very big opportunity to educate ordiance about its products and the roll in the country's development activities. Following photos recall the memory of being attending to Deyatakirula 2013 Exhibition.

Deyatakirula 2013 Site Inspection at Hardy Technical Collage, Ampara



Visitors to Our Stall Try to Get 3D View of Terrain from Arial Photos



Display of Field Survey Instruments





3.0 Under the JAICA project Maps of whole of northern area was prepared. During that time beside the official work responsible, a workshop was organized to make the government officers working in Jaffna aware about how the Maps can be effectively used to gather information for day to day work. Though it is not official, making the users understandable about department's products indirectly help the department in many ways. Following photos will recall the memory of that event.

Answer to a Question of a Participant During the Lecture



Curious about Huge Information in Maps



4.0 Officers in the Survey Department are busy with their day to day activities. But there are officers volunteered to work on areas and produce some output of which they think important for others to carry out their work effectively in the department. Mr. G.M. Abeysekara, a Senior Superintendent of Surveys, is a one of them. He has worked in Document Management and Professional Standards Branch for a long period and was about to quite from the branch on his next routine transfer. Therefore he has thought to write a book to share his knowledge gathered over the years at the branch with others. His tireless effort came to a success on 2013.06.15 as he was able to print the book called “ මිනිස්පෝරු දෙපාර්තමේන්තුවේ ආරම්භයේ සිට පිඹුරුවල විකාශනය”

Mr. G.M. Abeysekara presents his book to the Surveyor General at the Supervising Officers Conference -2013, held at Department Auditorium



Part of the Gathering of the Supervising Officers Conference 2013





5.0 Institute and Surveying and Mapping held convocation at BMICH in 2013. Following photos recall the memory of that occasion.





6.0 New office buildings were opened during the year in Gampaha, Kilinochchi and Mannar. Following photos are from the opening ceremony of the building extension of District Survey Office Gampaha.

