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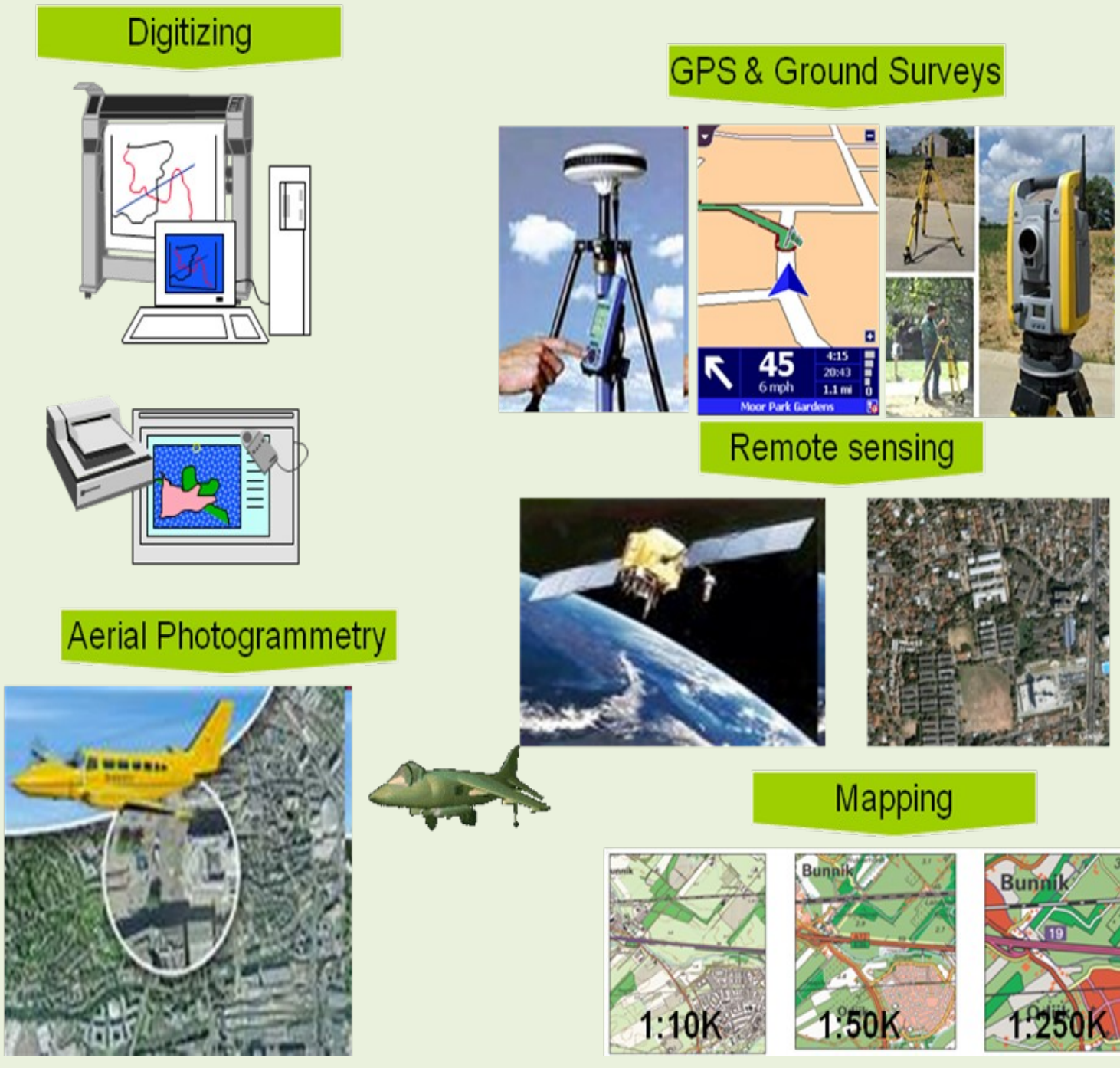
நில அளவைச் சஞ்சிகை

SURVEY JOURNAL

THE ANNUAL PUBLICATION OF THE SURVEY DEPARTMENT OF SRI LANKA MAY 2011 ISSUE 79



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ISSUE 79

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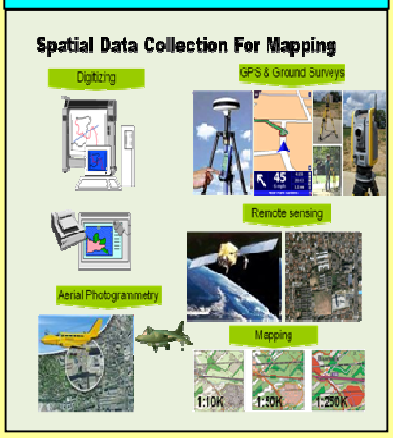
THE FRONT COVER



Survey Department is the National Mapping Agency in Sri Lanka and it is responsible for supplying Base Data.

Survey Department has Spatial data to cover whole country in 1:50,000 scale. There are several methods to spatial data collection such as digitizing existing maps, Ground Survey methods & GPS Surveys, Aerial Photogrammetry and Remote Sensing.

The front cover shows that spatial data collection methods.

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EDITOR

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Continuous Professional Development (CPD)

By
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1.0 What CPD does for you?

- Do you want to make more profit?
- Do you want to improve your productivity?
- Do you want to attract more or better customers?
- Do you want a better safety record?
- Do you want better career prospects?

Whatever goals you want to achieve CPD can help

2.0 What is CPD?

Continuous Professional Development (CPD) is the systematic maintenance, improvement and broadening of knowledge and skills, together with the development of personal qualities, necessary for the execution of professional and technical duties throughout a practitioner's working life.
The objectives of CPD are related to improving work related performance, enhancing career prospects, increasing the capacity for learning, encouraging participation and commitment to lifelong learning and being adaptable to, and prepared for, changes in industry.
CPD is an essential element in any profession. Failure to keep up-to-date with advances in discipline, technology and changes in legislation could have significant repercussions for an individual practitioner, a company and a professional organization.
It is therefore important that a profession is seen to be taking the lead in ensuring all its practitioners constantly updating their skills and knowledge in line with industry requirements.

3.0 Surveying Profession

The advances in the field of computers, digital and communication technologies have changed the way most professions are practiced including surveying. In the field of surveying the advent of Geographic Information System and Satellite Positioning Systems have revolutionized the practice of the profession particularly in the areas of data acquisition, data processing, data analysis, data management and storage. These developments have direct consequence on the law, ethics, practice and boundary of the profession.

Unfortunately, many licensed surveyors lack the interest to venture into these emerging areas. Many are generally conservative and so do not respond fast to changing situations. They have become largely out – dated.

3.1 Technological Development and change in Surveying Practice

Surveying practices have been particularly affected by technological developments during the past 60 years. In the 1950's, 60's, and 70's, technological developments contributed to significant changes in the surveying profession.

During the early 1950's, the electronic computer became a practical tool for numerical calculations. During the 50's and 60's, photogrammetric mapping evolved as the standard mapping tool for large engineering projects. The Transit Doppler satellite surveying system became operational in 1964 and was declassified for civilian use in 1967. The hand - held scientific calculator became commercially available in the early 1970's. Next the calculator became programmable and then a data collector. The electronic distance meter (EDM) became the instrument of choice for many surveyors during the 1970's. The first GPS satellite was launched in February 1978, over 30 years ago. This rate of change has accelerated even more during the 1980's and 1990's with developments in the Personal Computer (PC). The arrival of three new technologies. namely, the Global Positioning System (GPS), Geographic Information System (GIS) and the World Wide Web (WWW), have revolutionized professional practices, including surveying.

Conventional techniques and instruments have been transformed from analogue to digital and this has increased productivity. With modern equipment, collection of spatial data (surveying measurements) is less intensive now than it was about few decades ago. In addition to the conventional methods of data collection, spatial data are now collected using tools such as global positioning systems (GPS), satellite imagery, and total - station instruments.

4.0 The Growth and Development of the Surveying Profession in Sri Lanka

The growth and development of the surveying profession in Sri Lanka could be viewed from two perspectives. These are educational development and professional development.

4.1 Educational Development

1796 - The British occupation of Sri Lanka
1800 - Survey Department was established
1896 - The first surveying training class was started
1908 - Surveying course was offered at Ceylon Technical College, Colombo, a short practical training was given in Survey Department.
1910 - Entire Survey Education was taken over by Survey Department.
1912 - Survey Department started survey training school at Mutuwal
1924 - Survey training was shifted to Diyatalawa.
1967 - The training institute was upgraded to award diplomas and named as Institute of Surveying and Mapping (ISM)

The functions of the Institute (ISM) are :-

- to provide instruction in surveying, levelling and mapping;
- to hold examinations for the purpose of ascertaining the persons who have acquired proficiency in surveying, levelling and mapping;
- to grant diplomas to persons who have pursued approved courses of study in the Institute and who have passed the examinations of the Institute.
  In 1990, Institute of Surveying and Mapping was upgraded to award the Degree in Surveying Sciences
- The Degree course has been designed so as to provide knowledge on Photogrammetry; Remote Sensing, Hydrography; GIS; LIS and Cartography. It incorporates subjects such as land law, land valuation, environment studies, which makes it suitable for Land Administration field.

- **Higher Diploma Course (HDC) in Surveying at ISM**

Objective of the course

Understanding of the basic principles of advanced surveying techniques coupled with reasonable knowledge of Mathematics, Computer Science and other related fields.

The present Higher Diploma Course (HDC) curriculum is more or less equivalent to the curriculum of the M.Sc. degree in American universities. And somewhere between B.Sc and M.Sc. degrees in Canadian Universities (e.g. University of New Brunswick) and Australian universities (e.g. University of New South Wales).

- **ISM conducts some Diploma courses related to surveying field for other services in Survey Department.**

Those are; Diploma of

(i) Cartographic Technician
(ii) Remote Sensing Technician
(iii) Photogrammetric Technician
(iv) Aerial Photographer and Laboratory Technician

Objective of the Course:-

To cater to the needs of the Survey Department in the training of it's Cartographic, Remote Sensing, Photogrammetric , Aerial Photographer and Laboratory Technicians.

- **Degree course in Surveying Sciences at Sabaragamuwa University of Sri Lanka (SUSL).**

Sabaragamuwa University established in 1995 introduced a degree programme in Surveying Sciences in 1997. This is the first time in the history of Universities in Sri Lanka that offered a degree course in Surveying Sciences.

- **Faculty of Geomatics in SUSL**

The degree programme in Surveying Sciences is a four-year study program available to students in the physical science stream, who have the required qualifications to enter a University in Sri Lanka.

The Faculty of Geomatics will offer specialization in Surveying & Geodetic Sciences, Photogrammetry, Remote Sensing & GIS and Cartography & Mapping. Faculty of Geomantic consists of two Departments namely Department of Surveying and Geodesy, and the Department of Cartography, Photogrammetry, Remote Sensing and GIS.

- **MSc Courses in Surveying Sciences**

Post Graduate institutes of Sri Lanka Universities have introduced MSc programmes (related to GIS) in their universities now.

- **Short courses at ISM**

Presently, ISM organizes several short courses for departmental surveyors to update / enhance the theoretical background of modern technology. However this type (systematic) training for Licensed (Private) Surveyors is still lacking in this country. Most of the Licensed Surveyors are still using the traditional surveying and mapping technologies.

- **Short courses at The Surveyors' Institute of Sri Lanka.**
  On request of Licensed Surveyors, several workshops. Were organised to provide background and use of Total Stations and GPS technology by the Surveyors' Institute of Sri Lanka. The result is very satisfactory.

4.2 Professional development.

- **The short courses should aim the following**
  - Bringing together professionals from different parts and operational organisation involved in modern surveying technology and encouraging them to exchange their experience in modern surveying technology.
  - Updating the practical skills of professionals in operating software and producing high-quality output.
  - Achieving a more efficient and effective use of these equipment in practice.
  - Training module on planning, management and financial management for private surveyors

- **Management skills versus specialist skills.**
  The development of new push button technologies has voiced the need for including the core discipline of management as a basic element in today's surveying profession. Traditional specialist skills are no longer sufficient or adequate to serve the client base. Almost any individual can press buttons to create survey information and process this information in automated systems. The skill of the future lies in the interpretation of the data and in their management so as to meet the needs of customers, institutions and communities. Therefore, management skills will be a key demand in the future surveying world.

- **Project-organized education versus subject-based education**
  An alternative to traditional subject-based education is found in the project organized model where traditional taught courses assisted by actual practice are replaced by project work assisted by courses.
  The aim of the project work is "learning by doing" or "action learning". The project work is problem based.
  In general the focus of university education should be more on "learning to learn".
  The traditional subject-based approach focus on acquisition of professional and technical skills **(knowing how).** This approach should be modified by giving increased attention to managerial skills and to the process of problem-solving on a scientific basis **(knowing why).**

- **Virtual academy versus classroom lecture courses**
  - The traditional classroom lecturing should be supported by or even replaced by virtual media.
  - The use of distance learning and the www tends to be integrated tools for course delivery, which may lead to the establishment of the "virtual classroom" even at a global level.

- **Lifelong learning versus vocational training**
  - There was a time, when one qualified for life, once and for all.
  - Today we must qualify constantly just to keep up. Consequently, the concept of lifelong learning or continuing professional development (CPD) has gained increasing attention.

5.0 Obtaining an Annual Practicing License

According to regulations made by the Ministry of Lands under section 65 of the Survey act no. 17 of 2002, Section 41 of that Act reads as 'every Registered Surveyor who is desirous of obtaining an annual practicing license shall be required to satisfy the council of having followed **at least one course of study and training program in land related fields and surveying related fields'**. That is, every licensee should meet the continuing professional development (CPD) requirements as a condition for license renewal.

The primary purpose of licensing for professional land surveyors is to protect the public from unqualified or unethical practitioners. The requirement for CPD is also intended to protect the public by reinforcing the need for lifelong learning in order to update oneself with changing technology, equipment, procedures, processes tools and established standards.

5.0 CPD Plan

We should not interpret CPD too narrowly and restrict our self to the conventional training methods. Be sure to think about the resources available to us, as this will affect our choice of development activities. Training is both costly and time consuming. A CPD Plan should not be a request for unlimited training.

CPD activities may be **structured**, for example:

- In house courses and workshops.
- External courses and workshops.
- Vocational courses and workshops.
- Seminars and conferences.
- Distance and open learning qualifications.
- Preparation of lectures for organized events.
- Service on committees and technical panels.

CPD activities may be **unstructured**, for example:

- On the job research.
- Experience of new and extended technologies.
- Reading books, journals, professional magazines, technical papers and periodicals.
- Browsing relevant industry websites and participating in e-learning activities and research.
- Experience in the workplace, leading to a significant expansion of our knowledge base.
- Attendance of national and regional Institution events.
- Guest speaking at a national or regional Institution conference or seminar.
- Attendance of an Institution training course or workshop.
- Knowledge exchange with colleagues.
- Action learning / learning by doing

Professionals who are in any locations where structured CPD opportunities appear to be difficult to access can consider to take advantage of the wide range of unstructured CPD activities that are available to assist their professional development.

A person who learnt yesterday - not practicing today – will be uneducated tomorrow.

FLASH BACK OF SURVEY JOURNALS (Continuation……)

By Dr. K.Thavalingam, Additional Surveyor General
&
M.T.M. Rafeek, Supdt. of Surveys

Quarterly News Letters from 1 to 15 were summarized in the article written by us in Survey Journal No. 78. This paper covers the flash backs from Quarterly News Letters from 16 to 22. As we said in our earlier article, the publication of Survey Journal has been launched with the principal object of keeping the Field staff of the department, and more particularly those officers stationed in remote parts of the Island, to acquaint departmental activities and to serve as a medium for recording the results of their activities. The first issue of Surveyor Journal was published in April 1948, after independence, titled as Quarterly News Letter. We continue to write this paper to make aware to new officers in the department as regards the good old days reminiscences and some interesting experiences.

The Quarterly News Letter No. 16 was published in March 1952 which covered the two quarters ending December 1951 and March 1952, by order of Mr. G.B. King, then Surveyor General of Ceylon. In this issue a deep and sincere regret has been recorded for the death of former Prime Minister Hon. D.S. Senanayake and this record read as follows; 'We have to record with deep and sincere regret the death of the Rt. Hon. D.S. Senanayake, under whom it has been our privilege to serve for many years. Between the day when he first entered the Surveyor General's office as a temporary member of our staff and that on which he last set foot in it, as Prime Minister…….. He expected much of us, and we have striven to march in step with a grate man. In the large Colonization Schemes which he pioneered it has fallen to our lot to lend eyes to his imagination, for there can be no plan without a map, and in the Land Development Ordinance, with which we are constantly engaged, he was one of those responsible for laying down the pattern of a new era in Ceylon.'

Another memorandum written by J.R. Sinnathamby, Superintended of Surveys about **Major Skinner** one of our past Surveyor Generals referred to, worked in Ceylon from 1817 to 1867. He held practically every important post in the Island during this period of 50 years. The various offices held by him are to give them in their modern equivalents, Quarter Master General, Director of Public Works, Surveyor General, and Government Agent. Though he held all the highest offices in the Island, his greatest service to the country was rendered in humbler capacity as road tracer and surveyor. He was directly responsible for the tracing and building of several hundred miles of roads and the triangulation of that part of Ceylon commencing on the mountain ranges of Adams' Peak and sweeping across to the east towards Batticaloa and Hambantota. He arrived at Trincomalee in 1817 at the age of 14 as his father had already served for some years in Ceylon and was stationed at Trincomalee. Major Skinner was first employed in the Army, joined at the age of 15 and in the year 1867 he finally retired from Ceylon.

The Quarterly News Letter No. 17 was published in July 1952, by order of Mr. G.B. King, Surveyor General of Ceylon. Those days field staff have had many encounters with wild animals, and particularly bears. In this issue also one of the most unfortunate incidents was mentioned which was occurred on 29th of October 1951, when Head Labourer Mr. K.T.E. Perera was mauled by a she-bear with cubs. Mr. Perera was head labourer of a gang of labourers working under Mr.K.K.Ambrose. who had instructed the gang to clear along a grid line near Tikkampotana Village in the Northern Division until they reached a foot – path. Whilst clearing, the gang heard sounds resembling human voices and concluded that the foot – path was close by. The head labourer, Mr.K.T.E.Perera went ahead, creeping through the jungle to align and give a direction for clearing up to the path. He had proceeded thus about a hundred feet and was out of sight of the rest

of the gang when suddenly they heard his cries for help. The rest of the gang then rushed to the spot and saw a she – bear and two cubs running away from the Head labourer who was on the ground injured. He was badly mauled, particularly above the neck and he was covered in blood. He was carried to Tikkampotane village from where he was taken to Kahatagasdigiliya Hospital. Mr. Perera was treated at the general hospital, Colombo, and at the Eye Hospital, but we regret to record that in spite of every endeavour he lost his sight. In addition to the award made to him under the workmen's compensation ordinance on account of his permanent disablement, the welfare officer made an appeal on his behalf and received voluntary subscriptions. The amount subscribed by the staff of the department was presented to him after an expression of sympathy by the Surveyor General, in the Reading Room, Head office, in the presence of a large number of the staff.

Another incident reported by Mr. Bertram Rulach, Govt. Surveyor that, Surveyor Mr. T.B. Tennakoon, who was engaged on Engineering Surveys at Dambulla in connection with the restoration of the Kandalama Mahawewa, had an exciting day on May 28, when he encountered a herd of elephants. He was Surveying in the jungle when he found a herd of elephants, including a giant tusker, calmly walking across his survey line, between the back - pole man D.A.William and himself. He was at his theodolite at the time. Quite calmly he instructed his instrument man to take the theodolite to safety, while he and his labourers silently went in to hiding. The back – pole man however, found himself surrounded by elephants, and hastened up to a nearby tree. How he climbed the tree amazed the rest of the gang, because later it was found necessary to make a ladder to bring him down. He is said to have removed his sarong and tied himself to the tree to ensure further his safety till the herd moved into the jungle.

News Letter No. 18 was published in October 1953, by order of Mr. G.B. King, Surveyor General of Ceylon. Since this issue name of the journal was changed as ***News Letter*** and started publishing it yearly instead of quarterly publications. In this issue also there was a regrettable record here the tragic death of a survey labourer, Mr. M. Juwanis Perera. He was one of the parties of survey labourers stationed 22 miles from Polonnaruwa clearing a tertiary traverse along Periya Aru north of Sungawila in an area which has became one of the last refuges of wild elephants, that was chased out of their usual haunts by the land development programme. The late Mr.Juwanis Perea, along with nine other labourers proceeded to work on July 11,1953, at about 7AM. When they had walked about 3 ½ miles from their camp in single file along 'lines' cleared for the purpose of survey, a solitary elephant, apparently a 'rogue' was waiting at a bend hidden behind a big tree. Mr. Juwanis Perera happened to be the last man in the file. The elephant started chasing the man as soon as the last man had passed it. The other labourers fled for safety but unfortunately the elephant pursued this particular labourer for a distance of about 100 yards and trampled him to death. The other labourers who found themselves on trees when the attack took place could not get down for some time as the monster was in close proximity. His death must have been instantaneous. His head was badly smashed. The foot print of the animal on the man's chest was quite clear. After some time the labourers came down from their perches on trees. Four of them returned to Polonnaruwa to report the incident to Mr. C.Vanniasingham, Assistant Superintendent of Surveys, in charge of the party. The five remaining labourers, who remained behind guarding the body were found on trees even when Mr.Vanniasingham and the surveyor, Mr. M.R.Seneviratne, arrived on the scene at 6 PM, after wading through 3 streams waist deep in water. It appears that the elephant had come back twice to the spot where the man lay dead. It was 10 PM when the body was brought to Mr. Seneviratne's camp. A coffin was purchased at Polnnaruwa and brought to the camp by the Assistant Superintendent in a hiring car. The next morning after the inquest the body was removed by a brother of the deceased to Gampaha.

Another sad incident was also reported in this issue that, Mr M.A. Piyadasa, a survey labourer of Mr. L.W.D.Silva, Government Surveyor, working in a remote area of the Gal Oya valley had the misfortune of having been attacked by a bear, while returning to the camp after work on May 11,

1953. It appears that Mr.Piyadasa was leading two other labourers who were walking along a cleared passage cut through the thick jungle (for purposes of survey) when a bear suddenly rushed at him from the wall of the under growth on a side and knocked him down. He was bitten on the back of his left thigh and on the left side of his head. The other two labourers acted commendably in attacking the bear with their catties and scaring away. Mr.Piyadasa was removed to Inginiyagala Hospital where he was admitted and his injuries attended to.

News Letter No. 19 was published in July 1954, by order of Mr. G.B. King, Surveyor General of Ceylon. One noticeable news was that one Survey Instructor Mr. Shri S. Vaikuntanathan came from India to Diyatalawa on 6th October 1953 and was engaged in assisting in the supervision of survey students in the training school and also prepared lecture notes on Plane Tabling and Air Surveys. Besides supervising he was engaged in, the construction of Template Assembly and giving lectures to the students and surveyors in recess on Air Surveys.

Most of the young surveyors who joined the department do not know about the famous Boer Cemetery which is closed to ISM. There was an article published on this issue regarding the cemetery and that article is given here. During the Boer war the question of a suitable locality for the internment of the Boer prisoners arose, and the (then) Governor of Ceylon Sir West Ridgeway, Supplied the answer. Diyatalawa was linked to South Africa – the cold, dry air, the distant Blue Mountains, and the rolling patnas (veldt). So 5,000 Boers found themselves interested at Diyatalawa for a period of two years. Their dead bodies were buried in a special enclosure, and the Boer Cemetery was born. There are 140 names on the great stone monument, which stands in the cemetery. This was erected by the government of South Africa in 1913. Seven of the 140 graves are unmarked, and some of the marked graves bear names such as de Gong, de Bruin, van Rooyen Laurens, and Steyn – names which bear a special interest to Ceylon. The youngest in the roll of the dead is DOUW VAN DER WALT of Bloemfontein, aged 16 years. The oldest in the roll, died at 144 years, twice outliving the psalmist's span of life. He is W.J.R. BRETZ also of Bloemfontein, and his death was the last recorded, with dated December 17, 1902. There is much behind those simple inscriptions on some of those plain wooden crosses. An epidemic of enteric broke out in December, 1900. Six Bores died on the 23rd and five on the 24th. Public opinion was stirred, and Sir West Ridgeway took prompt action. It was Dr.T.F.Garvin, reputed to be the ablest physician in Government Service at that time who brought the epidemic under control. Still there are some evidences of this cemetery are remains at Diyatalawa.

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First time in the history of News letter two poems were included in Sinhala Language and one of the poems is given above which was written by Mr. N.D. De Costa which give some his impression while surveying along a stream in Kandapahala Korale in Central Province.

News Letter No. 20 was published in February 1955, by order of Mr. N.S. Perera, Surveyor General of Ceylon and edited by Mr. S.Karthigesu, Superintendent of Surveys. This is the first news letter published under first Ceylonese Surveyor General Mr. N.S. Perera. Those days surveyors and their labourers worked in jungles and often they have to spent the whole day in the jungle one incident published that a survey labourer got lost in the Kantalai jungles while doing surveying and had to spent a whole night up on a tree to which he strapped himself with his sarong. He was kept awake during the early hours of the morning by the ominous growling of a leopard which he later found at the foot of the tree. Somehow he was able to scare away the brute with his shouts and twigs from the tree. Descending the tree, he wandered off again and by some pure luck stumbled into another surveyor's camp thoroughly exhausted, scared, but with tears of joy at having reached safety.

In this publication, some of the place names in Matale District were described and given below.

Imbulandanda. – When king Senerat divided up the kingdom, he gave Matale to Prince Vijaya Pala who proceeded to build his place at Godapola. The villagers were ordered to supply the doors. The planks were painted with Imbul gum. The prince was so please with this that he called the village by this name.

Kawadupelella. – Called after a Vedda named MAHA KAWUDA during the reign of king Vijayapala.

Akuranboda. - Was founded by a Bandara from Arakan, who was afterwards killed by King Raja singa and village confiscated.

Kotanapola. – Paddy was pounded here for the Akuranboda Bandara.

Beliyakanda. – Doliyakanda – "palanquin hill "A king's palanquin is said to have been left on this hill. (Those who have climbed and know Beliyakanda will doubt this derivation)

Embulamby. – "Sour mango" – a very large one is said to have been given by Heart Abesekara Mudiyanse to King Valagam Bahu who gave it this name.

Kibissa. – was dedicated to the armpits of the Buddha image in the Raja Maha Vihara of the Dambulla Rock Temple.

Wariyapola. – Founded by Rantilaka Arachchila and Rajapaksa Arachchila. Hence it was named so because of their joint efforts.

Waduressa. – This is the name of a thorn probably common there.

Homapola. – "Place of burial". One Sonnuttara Terunnanse is said to have been buried here.

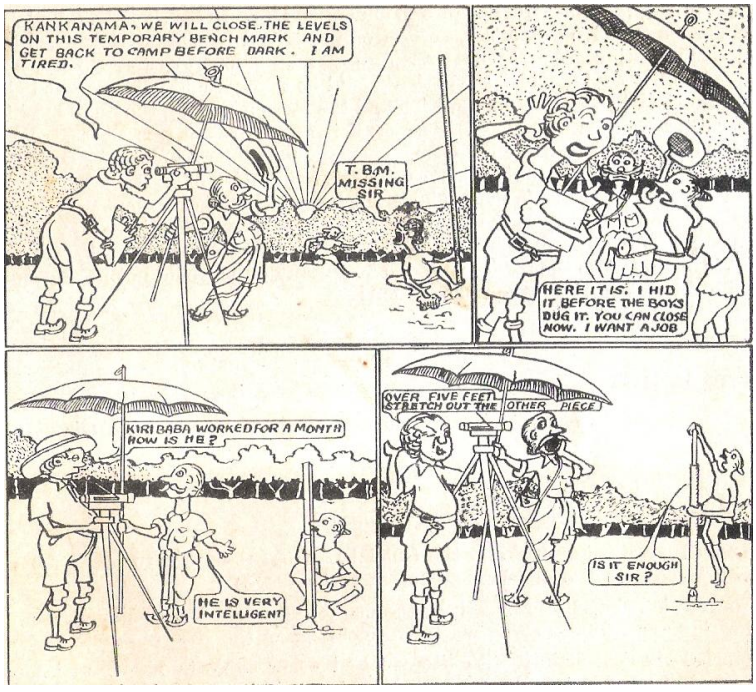
News Letter No. 21 was published in August 1955, by order of Mr. N.S. Perera, Surveyor General of Ceylon and edited by Mr. S.Karthigesu, Superintendent of Surveys. To this issue Mr. Bertram Rulach, Govt. Surveyor described his experience how he escaped from Elephants while engaged in surveying and this story read as follows. I had a close encounter with an elephant recently. I was surveying in the Inamalawa Forest Reserve when a lone elephant appeared as if from nowhere. it had moved so silently to within fifty feet of the instrument station that we were taken completely by surprise. But this surprise was short lived. Everyone was shouting; the labourers scattered; I was at my instrument and beside me was the shikari, frozen into immobility through fright, I presume. I

had a feeling that the elephant was almost on me; visions from the past moved in my mind's eye like a kaleidoscope, like a drawing person is said to experience. I was jolted out if these thoughts by an explosion. I had grabbed my shikari's gun and fired a shot in the air ; purely a matter of reflexes, I thing. The sudden sound stopped the elephant in its tracks and the next moment it had turned tail and fled in to the jungle.

Another incident was reported by a young surveyor V. Subramaiam, Govt. Surveyor in his first year of service and at first station in the jungle areas of the Island. On 21st of March 1955, after the morning's work in the field he was returning at about 1 p.m to his camp in the neighbourhood of Vammiadikulam off Akkaraipattu. He had apparently not so far met any of the wild denizens of the forest and was walking merrily away humming a pleasant tune to keep him company. Two of his labourers were with him walking in single file – one ahead and the other behind him, while four more were following at some distance away. The three had just dodged a live rock on their path and were skirting round it, when suddenly they came face to face with a she–bear and her cub. One of other labourers who had a catty in hand advanced to attack the bear calling out at the same time for the other labourers to come to the rescue. But before he could do anything the bear attacked Mr. Subramaniyam with a terrific roar. Mr. Subramaniyam turned away from the bear to protect his eyes, and the bear caught him on the right thigh. He gave a blow to the bear with his right hand and fell face downwards. The labourer meanwhile rained blows on the bear with his katty with all his might, forcing the creature to release his hold of Mr. Subramaniyam's thigh. The bear then got on to his shoulders. As the labourer with great courage dealt further blows on the bear, it jumped off Mr. Subramaniyam and bolted into the jungle. All these happened within a few minutes. Only after all the labourers came up and surrounded Mr. Subramaniyam that he stood up to notice for the first time a big wound on his right thigh. As he was unfit to walk, the labourers carried him to his camp half a mile away and from there to Sagamam, a distance of 8 miles as no conveyance was available then. From Sagamam he was despatched to the Kalmunai hospital which he reached at 7 p.m and he recovered from his wounds.

Mr. V.Subramaniam was my (Thavalingam) Supdt. Of Surveys, when I worked in Trincomalee as Asst.S.S. He told this story to me. After this incident he was nicknamed as "Karadhi Subba". In Tamil 'Karadhi' means bear.

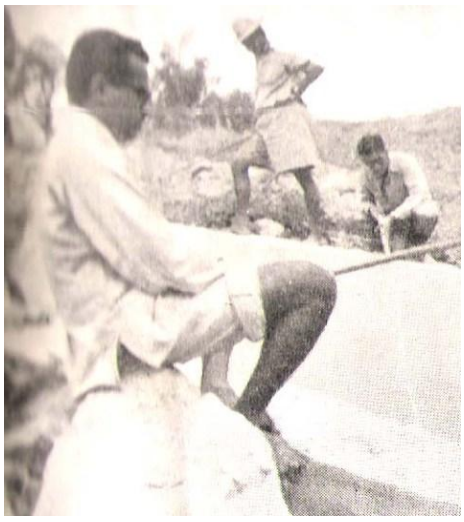
First time in the history of News letter in this issue a cartoon was published under the caption of "Out in the field" by Mr. N.D. De Costa and that cartoon is shown below.



News Letter No. 22 was published in February 1956, by order of Mr. N.S. Perera, Surveyor General of Ceylon and edited by Mr. S.Karthigesu, Superintendent of Surveys. One of the inetersting news in the issue was North East Monsoon Recess which was held at Dambulla. Owing to lack of sufficient accommodation at the survey camp, Diyatalawa, several parties of surveyors had to recess elsewhere. Parties recessed at Kandy, Kurunagala, Anuradhapura, Kundasale, Dambulla, and Colombo. A few snaps sent in By Mr.D.B.Rulach, Government Surveyor, which are published below give an insight of how off duty hours were spent by survey parties in distant Dambulla.

Fancy dress party at Dambulla.

A sing song in progress during a typical survey "tamasha" in the field.



Fishing is the chief recreation of the Block Survey Party recessing at Kandalama, Dambulla. Here three surveyors namely Mr. A.B.Weerasekara, P.Kapugeekiyana and Cecil Doolwela are angling in the Kandalama Maha Wewa.

Four "Survey Wives" in the field get together for a quiet game of carom.

(Rest of the interesting flash back will be continued in the next journal)

Half a Century of Surveying (1961-2011)

By
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(This Paper has been originally presented on the Technical Session of 'Surveying and Mapping Challenges of the Future 2011' on 14th January 2011)

My surveying career began in 1961 when I joined the Ceylon Survey Department as Probationary Assistant Superintendent of Surveys. It is the dawn of 2011, exactly fifty years later, and I am invited by the Surveyor General to be a key note speaker at the 210th Anniversary of the Sri Lankan Survey Department. I am hugely honored by your invitation.

I have lived long enough to see so many developments in Surveying. In the last 50yrs the Surveying profession has undergone many sea changes from:

- -Plane Table Surveying to Digital Photogrammetry
- Geodetic Surveying to Global Positioning Satellite (GPS) Surveying
- Cartography to Digital Mapping
- Land Surveying to a Geographic Information System (GIS)
- Architectural Surveying to Laser Scanning
- Photo Interpretation to Remote Sensing
- Gravimetric Survey to Geo-Potential Value (GPV)
- Stellar Navigation to GPS Navigation
- A Surveying Course in Civil Engineering to a PhD in Geomatic Engineering

The objective of this presentation is to describe these developments including my participation in them. It is an assessment of the past and present state of Surveying and speculates on what must lie ahead. It recommends a Research and Development program to promote GPV, GPS navigation and Surveying education

Plane Table Survey to Digital Photogrammetry

Most of the original mapping of Sri Lanka on a scale of 1" to one mile was done by surveyors using Plane Table Surveying technology. Not only were they skilled surveyors, but also skilled draughtsman, artists and explorers. In the 1960s, analogue photogrammetry replaced plane table surveying for topographic mapping. New expertise was needed in this transformation. Photogrammetric technicians were skilled stereo-plotter operators who could setup stereo models and draw contours skillfully. In those early days, photogrammetry needed ground controls, which were established using conventional surveying methods such as traversing, triangulation and trilateration.

With the advent of computer technology and advances in electronic technology, aircraft equipped with digital cameras, GPS and inertial navigation systems captured digital images. These digital images are loaded into PCs where the software enables one to view the images in 3D and create digital terrain models, ortho-photos and contours without any ground control.

I was introduced to Plane Table Surveying at Diyatalawa Training School, Sri Lanka in 1961 and to Multiplex Stereo Plotters at the Overseas Ordinance Survey, England in 1963.

I was most fortunate to have done a PhD in Photogrammetry, under Professor E.H. Thompson, a pioneer in analytical photogrammetry and inventor of the Thompson-Watts Stereo Plotter. I was also fortunate to have been the major professor for a number of Masters and PhD students whose research projects in digital photogrammetry were funded by state, federal and private agencies in the USA.

Geodetic Surveying to GPS Survey

I was introduced to Geodetic Surveying in 1963 by Professor J.E. Jackson of Cambridge University. Since then, I have worked with Rockwell International, IA DOT, and the National Geodetic Survey (NGS) on GPS projects. I also supervised the work of a number of students who did their thesis work on the development of GPS.

In 1961, control points for Plane Table Survey and Aerial Surveying were established by geodetic surveying and traversing using theodolite (transit) and tape (chain). In Geodetic Surveying, latitude and longitude of many primary stations were determined by Geodetic Astronomy using observations to stars, and base lines were established using invar tapes. In between primary stations and base lines, triangulation stations were established by triangulation using precise theodolites. Between triangulation stations control points were established by resection and traverse. In the 1960s, all the computations in surveying were done using mechanical calculators and log tables.

In 2011, the orbital paths of satellites are determined using the primary stations. Using signals from GPS satellites and the orbital paths, the GPS receiver determines the geocentric coordinates (x, y, z), which are then converted to latitude, longitude and ellipsoidal height. Using a base station receiver at a primary or triangulation station and a GPS receiver (rover) at a control point, the position of the control station can be determined to geodetic accuracy. A Total Station combining an Electronic Theodolite and an EDM (Electronic Distance Measuring instrument) located at a control station, is used to set or locate points to survey accuracy. All computations are done by the GPS receivers, hand held computers, office- based PCs and super-computers; the embedded software do all the computations rapidly and efficiently.

Cartography to Digital Mapping

In the 1960s, cartographic techniques and map projections were used to display data on maps. A surveyor knew not only the principles and applications of map projection but also how to use cartographic techniques to produce attractive and informative map for special applications.

By the turn of the century, in 2000, with the advent of computer technology these maps were scanned into digital maps either by raster or vector methods. Computer software is now used to convert the survey data into projection coordinates that are then included in digital maps. The digital maps can be rubber sheeted and displayed to cover the entire country or state. Also, these digital maps can be enlarged or reduced and a map required for a specific application displayed instantly. Furthermore, any hard copy of the map on any scale can be printed instantly.

In 1961, I was introduced to drafting at the Diyatalawa Survey Camp. In the academic year 1963-64 I was sent to Cambridge University to study map projections under Professor J.E. Jackson. By early 1980s, digital mapping had developed and my graduate students at Iowa State University were engaged in research projects concerning the development and use of digital maps. By 2011 the “Google Map” appeared. It can be used to access digital maps using Personnel Computer (PC), Cellular Phones etc. We have travelled a long way since 1960.

Land Surveying to GIS

In the 1960s, land surveyors determined the location of corners and boundaries of properties to draw cadastral survey maps showing the property ownership, property description etc. These were legal documents included in deeds describing lands bought and sold in the market. Licensed land surveyors produced these maps and filed the information as public records in a government agency, such as the Survey Department of Sri Lanka. They were integrated and published as cadastral survey maps of the city, state and the country. The procedure was time consuming and tedious.

By 1980, digital mapping technology had developed. Cadastral survey maps and other maps such as topographic maps were made available to the public as digital maps, mainly in raster form. The Geographic Information System (GIS) not only displays the map but also shows information of nodes, lines, and polygons of the digital maps. It is computer- software driven technology, which can create digital maps using the survey coordinates of the nodes, lines and polygons. The information on the nodes, lines and polygons are stored separately. Thus, upon request the information of any node, line or polygon can be displayed; and vice versa, given the information of any item on the map, the corresponding nodes, lines or polygon can also be displayed. Also, the GIS, facilitates the preparation of maps, reports, tables, navigation charts etc.

I was introduced to Cadastral Surveys (Block Survey, as it was called in Sri Lanka at that time) in 1962-63. I collected data for a village and produced a Cadastral Survey Map. In the 1980s, my graduate students at ISA worked on research projects on the development of GIS. They also helped to develop and maintain the GIS Center at Iowa State University, Ames, IA. USA

Architectural Surveying to Laser Scanning

In the 1960s terrestrial photogrammetry, short range photogrammetry, plane table survey, traverse, and radiation surveys were used in Architectural Survey work. Photographs and maps produced in these surveys were used in the preservation and restoration of an architectural site and monuments. These were labor intensive and time consuming methods.

In the 1990s, laser technology was developed and by 2010 it became fully operational. Essentially, laser pulses are sent out from a known location in known direction to the target. The return pulses are stored and analyzed by computer software. The software determines the three dimensional location and the reflected energy of the target. By scanning a number of targets on the object the software creates a three dimensional model of the object. Typically, these laser scanners are installed on a total station and the three dimensional models are formed on a PC. The three dimensional model can then be used to measure and identify data for restoration and preservation of the architectural site and monuments.

In the 1960s, I was introduced to Terrestrial Photogrammetry by Professor E.H. Thompson.
Professor Thompson used this technology in the architectural survey of a cathedral in England. In 2000, my graduate students were involved in a research project that used laser scanning methods to monitor the movement of a bridge with the objective of stabilizing it to ensure the safety of traffic.

Photo Interpretation to Remote Sensing

In the 1960s, photo interpretation methods were widely used in land use studies, geology, forestry etc. By observing the texture and tone of an image, human expertise identified objects in a photograph. This was a labor intensive exercise and the procedure was also subject to human error. By 1970, NASA of USA was using digital cameras from a satellite to photograph the earth and the

moon. These digital images consisted of pixels in which radiometric values of the detectors, which are sensitive to red, blue, green etc. portion of the light, are stored. These radiometric values are then used to display the true or false color images of the object.
With the advent of Remote Sensing technology, software was developed that uses the radiometric values to classify and identify objects. A proven success of this technology is weather forecasting, where images from geocentric satellites are used to identify the location and movement of clouds and predict weather on the basis of these observations. In 2010, remote sensing in conjunction with digital photogrammetry was widely used in land use studies, forestry, and geology.

I was introduced to photo interpretation in 1961 at the survey training school at Diyatalawa and shortly thereafter; by Professor Atkinson at University College, England. In his lectures Professor Atkinson was the first to suggest the Remote Sensing alternative to Photo Interpretation. In 1980s, I was invited to attend a few 2 week seminars on Remote Sensing sponsored by NASA for the faculty at various universities.

Gravimetric Survey to Geo-Potential Value (GPV)

In the 1960s, the principle of gravimetric geodesy was used to determine the shape of the earth. The gravity values obtained by absolute and relative measurements around the globe were used to develop the global gravity models. These gravity models are not only used to determine the shape of the earth, but also to predict the satellite orbital paths and the path of long range missiles.
Today, GPS gives the x, y, and z location on an earth centered geocentric coordinate system. These x, y, and z values are then used to determine the height above reference ellipsoid. These heights differ from the elevation above mean sea level (MSL) determined by survey level depending on the geoid undulation, N. The gravity model produced by gravity measurement is used to determine the geoid undulation. In 2011, new technology measures absolute and relative gravity in real time. These measurements can be electronically stored and transmitted. With the advent of GPS, height above the reference ellipsoid, h, and the geoid undulation, N, are used to determine the GPS mean sea elevation, H = h-N. (See fig.1) The GPS mean sea elevation varies with polar motion and other forces affecting the local potential. As a result, the GPS mean sea elevation measurements are not accurate for most engineering applications.

Recent developments in gravimeter instrumentation enable reliable determination of the variation in gravity on a mobile platform. The gravity, g, in combination with GPS can be used to give the Geo-Potential Value, GPV= Hg. For engineering applications, the difference in GPV, ΔGPV, can be used to determine the difference in mean sea elevation, $\Delta E = (\Delta GPV)/g$. Unlike mean sea level elevation determined by leveling, which is a time consuming leveling procedure for long lines, determining GPV by GPS and gravimeter can be done almost instantaneously at any time and at any location.

GPV can be used globally not only for large engineering projects covering a continent but also for predicting a Tsunami in Sri Lanka or ocean surge that may cause the destruction of the levy in New Orleans. The 1957 Geoid Undulation in Figure 3 below clearly shows that any abnormal change in GPV at a particular location, such as in west Indonesia and East Florida, will cause tidal waves at another location, such as Sri Lanka or New Orleans.

I was introduced to gravity measurement in 1963-/64 by Professor Jackson at Cambridge, England. Professor Jackson was involved in a research project measuring gravity using the Cambridge gravimeter. Professor Jackson proposed using GPV instead of elevation above MSL. In 2000, my graduates and I were working on a number of research projects determining elevation using GPS

Stellar Navigation to GPS Navigation

In the 1960s, direction or azimuth was done by using the sun, Polaris or the stars. The astronomic azimuth had to be corrected to determine the geodetic azimuth, which is used for mapping. In 2000, GPS gives the geodetic azimuth directly. The geodetic azimuth can be converted to astronomic azimuth using the deviation of the vertical. The deviation of the vertical can be determined by the gravity anomaly, which can be derived from the gravity model.

GPS positioning and direction directly correlates to the map. Thus, GPS has become a very effective tool in navigation. A hand held GPS receiver is now widely used for navigation instead of a map and/or compass. Digital Maps and GPS are used in mobile vehicles such as cars. For real time navigation GPS coordinates must be accurate. Unfortunately, in real time GPS coordinates are accurate to about 2-3m. To improve the accuracy to about 2-3 cm, differential corrections must to be applied. Today, differential corrections are transmitted from base stations or via geocentric satellites directly to the rover (mobile) GPS receiver. Typically, USA has about 3 correction satellites which give about a meter accuracy and the State of Iowa has about 80 base stations which give about 2-3 cm accuracy.

In 1961, I learned to determine direction using the sun at the Survey Training School at Diyatalawa and in 1964, to determine direction by Polaris at Cambridge, England. In the 1980s, I was among the first to evaluate the GPS navigation system developed by Rockwell International. It was installed in a van equipped with a GPS receiver and a computer with digital maps. Many of the modern aircraft and motor cars use improved versions of the Rockwell GPS navigation system.

A Surveying Course in Civil Engineering to a PhD in Geomatic Engineering

In the 1960s, a surveying course in the Civil Engineering program at University of Ceylon was taught by Professor H.B.De Silva. Professor Silva trained in Surveying at the Survey Training School at Diyatalawa, Cambridge University, England, and University College, London. In those days, a university education in surveying was treated as a sub-component of engineering, geography or physical sciences. Many of the surveyors who got their professional education were sponsored by government agencies, such Survey Department, Sri Lanka; Ordinance Survey, England; National Geodetic Surveys, USA, etc..

By 1970, professional societies in the USA such as ACSM, ASPRS, felt that a 4 year specialized bachelors' degree is required for Professional Licensure. Thus, surveying programs were developed at California State University, Fresno (CSUF), Iowa State University (ISU), and Ohio State University. In order to get public recognition and acceptance, Canada and the USA called these programs Surveying Enginneering, Geomatic Engineering, Geometronics, Geodetic Sciences and so on and several universities in these countries also started Masters and PhD programs in Surveying.

In Sri Lanka, the Survey Department committed itself to the idea that a formal education in surveying can provide a community with new opportunities for economic development. Under the leadership of Chris Nanayakara, Samson Herat and S. Somasekaram the Surveying Training Program at Diyatalawa developed a three year Bachelors' Program. While this development has improved the skills of the graduating surveyors, significant challenges remain.

In 1960s, I did undergraduate survey training work at the Survey Training Camp, Diyata;lwa, Cambridge, England and graduate study in University College, London.. I did research and also taught at Ohio State, CSUF and ISU in the last 40yrs.

Proposal for the Next 10 yrs

In the foregoing presentation, I have shown that Surveying, taking advantage of the growth in computer technology, has become an extremely high tech field. To keep abreast of the developments that I have outlined above, we need a great deal of formal education- a 4 year undergraduate degree program, 2 year Ms. program and a 5 year PhD program focused on research. Specifically, these programs must

- improve the quality of surveying education by designing a new training program for the NEXT generation of surveyors with emphasis on the amalgamation of surveying with computer technology and electronics. It is bound to encourage students to consider surveying careers

- involve highly qualified surveyors and prominent business people in the content development of this program

- offer startups access to a network of fellow collegiate surveying entrepreneurs who might help them to obtain loans and provide support services

- promote the self-employment of trainees by developing a surveying education program by highlighting business prospects and careers in surveying. The greatest .benefit from the education program is the opportunity to see that surveying provides a viable career.
-

University Education

The Sri Lankan Survey Department has a training program in Diyatalawa leading to the bachelors' degree and a diploma in surveying. Unfortunately, the environment is unlike a university and the program is too technical; neither is conducive to social interaction among students nor does it help in the development of political leadership and entrepreneurship.

In the 1960s, we were recruited as Probationers (cadets) after graduating from the University of Ceylon and given special training in surveying and leadership. Because of our connections during undergraduate days at the University, we had friends who were cadets and officers in the Army, Air Force & Navy training camps at Diyatalawa. We were able to get together in sports and social activities such as Tennis, billiard and clubhouse social activities. This opportunity allowed us to mature into professionals. As far I am aware, the armed forces training program in Diyatalawa has the same defects as the survey training program. In developed countries like the USA, there are campuses for training purpose: West Point, Naval and Air Force Academies. They are university campuses with emphasis on military training. These campuses are funded by the federal government.

Sri Lanka is a small country of about 20 million and it is not economically feasible to have separate campus for all defense and mapping personals. I propose a joint campus for the defense and survey department personnel. At this point in my lecture may I recall that the term Surveyor General originated from the tie up between surveying and military exercise in colonial days. The top brass of the Survey Department was the army general- hence Surveyor General. The central campus so designed would offer courses in Languages, Natural Sciences, Political Sciences, Music, Art, Sports etc. The cadets and trainees from each unit will be required to take these classes and

graduate from their respective colleges: Army College, Air Force College, Naval College and Surveying College. Just like a normal university there will be scope and talent for sport activities such as cricket, soccer, and tennis.

R & D Program

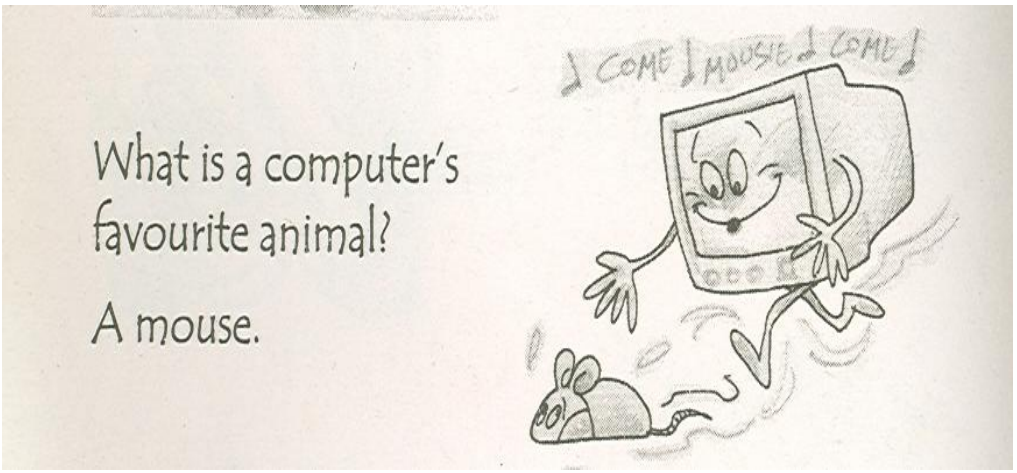
Typically, a GCE (O-level) or a high school program trains a student to become an educated citizen. A university provides opportunities and supplies an environment for students to become professionals, leaders and entrepreneurs. Graduate education gives opportunity for leadership in research and development. Thus, a graduate program should be a part of the university education and the success of the program depends on the research and publications of its faculty.

In the next 10 yrs. I propose that the survey department in cooperation with other government agencies and the universities do:

1. Research on determining the GPV and establish GPV for all the primary benchmarks and tidal stations.

2. Research on real time GPS. Either establish base stations or have an agreement with other nations for satellites transmitting real corrections.

3. Research on linking accurate digital maps with accurate GPS positioning



Surveying and Mapping Challenges of the Future Land Titling in Sri Lanka
A view

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(This Paper has been originally presented on the Technical Session of 'Surveying and Mapping Challenges of the Future 2011' on 14th January 2011)

Title Registration

- **What is Registration of Title**
  - Registration of ownership of land along with the land and associated rights, responsibilities and restrictions
  - Cadastral Maps are used to identify the land parcel

- **Land Titling in Sri Lanka**
- Started in 1800 with proclamation of Governor Fredric North
  - Land has to be identified and individual ownerships to be registered
  - Disposal of State Lands through Title Plans
- 1863 - Registration of Documents Ordinance
  - Allowed to register without a survey plan
  - Land identified with relation to adjoining properties
- 1927 - Registration of Documents superseded Registration of Title
- 1998 Registration of Title Act with better preparations and improved situation
- 2002 - Learning and Innovation Project
- 2007 – Bim Saviya, Sri Lankan National Land Titling Program.

History Repeats

- 1863 Registration of documents came up
  - Ownership complications
  - Inability to Survey all lands
- 1927 Registration of Title went away leaving only Registration of documents
  - Ownership complications
  - Inability to Survey all lands
  - Limited to Wellawatta Kirulapana – Today as an Improved deed System

Current Status of Land Titling in Sri Lanka

- Bim Saviya is operational from 2007 as a National Program
- 2007 – 5 Divisions
- 2008 – 6
- 2009 – 10
- 2010 – 18 – Surveying completed 5
- 2011 – 72 (18 to complete in 6 months)

Progress of Bim Saviya

- Fifteen Year Time Frame
- Already 3 years passed
- Plan to completed in 10 years - 2020

Bim Saviya Program

District	DS Division	DS Division	DS Division
Kandy	**Udapalatha / Doluwa**	**Udunuwara**	
Matale	**Dambulla**		
Ratnapura	**Balangoda**	**Weligepola**	
Gampaha	**Divulapitiya**	**Meerigama**	
Anuradhapura	**Tambuttegama**	**Thalawa**	
Colombo	**Homagama**	**Moratuwa**	**Ratmalana**
Hambantota	**Lunugamwehera**	**Tissamaharama**	
Monaragala	**Siyambalanduwa**		
Badulla	**Rideemaliyadda**	**Mahiyangana(C)**	
Kurunegala	**Rideegama**	**Pannala**	
Polonnaruwa	**Medirigiriya**	**Dimbulagala(B)**	

Long Term Work Plan and Progress

Year	2007	2008	2009	2010	2011
Surveyors / AIO	100 (46)	250 (65)	300 (140+65)	450 (128+80)	650 (200+175)
Target	120,000	300,000	360,000	540,000	780,000
Revised	20,000	30,000	50,000	100,000	220,000
Surveyed	12,428	40,194	101,966	163,000	270,000
Determinations	7,387	16,701	58,734	116,000	220,000
Registrations	6,148	14,622	19,706	80,000	220,000

Cadastre and Title Registration

- What is Cadastre
  - Cadastre is a form of a Land Information System. More specifically focused on land ownership, value or use of Land Parcels
- Cadastral Survey
  - Survey of a land for the purpose of recording ownership

Cadastre

- The Cadastre is an information system consisting of two parts:
  - A series of maps or plans showing the size and location of all land parcels
  - Text records that describe the attributes of the land.
- It is distinguished from a land registration system in that the latter is exclusively concerned with ownership.
- Cadastres are based either on the proprietary land parcel, which is the area defined by ownership; or on the taxable area of land which may be different from the extent of what is owned; or on areas defined by land use rather than by land ownership,
- Cadastres may support either recording of property rights, or the taxation of land, or the recording of land use.

Fixed boundaries vs. General Boundaries

- Within a registration system, boundaries are often referred to as either “fixed” or “general”. These terms are ambiguous for there are at least three concepts of a fixed boundary and three of a general boundary.

Fixed Boundary

- To some a fixed boundary (sometimes referred to as a specific boundary) is one which has been accurately surveyed so that any lost corner monument can be replaced precisely from the measurements
- The term "fixed boundary " is used to describe a boundary corner point which becomes fixed in space when agreement is reached at the time of alienation of the land. The location of the legal boundary cannot then be changed without some document of transfer. The surveyor's measurements may provide useful evidence of the boundary's location but the boundary is fixed whether or not there has been a survey.
- Under both these definitions of a fixed boundary, evidence on the ground takes precedence over what is actually written down.
- In some systems, however, a boundary is only fixed when agreement is reached between adjoining owners and the line of division between them is recorded as fixed in the register. From then on the evidence on the register normally overrides whatever is on the ground.

General Boundary

- In the case of general boundaries, the precise line of the legal boundary between adjoining parcels is left undetermined as to whether it is one side of a hedge or fence or the other or down the middle. The ownership of the land can be guaranteed up to the bounding feature, the ownership of which is left uncertain. There is no need for a precise survey, although a reasonably accurate topographic plan *is* needed. General boundaries are most appropriate where the development of the landscape is mature, for example in urban areas and in rural areas that have been cultivated for a long time so that the pattern of land use is well established.

More convenient

- Under the system of general boundaries, the ownership of a plot of land can be registered without the neighbours being consulted and having to agree the precise location of the legal boundary lines. This reduces the number of disputes in the short term but may give rise to problems in the longer term.

More flexible

- A general boundary may also be an indefinite boundary, such as one which is uncertain and variable like the edge of a forest or the line of high tide in coastal regions. In some registration systems, the law refers to "approximate boundaries" that are deliberately kept vague to prevent argument between neighbors.

Parcel Identification

- Provided that there is good monumentation, for instance in the form of fences or iron stakes driven into the ground, then the parcels define themselves and all that is needed by the registrar of titles is a pointer to ensure that the correct parcel has been referred to. Inspection on the ground can reveal the precise alignment of the boundaries should that be needed and a surveyed plan is only necessary to identify the parcels.

Advantages of General Boundaries

- The advantages of general boundaries lie primarily in the less demanding standards of survey and the manner in which the registrar of titles can ignore small changes in the position of a boundary agreed between two parties, whilst still guaranteeing the title of each. The cadastral records may therefore be compiled more cheaply and maintained within

defined limits more accurately. If, for example, a fence between two properties falls down and is re-erected along a slightly different line, there would be no need to alter any cadastral map or filed plan.

General Boundaries for Strata Titles

- In the case of strata titles, for example where there is separate ownership of an apartment within a block of flats, the ownership of parts of buildings can be defined and guaranteed without the precise determination of where, within the walls and floors, one set of property rights changes into another.

Cadastral Index Map / Cadastral Overlay

- Provided that there is good monumentation, for instance in the form of fences or iron stakes driven into the ground, then the parcels define themselves and all that is needed by the registrar of titles is a pointer to ensure that the correct parcel has been referred to. Inspection on the ground can reveal the precise alignment of the boundaries should that be needed and a surveyed plan is only necessary to identify the parcels.

Adjudication

- When title to land is brought into the register for the first time, a special procedure may need to operate. This is known as adjudication, which is the process whereby existing rights in parcels of land are finally and authoritatively determined. Adjudication is the first stage in the registration. of title to land in areas where the ownership of the land is not officially known.
- In theory, the land adjudication process neither alters existing rights in land, nor creates new ones; rather it establishes what rights exist, by whom they are exercised and to what limitations, if any, they are subject. As such, it should introduce certainty and finality into the land records, a process which frequently alters the status quo since all too often the existing ownership and rights in land are unclear.
- Adjudication necessitates determining "who" owns "what", that is the rights and ownership must be ascertained as well as the extent of the land affected. The latter means that the boundaries of each parcel must be agreed between the adjoining parties.

Need of Research

- Research must encompass all facets of land management, ranging from the purely technical to legal, social and economic issues. It also requires close coordination across the varying professional disciplines and needs to be directed towards affordable and appropriate technological solutions. It is essential that society should allocate resources to this end.

Importance of expediting Bim Saviya

- To provide fullest support of LAND to current development plan it is essential to complete Bim Saviya Program early as possible
- Secure Land Tenure
  - Attract Investors
  - Land as a tool for generating capital
  - Improved land market – High return on Stamp Fees and Registration Fees
  - Improved Land Development
- Less Land Disputes
  - Peace and Harmony
  - Saving time and money
- Land Information System
  - Support to other activities by Land Information System
  - Avoid duplication of efforts – Save money / Make things easy

Attention

In countries in transition, systems have been driven from the centre and not by the public. Those responsible for the cadastre have not been accustomed to responding to user needs, especially those of private individuals. A lead agency must be seen to be neutral and to take fair and balanced account of the interest of all parties.

Critical Issues

- Changes in RTA
- Shortage of staff
  - Surveyors
  - Adjudicators
  - Support staff (Translators / Data Entry Operators)
- Public Awareness – Better Publicity
- Institutional Co-operation
- State Land Problem solving
- Maximum benefit of IT not obtained

Changes of RTA

- Provide Administrative flexibility
- Effective Problem solving mechanism
- Customized procedure
- Allowing co-ownership
- Indefeasibility – Is it a strong point or an opening for further fraud?

Process of Land Titling

- Preliminary investigations
- Preparation of Cadastral Map
- Public exhibitions and calling for objections
- All lands taken into register
- Deeds should be connected to Cadastre
- All surveys should be on Cadastral standards – Necessary control to be established

Complications in Land Law

- Current land related laws are generated stand alone
- LDO/LGSP/Land Settlement/ Vihara Devalagam/LRC/Land Titling/Customary laws
- Proposal to develop a common land law

Remedial Action

- Registration based on Cadastral Index Map
  - Precise Cadastral Surveys only where necessary
  - Incorporation of all Statutory Surveys
  - (FCP / FCP /PP / Land acquisitions / Forest surveys etc.)
  - Effective utilization of Private Sector surveys
  - (Incorporation of plans with large areas – Land Sales/Estates etc.)
  - Connect all future surveys to National Grid where possible
  - Connect parcels with fixed boundaries
  - Identify parcels with permanent fixed boundaries
  - Adopt alternative technology to generate cadastral maps
  - GPS RTK Surveys
  - Different Accuracies subject to location and land value

- Fully utilize power of IT to speed up program
- Simplification of determination criteria / activity
- Outsource Land Registry Searches to Private Sector

Effective utilization of conciliation Boards

Can we bear this

- Sub Divisions and amalgamations
  - If we cannot cope up efficiently with Sub Divisions and Amalgamations it is going to be a disaster.
  - Therefore we have to make sure we are attending sub divisions and amalgamations with due care
  - Efficient and people friendly procedure is required
- Surveyors should take an practical approach in this activity – Cost / Time / Amount of work

Surveying and Mapping Today

by
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(This Paper has been originally presented on the Technical Session of 'Surveying and Mapping Challenges of the Future 2011' on 14th January 2011)

Surveying and Mapping belongs to one of the oldest professions on planet Earth. The recorded history of surveying dated back to 230 BC. The age old question of "Where I am?" may have triggered human minds to search about the planet that they live. Today the Surveying and Mapping discipline is enriched with knowledge base gathered for more than 2000 years. Hence it is no surprise that most of the modern techniques such as space technology, computer technology and artificial intelligence have become part and partial of Surveying and Mapping today.

The Surveying, science of computing absolute or relative positions on the earth has been widely supplemented by the theoretical innovations in Mathematics. As a result surveying is capable of achieving very precise positions in millimeter levels of accuracy. Measuring very long lines across the globe can be achieved though latest technology in Surveying. This triumph has certainly allowed other disciplines such as Geology, Oceanography to forecast the structural changes of the earth. This will be very important in mitigating disasters such as earthquakes, global warming and eruption of volcanoes.

Conventionally surveying was carried out by direct observations of distances and angles, positions were computed through observed distances and angles. Historically distances were measured by counting steps along the length to be measured. Today surveyors employ electromagnetic pulses to measure distances through long distances resulting millimeter levels of accuracy. In order to measure distance between two points inter-visibility between points should not be interrupted. This barrier was conquered by utilizing space based technology called Global Positioning System. Today by logging in to signals emitted by satellites orbiting high up in the sky, Surveyors are capable of measuring greater distances even between points which are not inter visible.

Measurements of distances became very simple less time consuming and accurate due to introduction of electromagnetic distance measuring technology. Today LIght Detection And Ranging technology (LIDAR) is emerging as an alternative to electromagnetic distance measuring technology. LIDAR uses near infra-red range of electromagnetic spectrum which will emitted towards the object to be surveyed and reflected beam from the object will get captured from the system. The time taken to travel the distance and the intensity of the returned beam will get analyzed to gather three dimensional shape of the object. Rapid observations to millions of objects in vicinity can be obtained by LIDAR. This technology provides measuring distances to objects at lightning speeds such as couple of hundred thousand points per second. This new tool required computer assisted platform to process the colossal amount of data. A new dimension of mathematics allows to process cloud of points as unit.

The art of measuring angles started by observing angles through optical telescope and using mechanical venire scales to get the value of the angle. These systems were developed by ancient mariners to get their latitude and longitude by observing stars using instruments such as sextant. Later those systems were adopted by surveyors to measure horizontal and vertical angles in their theodolites. Disadvantage of mechanical vernier system was that it was very difficult to achieve higher accuracies without making bigger reading circles. Hence accurate conventional surveying equipments were bulky in dimensions and very difficult to transport through rugged terrain. But researches in physics paved the gate way through inventing fiber optical devices such as parallel plate micrometers which were adopted by the surveying instrument manufactures to replace the mechanical verniers. This turning point allows instrument manufactures to produce new generation of instruments which are fully optical with higher angle measuring accuracy yet small and portable. These instruments were known as optical theodolites, very useful for precise applications such as deformation measurements. One classic example is legendary wild T3 theodolite capable of measuring angles to accuracy of 0.2" which was very popular among geodetic surveyors. But technology gallops and produces more opportunities for surveyors. With the invention of computers, researches developed digital platforms for almost all professions. In fact surveying was one of the professions took advantage of the digital revolution to its well being. Today angle measurements were obtained through digital encoders to very high degree of precision. The other advantage is that digital encoders could read angles electronically and angles can be recorded to the internal memory of the instrument. Later those measurements could be transformed to computer for post processing. Hence concept of paper less surveying was born. Then manufacturers were able to produce a new generation of surveying instruments by amalgamating digital angle measurement and electromagnetic distance measurement capabilities under one container of a compact instrument widely popular in the surveying community as total stations. It appears that nothing stops the flow of technology. New concept was seeped in to the minds of surveyors and designers of surveying instruments. Probably after reading scientific fictions or watching the robots employed by large auto makers. "Why not making an instrument which can measure by itself?" This new concept which was flashed in to the minds and through utilization of digital servo motors, artificial intelligence, automatic target recognition through data analysis, a new born child to surveying profession was called robotic total station. This remarkable achievement allows surveyors freedom. So that he is not confined to the theodolite in the field. He can go to the point to be picked up personally and the instrument measures the point automatically by following the target carried by the surveyor. The instrument can be operated from the target end and the surveyors can personally satisfy that they will be picking up data which they intend to pick.

The third dimension which was very difficult to compromise was the height. Conventionally surveyors measure height by obtaining the height differences manually from the known height or the datum. This process is very laborious and time consuming. By observing readings to a graduated rod using an instrument called level, surveyors can compute the height differences accurately up to one tenth of a millimeter. But obtaining readings manually is time consuming and subjected to human errors in reading. The development of the digital technology enable to eliminate the problem of manual reading by installing a precise bar code reader to the levels and changing the digits marked on the staff to barcodes which is called digital leveling. As data is recorded electronically and can be downloaded to computer for post processing enabling paper less leveling. By using digital levels surveyors are capable of measuring vertical measurements up to millimeter levels which is very important in deformation detection of large structures such as high rise buildings, dams etc. At the same time another way of leveling technology emerged by using a horizontal laser beam called laser leveling which is very popular among surveyors engaged on construction sites. For ordinary leveling LIDAR technology can be adopted as it can be measure

points in the accuracy range of ± 10 cm level. Today assortment of different technologies are available to make surveying more competitive.

Today space technology is inseparable from Surveying and Mapping. Finding position by distance and angle measurements or by observation taken to heavenly bodies such as sun, moon and stars are fading away from the surveying profession.

Increasingly space base platforms provides precise positioning for surveying, high resolution images from the space provide detailed pictures of the surface of the earth or even terrain sub merge by water for accurate detail mapping. Space based positioning practically available to the field of surveying with the introduction of Global Positioning System (GPS). Today surveyors are capable of computing the position accurately by logging to space based positioning systems. By doing so long computational streams required for conventional positioning methods were cut short and almost instantaneous positioning is possible. This sector is developing rapidly and different types of spaces based positioning are already available or due in near future. Hence Global Navigation Satellite System (GNSS) will be one of the best technical companions of future surveyors.

Time is very crucial function in development projects today. Most of the projects demands virtually impossible time frames. Surveyors are the ones who will call first for many development projects. Their services are necessary even before the physical construction taken place. Hence today professional surveyors have to adhere to time frames which were unimaginable several years back. But due to the technological achievements such as LIDAR, GPS, laser / electronic leveling such projects can be completed with in very short time periods.

After gathering the spatial knowledge about the earth the next challenge is to share this knowledge among users. The map making or cartography is the art and science of showing information about the earth. Conventional mapping was done by publishing paper based maps / plans drawn manually using point data collected by surveyors in field. Disadvantage of paper based maps are that they can show limited amount of data in the scale used to draw the map, Difficult and longer updating cycle, which is very crucial due to the rapid changes in environment facing today. On the other hand various formats of data are available for a mapper today. This data can be ranging from individual point data, data collected through aerial photogrammetry, data collected by digitizing of paper based map, raster data from satellite and point clouds obtained from technology etc., As variety of digital media are available today such as e-books, e-maps, images etc, paper based media will not be widely used in future. Hence modern mappers / cartographers are to be equipped with presenting their data in digital media.

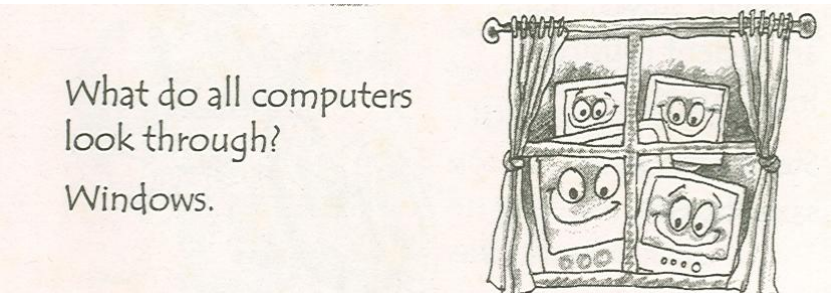
As computers are capable of handling graphics and also capable of handling huge amount of information it makes perfect platform to produce topographical features with their inherited characteristics. Therefore a new digital arena for cartographers was emerged which is commonly known as Geographic Information System (GIS). Geographic information System allows users to represent the shape of the object along with the characteristics of the object stored in a computer as a data base. The picture and the data base is link together so the user can interactively quarry data and filter out required data or can find behavior of data against time or any other variable and can derive mathematical relationships to represent the behavior of the object which is called as modeling. This will be very useful as a decision making tool, which was very popular among decision makers. In the mean time information technology offered the World Wide Web to share information and knowledge throughout the world. As this free common domain which could be accessible from almost every corner of the globe provided the required common platform for the mapping community and users to share their wealth. Hence a new off shoot of GIS which is known as web GIS was developing rapidly.

Rapid technological development in the field of surveying and mapping triggered several important institutional problems.
Which technology is suitable to adopt as many new techniques are available. This is very complicated issue. First of all the technology should be flexible enough to custom tailored to suit to the environment it is being used. Most of these technologies are manufactured to suit to conditions prevailing in the country or region of origin. But when they are utilized in another part of the world the expected efficiency, accuracy can be adversely affected. As the investment required for most of modern technologies are fairly heavy this issue to be considered thoroughly before making final decision.

Another fact to be considered is the reliability and life span of technology. Some technologies will get introduced to the market but within short period they will get discarded mostly due to arrival of superior competitor. Hence alternative technologies possible to get introduce in near future also to be considered.

The next issue is the process of amending prevailing institutional rules and regulations after acquiring of new technology. Technical issues such as accuracy standards and operating procedures should be amended or reviewed to suit to the new technology. This part is very important to get efficient and quality output from the technology. But in most cases institutions will not pay adequate concern on this aspect. This institutional moment of inertia can be overcome by bold managerial decisions.

Hence it is very important to get the right technology, suitable for the local conditions and set the technical and the managerial tools and standards to suit to the technology. This process will ensure sustainability and maximum efficiency of the technology.



SURVEYOR'S ROLE IN SOCIETY

By

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Who is a Surveyor ?

It would be prudent to consider who a 'SURVEYOR' is before discussing his role in society. There are several definitions of the word 'SURVEYOR' by various organizations and institutions. Someone had attempted to describe a 'surveyor' as "a fellow who sends a man with a pole painted red and white into the jungle and tries to find him with a telescope". Let us for the time being consider a more realistic definition. I quote the definition of the American Congress on Surveying and Mapping: "SURVEYING is the science and Art of making all essential measurements to determine the relative position of points and/ or physical and cultural details ABOVE. ON or BENEATH the surface of the EARTH and to depict them in a usable form or to establish the position of points and/ or details."

"LAND SURVEYING" is the is the detailed study or inspection, as by gathering information through observation, measurements in the field, questionnaires, or research of legal instruments, and data analysis in the support of planning, designing and establishing of property boundaries.

Those who carry out these function are called "SURVEYORS"

Historical Background

From the time Human Being evolved on the Earth, there is a rigid bond between Man and Land. The first requirement for Man's existence and survival is Land. Therefore the relationship between Man and Land is inseparable. History tells us that this relationship has grown tremendously with passage of time and the development of civilizations. The need for a place for dwelling gradually became a need for the family and later for the complex needs of a community.

It did not take long before conflicts began to arise due to various reasons. With the expansion of human habitat, gradually people realized the importance of quality and quantity of land and soon the need arose for control of possession of land. Naturally the more strength and power one individual or a group possessed more quantity and quality could they possess.

As civilizations flourished in various parts of the Earth, the need for land became diverse, hand in hand with development in the fields of agriculture, irrigation, industries, transport, commerce etc. History tells how the greed for possession of more quantity and quality gave rise to quarrels, wars and invasions.

All ancient civilizations realized the value of land and took steps to develop it in order to improve agricultural produce, planning irrigation schemes, regularization of settlements, planning of townships, development of roads and later on for development of industries.

These activities necessitated the need to know the nature and extents of land. Thus the science and art of 'surveying' gradually developed over centuries and the profession of 'surveying' came to stay.

It is amply evident when perusing through the pages of history that the 'surveyor' played a significant role in the evolution of all great civilizations.

The following are some of the examples of historical contributions made by 'surveyors'.

- In ancient Egypt when the Nile River Overflowed its banks and washed out farm boundaries, it is said that the boundaries were reestablished by 'a rope stretcher' or a 'surveyor'.
- There is evidence of the existence of a 'land register' in Egypt around 3000 BC, formulation of which required the service of surveyors.
- The nearly perfect squareness and north-south orientation of the Great Pyramid of Giza around 2700 BC, setting out of which would have been done by surveyors.
- Evidence of using land surveying instruments in Mesopotamia (present day Iraq) around 1000 BC
- Ancient irrigation works in Sri Lanka
- Under the Romans land surveyors were established as a profession and they established the basic measurements required for the tax register around 300 AD
- Surveying done in the Arab Empire and the invention of specialized instruments for surveying.

It is said that at Thebes in Egypt on the walls of an ancient tomb of a chieftain there is a picture clearly portraying a land measurer or a 'surveyor' and his party at work.

Here in Sri Lanka the ruins of ancient structures provide ample testimony to remarkable achievements by surveyors of that era.

The gradient of the ancient Yoda Ela from Kalawewa to Nuwarawewa in Anuradhapura is said to be 1 foot per mile. It would be and immensely difficult task to maintain that gradient today even with all the modern technology and equipment. In Huruluwewa and more recently in Maduru Oya, the ideal site selected for the sluice of the reservoir coincided with that use by the ancients, which proves beyond doubt how accurately the ancient Surveyors hand done their surveys.

Surveyour in Sri Lanka

We can be proud that Sri Lanka has had its share of eminent surveyors in the past. Although ancient books shed no Light to indicate what instruments and what technology they used, it would be prudent to assume that the ancient surveyors of Sri Lanka would have possessed the necessary technology and reliable instruments to determine distances and heights accurately over 200 years back, without which the achievements they made could not have been accomplished. It is indeed a tragedy that they did not leave behind any legacy for the continuity of the profession.

However the present generation of surveyors in Sri Lanka can be proud of a recorded history of 210 years. The Survey Department came into existence in 1800 A.D., long before the entire Island came to be under the rule of the British in 1815 A.D. The fact that the Survey Department was one of the first departments to be established under the British rule amply proves the importance of surveying of land for the effective governance of a country. We should be grateful to the solid foundations laid by the surveyors who were originally from England. Most of the records of the work done by them have been meticulously preserved by the Survey Department.

Constitutional Provisions for the Profession

Although work of the original surveyors in the Survey Department was confined to surveying of land for the needs of the State, later on the needs of the general public necessitated the widening of scope beyond surveying of state lands. In order to provide a legal framework for the surveyors to operate we see the emergence of statutes like the Land Surveys Ordinance, The Surveyors Ordinance etc. and more recently **The Survey Act.**

Not all professions are generally conferred with constitutional provisions for their practice. If one examines carefully, it would appear that it is because the service is fulfilling a valuable basic requirement of the people which has a direct impact on the individual and the general public, unlike a trade or business. It is observed that while the population increases with time, the land area of the country remains the same or more correctly decreases. The state has a responsibility to ensure that this valuable commodity is dealt with utmost care and caution. Because of the fundamental value of land and real estate to the local and global economy, land surveying was one of the first professions to require Professional Licensure. Through the provisions of the Survey Act the state accords the surveying profession a privileged status by directly or indirectly conferring monopolistic or nearly monopolistic rights to practice the profession. While doing so the state has also insured that this privilege is accorded to a specific group of citizens who have proven their suitability and competence to provide this service accurately, honestly and impartially. Thus all surveyors are legally bound to fulfill this requirement to the society. The Surveyors are legally bound to fulfill this requirement to the society. The Surveyor General and the Land Survey Council have been conferred with sufficient powers to ensure that these requirements are fulfilled.

The role of the Surveyor

In Sri Lanka are surveyors in the state sector as well as in the private sector. Those in the State sector are being paid with the taxpayer's money, making them dependant on the taxpayer directly. Those in the Private sector earn their living by providing their services for a fee or reward, making them indirectly dependant on the taxpayer. Whatever sector they are in, they all enjoy a privileged status in society. It is our bounden duty at all times to ask ourselves whether we are fulfilling our obligations to the society in return for the privileged status we enjoy. We must critically evaluate our performance in a systematic way in the light of the rational grounds for our existence.

History tells us what we have been, technological and legal standards direct us to where we are and ethics tells us where we ought to be. Although there are legal provisions to guard against offenders, there is no guarantee that all will comply with the law. Even while staying within the legal limits, one may not give his due service to the society. It is ethics of any profession that determines the ultimate performance of the professional. Until recent times ethics were treated with much reverence and were considered sacred. It is sad to observe that of late in all spheres ethics have been often disregarded in the fierce competition for money making. Every one of us, as human beings has a natural desire for wealth, similar to our need for food and comfort. But in the pursuit for money, ethics should never be ignored or overlooked. Ethical limits should never be exceeded in making decisions. It is only ethics that can govern the decisions of the individual professional, where the legal provisions sometimes cannot reach.

Professionals are required at all times to maintain the honor and dignity of their profession and in practice as well as in private life they are required to abstain from any behavior which may tend to discredit the profession of which they are members. A person who would enjoy the respect and confidence of the community as well as other members of the profession must endeavor to rise beyond the minimum standards prescribed by a code and strive to maintain the highest possible degree of ethical conduct.

Principles that constitute the ethics common to all professions dictate that :

1. A professional shall always give precedence to his obligations to society in safeguarding public interests over his obligations to his client.
2. Every person who seeks services as well as the rest of members of the society must be treated equally without discrimination.

3. One must avoid situations where conflict of interest will undermine the professional service to a client.
4. Any personal information obtained from a client in the course of such professional service should be kept confidential, except when disclosure is required by law.
5. Any decisions can be carried out only with the consent and knowledge of the client.
6. A professional shall not permit his professional name and reputation to be used by any others.
7. One must ensure that professional competence is maintained and updated by continuing to learn and participation in continuous professional development programs.

When it comes to surveying, we are taught that Honesty and integrity are essential basic qualities required of a surveyor. It is because these qualities are being put to test at all times when a surveyor is at work. He is away from the eyes of the law and is free to make his own decisions. The consequences of a mistake can be very serious and costly. We know that the basic principles of surveying dictate us to check and recheck our work at all times to eliminate the possibility of making a mistake.

It is normal for a client, who is generally a layman, to make various requests or demands to fulfill his selfish desires. Such requests or demands, if granted, could be contrary to technical standards, Contrary to regulations, detrimental to the owners of adjoining properties, detrimental to the society in general or detrimental to the state. If the surveyor accedes to the request he shall only satisfy the client for the moment. But it is certain that problems are bound to crop up sooner or later. There is a saying that a doctor's mistakes are buried and a lawyer's mistakes are hanged, but a surveyor's mistakes are there forever. It is most likely that the client who made the request himself may have to suffer the consequences or the surveyor may have to answer charges either in courts or with the Land Survey Council. The society, in general expects the surveyor to act correctly and impartially at all times. They would generally believe that a surveyor is a person who will never make a mistake or deliberately commit an illegal act. This is specially so in the light of the fact that the surveyor is either representing the Surveyor General, who is the final authority in surveying in Sri Lankan, or is a Registered Licensed Surveyor, who is empowered by the Survey Act to carry out surveys. If a surveyor was to survey or demarcate a parcel of land and state that the extent is 'x' perches, the layman accepts it as gospel. There are legal provisions for the courts to accept it as correct. This is a trust that the society and the state places with the surveyor, one that should never be betrayed.

There are several regulations laid down by the state and other statutory Authorities in order to make provisions for various facilities and services required by the individual or the society as a whole. The primary responsibility of the implementation of these regulations lies with the surveyor who should ensure that the requirements of the regulations wherever applicable are implemented at the time of the survey. If these are ignored, sooner or later it would result in serious problems to the individual or the society.

There are numerous instances where lands in rural areas have been blocked out in haphazard ways, without providing adequate means of access to individual lots, sometimes without any access at all . This would have been done at the request of the land owners who would have been desirous of dividing his land among his children with the intent of saving a few perches, or may be due to carelessness of the surveyor. Several years later the problems have lead to quarrels among the parties affected ending up in expensive litigation or leading to severe social conflicts.

If we take a closer look at some of the real estate developments that have taken place some years back we can observe the adverse effects of negligence or ignorance on the part of some surveyors who have carried out such surveys. The intent of the real estate company is obviously making a large profit and they dictate conditions to the surveyor who had become merely a tool in the hands of the real estate company. Of course until recently there have been few or no rules or guidelines for the surveyor to follow, but still it was the bounden duty of the surveyor to have considered the needs of the community and the impact of their actions or inactions on the society.

This void has now been filled with the introduction of the regulations imposed by local authorities and the U.D.A. some of the regulations so imposed seem to encroach on the domain of the surveyor. This situation may have probably arisen due to fact that the quality of professionalism shown by some of the surveyors was not up to the social requirements of the day.

A surveyor should be a professional who is capable of discharging his functions impartially without fear or favor. If the surveyor had advised the clients correctly this problem could have been avoided. If such advice is to be followed and accepted by the society the surveyor should, in his routine activities have earned accreditation as an honest, impartial and a reliable professional.

Touching on the issue of regulations, it is a pity to observe that when making rules and regulations concerning matters related to surveying, some of the authorities concerned do not seem to consider it necessary to obtain the views of the surveyors. The Apartment Ownership Act and the UDA Regulations are two such instances. Although the surveyor has a significant role to play in the execution of these enactments, the surveyors do not seem to have been consulted at the formulation stage. There have been several instances where the Surveyor General, the Surveyors' Institute and the Land Survey Council had to have discussions with the authorities concerned to seek remedial action. Had there been a dialog before the formulation of these legislations, much of these problems and delays could have been avoided. Why some of the authorities do not seem to recognize the necessity of consulting surveyors on such matters may be due to the fact that surveying is essentially a silent service. Perhaps we are suffering from the consequences of being too silent. Considering the competition that exists at all levels today, I believe it is necessary to assert ourselves to ensure that the services of surveyors are properly utilized for the development of the country. In these matters it is not only the individual surveyor that has to earn accreditation, but the institutions that represent the profession too at all times should keep the interests of the profession upper most.

Court Commission Surveys

The surveyor has a very special role to play in the execution of Court Commission Surveys. Commissions are issued to surveyors by the courts under the partitions Act as well as to settle land disputes. In either of these cases the surveyor is called upon by the courts to assist the judge to dispense justice. We must recognize the fact that the role of judge to dispense justice. We must recognize the fact that the role of the surveyor is far different from that of a lawyer. Whereas the lawyer's role is merely to satisfy the needs of his or her client, the surveyor's role is to provide correct data and information for the courts to dispense justice and not to satisfy the client. It is common knowledge that some cases get dragged on for years making the cost unbearable for the parties concerned. The delays are not necessarily caused by surveyors. However it is the duty of each and every surveyor attending to court commissions to ensure that no delays or omissions are caused. Sometimes the surveyor is called up before courts to give further evidence or to clarify matters. The surveyor must be armed with a good knowledge of rules and regulations involved and correct and fool proof data to resist attempts by lawyers who may use their skills to make commitments by the surveyor which may be favorable to their respective clients. The role of the

surveyor is primarily to ensure that justice is mated out to all parties concerned. It has to be remembered that in most cases it is the poor and ignorant people who are made to suffer the consequences. So we have a responsibility to ensure justice is meted out to them.

Cadastral Surveys for Registration of Title

The Registration of Title Act passed in 1998 is a piece of legislation that the surveyors were agitating for a long time in Sri Lanka. This involves the entire island being brought under Cadastral Surveys and poses a hug e challenge to the surveyors. The technicalities involved with the Cadastral Surveys are being handled by the Surveyor General while the Project Director is a Senior DSG. While we are happy that the matter is in the hands of two senior officers who are quite capable, one cannot ignore the quality of work that is required, immensity of the volume of work to be done and the time factor. Here again the role of the surveyor is of extreme importance. The state bears the huge cost of the surveys. The beneficiaries are the taxpayers of the country. We have to be satisfied that the end product serves the intended purpose. In the race for time we cannot sacrifice accuracy, completeness and the reliability of data. According to the Registration of Title Act, 'The Certificate of Title' so issued shall form conclusive evidence of the title to such interest. This statement tells how important this document is. The Certificate should be absolutely foolproof. The surveyors engaged on this project have a huge responsibility on their shoulders. While maintaining the technical standards, there cannot be any mistakes in representing the physical positions of the boundaries and legendary data on plan. Extreme care and caution should be exercised in the conduct of field and plan work. Surveyors should guard against the temptation for greater progress which may tend to the work being sloppy. The surveyors' role to the society is to ensure that the Cadastral Plans they produce are of the highest quality and standard. This objective should be held above the race for earning a higher output resulting in higher wages or incentives. We cannot forget the fact that the properties and fortunes of the members of society are committed to the surveyors who carry out the cadastral surveys. It is obligatory on the part of all who participate in this activity to ensure that the Cadastral Plans are free of errors and are of the highest standard. Whether they achieve it or not only time will tell. Here again we have enough examples to go by. If we study carefully some of the Final Village Plans we can imagine the pains to which the surveyors of the ensure that plans they produced are of a very high standard. However it is a pity that much of the information contained in these plans are not being fully utilized.

The nature of the work of a surveyor is such that he or she is part and parcel of the environment. I can remember the time when we were under canvas in the remote jungles, how close we were to the environment. It is our duty and obligation to do everything within our power to protect it. Today not only us, but all over the world we can see very clearly the adverse effects of neglecting the environment. Surveyors have an important role to play especially with regard to natural waterways when surveying.

There are instances where the surveyor is in a position to advice the client, the society, local authority or the government with respect to better management or utilization of land. Of course such advice should be confined to the technical scope of a surveyor. We cannot be too optimistic that any of our advice will be sought or accepted, but through our service and activities if a good image is built, then there is the possibility that our advice would be sought someday.

If we can take an example from the past, the name of an eminent surveyor, Dr.R.L.Brohier comes to mind. Many surveyors of that era and before, would have surveyed numerous ancient irrigation works in Sri Lanka in the course of their routine work. Old maps and plans in the Survey Department testify to the fact that they have spared no effort in doing it exceptionally well. But Dr.Brochier went much further. He studied them in detail, researched into the history and produced

valuable books on the subject 'Ancient Irrigation Works of Ceylon'. It is the information supplied by him that led to the restoration of many of them such as Parakrama Samudra, Minneriya, Giritale, Kantalai, Kakawewa, Padawiya, Mahalkada etc. The pioneering work done by him, far beyond the call of duty, has helped to serve hundreds of thousands of families and has helped immensely to develop food production of the country and sustain the rural economy of Sri Lanka.

Let us hope that the surveyors of today and the future will perform their service to the society to the fullest and make Sri Lanka a better place to live.

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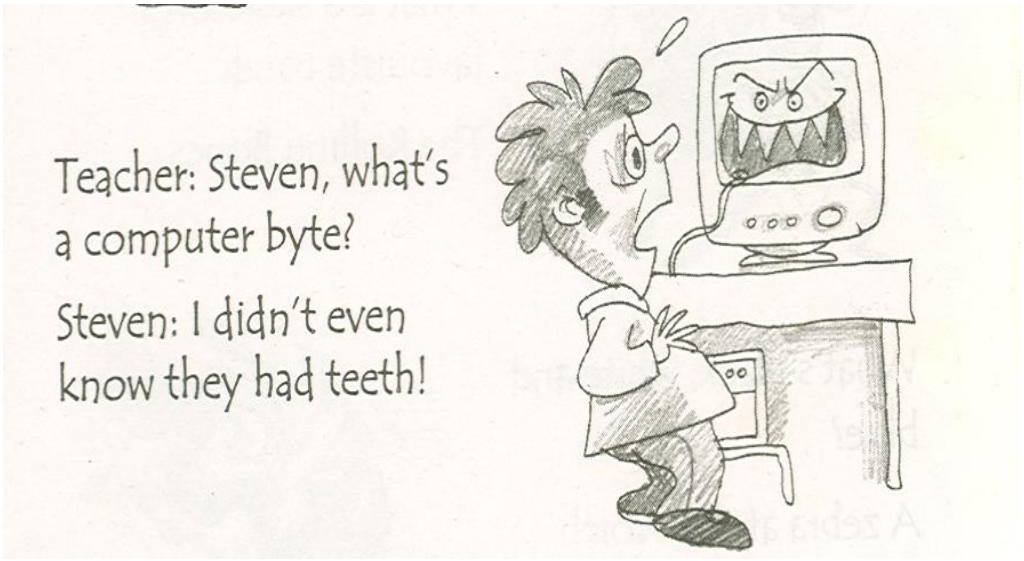

Public Procurement & Value for Money (VfM)

by
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Abstract

Value for Money *(VfM) is about obtaining the maximum benefit with the resources available. Decisions about VfM are a daily reality in all our lives, whether we purchase food, clothing, vehicle, house or any other commodity. Procurement is a purchasing activity, by which the Purchaser should achieve the best VfM. Value implies more than just the price, since quality, durability, operational cost, after sales services, life cycle cost and fitness for purpose issues should also be taken into account. The low initial price may not equate to lowest cost over the operating life of the item procured. The ultimate purpose of procurement is to obtain maximum VfM. If VfM is not achieved by an individual's purchasing activity, it is the individual who suffer, but in Public Procurements if maximum VfM is not achieved the entire society concerned has to suffer.*

1 Public Procurement

The term "Public Procurement" is defined as 'the process of obtaining Goods, Works, Services or Consultancy by the most appropriate means, using public funds'.

Although public money is often treated as 'Nobody's Money, the actual fact is that it is 'Everybody's Money, the money of all the citizens in the society including the handful of people involved in the Procurement Process, namely the Officials, Suppliers and Contractors.

Public Procurement is the process by which, the necessary inputs for vital public sector investments are obtained. Those investments lay foundation for national development in terms of physical infrastructure, and institutional and human capacities.

The quality, timeliness, appropriateness, and affordability of the inputs so procured largely determine whether the public investment will succeed or fail.

The objectives of the public procurement process are to ensure;

- Maximizing economy, timeliness and quality in Procurement resulting in least cost together with the high quality.
- Adhering to prescribed standards, specifications, rules, regulations and good governance.
- Providing fair, equal and maximum opportunity for eligible interested parties to participate in procurement.
- Expeditious execution of Works and delivery of Goods and Services.
- Compliance with local laws and regulations and international obligations.
- Ensuring transparency and consistency in the evaluation and selection procedure.
- Retaining confidentiality of information provided by bidders.

The general principles of Public Procurement process are :

- Subject to Competition
- Value for Money
- Transparency
- Accountability
- Fairness (Non discrimination)
- Equal Opportunity
- Development of local Business
- Achievement of national Development Objectives
- Win-win outcomes.

The five main objectives that have to be achieved in public procurements are:

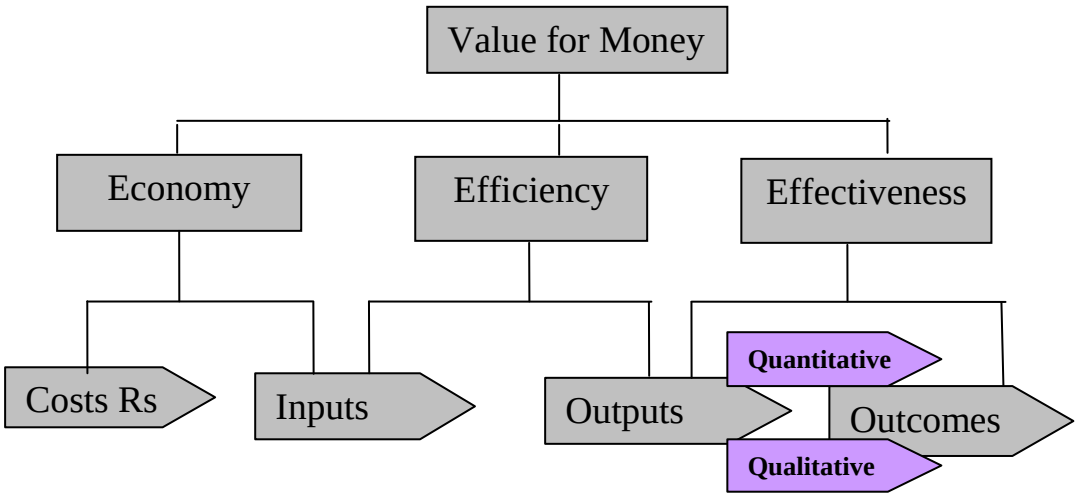
- Value for money;
- Open and effective competition;
- Ethics and fairness; and
- Accountability, transparency and reporting
- Equity.

2. Value for Money (VfM)

Put simply, **Value for Money** (VfM) is about obtaining the maximum benefit with the resources available. Decisions about VfM are a daily reality in all our lives. We are constantly choosing which items or services to buy, and judging the right balance for us between quality and cost.

Public services are no different. VfM is about achieving the right balance between economy, efficiency and effectiveness, the **3Es** - spending less, spending well and spending wisely.

This means that VfM not only measures the cost of goods and services but also takes account of the mix of cost with quality, resource use, and fitness for purpose and timeliness to judge whether or not, together, they constitute good value.



Economy is the price paid for what goes into providing a good or service.
Efficiency is a measure of productivity i.e, how much you get out in relation to what is put in.
Effectiveness is a measure of the impact that has been achieved, which can be either quantitative or qualitative.

VfM is high when there is an optimum balance between all three elements - when costs are relatively low, productivity is high and successful outcomes have been achieved.

VfM is not about **cuts**. It can be achieved in different ways including:

- reducing costs (eg, labour costs, better procurement and commissioning) for the same outputs
- reducing inputs (eg, people, assets, energy, materials) for the same outputs
- getting greater outputs with improved quality (eg, extra service or productivity) for the same inputs
- getting proportionally more outputs or improved quality in return for an increase in resources.

Assessing and measuring VfM can, however, still be a challenge. Some elements, such as quality and sustainability, may be subjective, difficult to measure, intangible and misunderstood.

Value can often take many years to materialise, for example in long-term contracts. It is also specific to different contexts. What is VfM for one organisation, or locality, may not be the same for another. What is VfM at one point time may not be a year later. A strong element of good, informed, judgment is therefore required when considering whether VfM has been satisfactorily achieved or not.

VfM in the broadest sense must ensure Economic, Social, Environmental, and Cost & Benefits for the entire society concerned.

3. Public Procurement & Value for Money

Procurement is a purchasing activity, by which the Purchaser should achieve the best Value for Money (VfM). Value implies more than just the price, since quality, , durability, operational cost, after sales services, life cycle cost issues should also be addressed. The low initial price may not equate to lowest cost over the operating life of the item procured. The ultimate purpose of sound procurement system is to obtain maximum VfM.

The parties involved in Public Procurement process should follow the following rules of ethics which has direct impact on obtaining best VfM.

- Confidentiality
- Corruption
- Conflict of Interest
- No gifts or inducement to be accepted

VfM is the obligation to spend public funds more economically, efficiently, an effectively to achieve the public interest.

VfM is an essential test against which procuring entities must justify a procurement outcome. Price alone is not a sound indicator and procuring entities cannot necessarily get the best VfM by accepting the lowest price or bid. Best VfM therefore means going beyond the price to get the best available outcome when all relevant costs and benefits over the procurement cycle are considered.

It is therefore the responsibility of any procurement process to ensure that procurement proposals in the organization reflect the best VfM and high quality possible.

VfM can be achieved in procurement by

- increasing level or quality of goods, works, or service at the same cost,
- avoiding unnecessary procurements,
- procuring items that the user needs are met but not exceeded doing needs assessment,
- specifying the purchasing requirement in terms of output,
- focusing full life of the contract rather than considering the initial cost,
- introducing incentives into the contract to ensure continuous cost and quality improvements throughout its duration,
- obtaining volume discounts,
- reducing the level of stocks keep at a given time,
- minimizing the cost of procuring goods, services or works by properly streamlining procurement and finance process,
- Improving project, contract and asset management.

If public procurement is to be consciously done to achieve VfM, procuring entities and structures should at all cost:

- avoid any unnecessary costs and delays for themselves and suppliers;
- monitor the supply arrangements and revisit them if they stop to provide the expected benefits;
- and ensure continuous improvement in the efficiency of internal processes and systems.

The procurement process should be designed to ensure the best VfM because;

- Public finance management is interconnected with public procurement,
- Best procurement policies, practices and procedures are important to achieve macro economic development perspectives,
- Limited funds are available for works, goods and services,
- Effective public procurement policies and practices also contribute towards the sound management of public expenditures more generally.

The procurement process must ensure and enhance the transparency of government procurement process, to minimize delays and to obtain financially most advantageous and qualitatively the best services and supplies for the nation.

The objectives of the procurement process should be to maximize economy, timeliness and quality considering least cost for high quality, where Economy is one of the important elements of the VfM in public procurement. However the best available VfM cannot be necessarily obtained by accepting the lowest price. Quality can be achieved by obtaining a certificate issued by the manufacturer, detailed inspection, safety, design, function, appearance, and performance to ensure products are in compliance with required specifications and regulations. Timeliness can be achieved by adhering to the time table as planned and by avoiding delays as much as possible.

In order to achieve VfM, it is necessary to provide guidelines in procurements and best practices for the contractors as well in addition to the public officers involved in public procurements. They too must be educated that they are also part of the beneficiaries as a tax payer or a citizen of the country if VfM can be achieved by procurements.

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"එක තැන සිටීම"

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නූතන ලෝකයේ විවිධ සේවා සපයන පෞද්ගලික ආයතන පාරිභෝගිකයින් හෝ සේවා ලාභීන් තම ආයතන වෙත ආකර්ශනය කර ගැනීම සඳහා විවිධ වූ ක්‍රමවේද භාවිතා කරමින් සිටිති. භාණ්ඩයක් හෝ සේවාවක් සපයා ඊට සාධාරණ මුදලක් අය කිරීම ලෙස මෑත ඉතිහාසය තෙක් සැලකූ "අලෙවිකරණය" (Marketing) යන සන්ධර්භය සීමා මායිම් බිඳ දමමින් නිම්වලළු වලින් තොර විෂයයක් බවට පත්වෙමින් තිබේ. තරඟකාරී ලෝකය තුල තම ආයතනයේ ස්ථාවරත්වය හා ජනප්‍රියත්වය දියුණු කර ගැනීමට "මහජන සම්බන්ධතාවය හා පාරිභෝගික සංතෘෂ්ඨිය" (Public relation & Customer care) පිළිබඳව නිබඳව අධ්‍යයනය කරමින් තම නිෂ්පාදන හා සේවා සැපයීම් වල ගුණාත්මකභාවය හා කාර්යක්ෂමතාව දියුණු කරමින් අලෙවිකරණය ප්‍රවර්ධනය කර ගන්නා අතර විවිධ උද්‍යෝග පාඨ (Slogan) මගින් තම අභිමානවත් සේවාව පාරිභෝගික මනසේ රෝපනය කිරීමට උත්සාහ කරති.

"පාරිභෝගිකයා යනු ආයතනයකට පැමිණෙන වැදගත්ම තැනැත්තාය. ඔහු කරදරකාරයෙකු නොව ආයතනයේ දියුණුව සඳහා උපකාරී වන තැනැත්තාය" ලෙස සඳහන් වන මහත්මා ගාන්ධි විසින් දක්වන ලද උධෘත පාඨයක් වෙලඳසල් වල ප්‍රදර්ශණය කර තිබෙනු ඔබ දැක ඇතැයි සිතමි. "පාරිභෝගිකයා" යන වචනයේ අර්ථයද යෙදුමද එම ප්‍රකාශයට වඩා (උදා : සැමියා බිරිඳට හා බිරිඳ සැමියාට ද, මවට බිළිඳා ද බිළිඳාට මවද, දරුවන්ට දෙමාපියන් දෙමාපියන්ට දරුවන් ද සිසු සිසුවියනට ද, සේවකයා සේවාදායකයා ට ද, සේවාදායකයා සේවකයා ට ද, වෛද්‍යවරයා රෝගියාට ද රෝගියා වෛද්‍යවරයා ට ද, ආදී වශයෙන් අන්‍යෝන්‍යව පාරිභෝගිකයින් හා සේවා ආයතන ලෙස හැසිරේ. මුදල් නොව විවිධ මානුෂීය අවශ්‍යතා, දැනුම, ශ්‍රමය, යුතුකම් සහ හැඟීම් එම ආයතන තුල අලෙවිකරණය වේ. එහිදී ද පාරිභෝගික සන්තුෂ්ඨිය හීන වූ විට විවිධ හැල හැප්පීම් ඉස්මතුවේ) පුළුල් වෙමින් පවතින අතර සේවා සැපයීමට අමතරව ආයතන පරිසරය හා මනා සංනිවේදනය ආදී ක්‍රම මගින් පාරිභෝගික සන්තෘෂ්ඨිය (Customer Care) උපරිමව ලබා දීමට කටයුතු කරති.

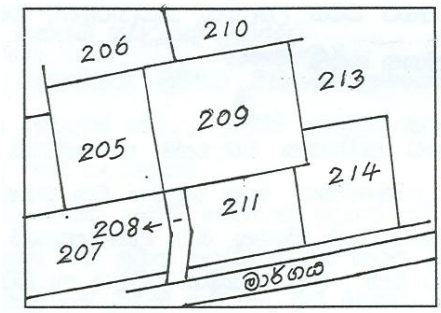
අප රට තුලද පෞද්ගලික හා රාජ්‍ය ආයතන මෙම සන්දර්භය තුල අනුගත වෙමින් සිටිති. උදාහරණ ලෙස පෞද්ගලික රක්ෂණ සමාගමක් හදුන්වා දී ඇති VIP රක්ෂණය (වාහන අනතුරු) දැක්විය හැක. එහිදී අනතුර වූ ස්ථානයට පැමිණ අනතුරෙහි අලාභය තක්සේරු කර වන්දි මුදලක් ඒ මොහොතේ ලබා දෙයි. (On the spot Payment) එක් අතෙකින් එය මීට පෙර ක්‍රම මගින් වන්දි ලබා ගැනීමට කල දුෂ්කර ක්‍රියාවන් හා අනතුර වූ මොහොතේ වාහන හිමියාට ඇතිවූ කම්පනයත් (පාරිභෝගික දුෂ්කරතා) නිසි පරිදි හදුනා එය තක්සේරු කිරීමකි. තරඟකාරීත්වයක් නොමැති වුවද රාජ්‍ය ආයතනද මෙම ප්‍රවාහයට එක් වෙමින් තිබෙන අතර එක් දින විදේශ ගමන් බලපත්‍ර සේවය, උප්පැන්න, විවාහ සහතික නිකුත් කිරීමේ සේවය, ගර්හනී මව් සත්කාර (කාසල් රෝහල - බොරැල්ල) ආදිය උදාහරණ ලෙස දැක්විය හැකි අතර තවත් බොහෝ ආයතන පංචවිධ සංකල්පය අනුව කටයුතු කරමින් සිටිති.

ඉහත කරුණු මා දැක්වුයේ මාගේ සේවා කාලය තුල සේවාලාභීන් තෘප්තිමත් නොවූ අවස්ථා බොහොමයක් කැටි කර එලි දැක්වීමේ ප්‍රවේශයක් ලෙසිනි. එම අවස්ථා ඇතිවූ හේතු හා දිය හැකි විසඳුම් ද යෝජනා කරමින් පාරිභෝගික බදු මුදලින් වැටුප් ලබන අපි ඔවුන්ගේ අවශ්‍යතාවයන් හදුනා තෘප්තිමත් සේවාවක් ලබා දී අපටද අපගේ අලෙවිකරණයේ සීමාවන් පුළුල් කර ගැනීමට හැකි අවස්ථා පෙන්වා දීම මෙම ලිපියේ අරමුණයි.
නිවාස ණය මුදලක් අයදුම් කිරීමට "සත්‍ය උධෘතයක්" රැගෙන ගිය පෙරේරා මහතා දින දෙකකට පසුව කොළඹ දිස්ත්‍රික් මිනින්දෝරු කාර්යාලය වෙත පැමිණියේ බැංකුව පෙන්වා දුන් අඩු පාඩු කිහිපයක් සම්පූර්ණ කර ගැනීමටය. ඒවා නම්

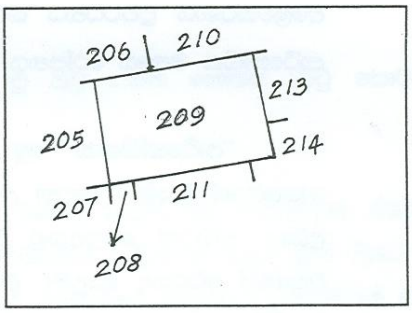
1. ප්‍රවේශ මාර්ගයක් නොමැති වීම
2. ඉඩම් විස්තරය නොමැති වීම
3. මායිම් විස්තර නොමැති වීම

මුල් පිඹුර ගෙන පරීක්ෂා කිරීමේදී සත්‍ය උධෘතයෙහි දකුණු මායිමේ වම්පස පටු තීරුව (කැබලි අංක 208) ප්‍රවේශ මාර්ගයක් සඳහා වෙන් කර ඇති බව ඉඩම් විස්තර ලැයිස්තුවෙ හි සඳහන් විය. (රූප සටහන බලන්න)

පිඹුර



සත්‍ය උධෘතය



"කොහොමද ඒ විස්තර මම ගත්තු ප්ලැන් එකට දාගන්නෙ" පෙරේරා මහතා ඉලාපොරොත්තු සහගතව විමසා සිටියේය.

"දැන්නං මේකට ඒක ඇතුලත් කරන්න බැහැ. ප්‍රවේශ මාර්ගය දිගට නැති හන්දා ඒකටයි (කැබලි අංක 208) මහත්තයාගේ ඉඩමයි (කැබලි අංක 209) දෙකම ගන්න අලුතින් අයදුම් කරමු. ගත්තු එක අහක යන්නෙ නැහැ ඒක ගෙදරට ගන්න පුලුවන්නෙ. ඉඩම් විස්තරයට ඉඩම් විස්තර ලැයිස්තු උධෘතයක් (S420) වෙනම ගෙවල ගන්න පුලුවන්. මායිම් විස්තර ඇතුලත් කරන්න විදියක් නැහැ චක්‍රලේඛයේ උපදෙස් දීල නැති හින්දා. ඔප්පුවත් එක්ක ප්ලැන් එකේ විස්තර ගැළපෙන හින්දා බැංකුවත් එක්ක කථා කරල විසඳගන්න පුලුවන් වේවි." මම යෝජනා කලෙමි.

අවශ්‍යතාව දැඩි වූ හෙයින් හා වෙනත් විකල්පයක් නොමැති හෙයින් පිඹුරට, උධෘතයට හා තවත් වරක් රස්තියාදු වීමට නොහැකි බව පවසමින් ඉඩම් විස්තර ලැයිස්තු ඡායා පිටපතකටද මුදල් ගෙවන ලදුව අනුග්‍රහයක් වශයෙන් පැය 2 ක් තුල සියල්ල නිමකර පෙරේරා මහතා වෙත ලබා දීමට කටයුතු කලෙමි.

ඉහත සිදු වීම විග්‍රහ කිරීමේ දී අපගේ "සත්‍ය උධෘත" සම්බන්ධයෙන් ප්‍රධාන පාරිභෝගිකයා වන බැංකුව තෘප්තිමත් වී නොමැති බව පැහැදිලිය. වර්තමාන මුල්‍ය ආයතන ණය හා ලීසිං සේවා කාර්යක්ෂමව ලබා දීම සඳහා උද්‍යෝග පාඨයන් ලෙස දක්වන්නේ "අඩුම ලේඛන" ගනනකින් ඉටු කරන බවයි. එහෙයින් පිඹුරක අවශ්‍යතාව ඉටු කිරීමට එයට අමතරව තවත් ලේඛන ලබා දීමට පෙරේරා මහතාට සිදු වුයේ ඇයිද යන්න විමසා බලමු.

ගැටළුවට තුඩු දුන් එක් හේතුවක් ඉතා සරලය. එනම් පිඹුරේ ප්‍රවේශ මාර්ග දැක්වීමට කෙටි යෙදුමක් හඳුන්වා නොදීමයි. පැරණි ක්ෂේත්‍ර පත්‍ර වල අඩි පාරක් සඳහා සංකේතයක් ද කෙටි යෙදුමක් ද යොදා තිබෙන නමුත් මෑත කාලීන පිඹුරු වල අඩි 8 ක් 10 ක් පලල ප්‍රවේශ මාර්ගයක් සඳහා කෙටි යෙදුමක් හඳුන්වා දී නොමැත.

අනෙක් හේතුව නම් ඉඩම් විස්තරය හා මායිම් විස්තරය පහසුවෙන් පිඹුරු පිටපත ඇතුලත් කිරීමට හැකියාව ඇතත් ඒ සඳහා සුදුසු පරිදි චක්‍රලේඛ නිකුත් නොවීමයි.

ප්‍රධාන කරුණක් වන්නේ "සත්‍ය උධෘත" රාමුවට සිරවී දශක ගණනාවක් තිස්සේ එක තැන සිටීමයි. තමන් ලබාගත් සත්‍ය උධෘතයේ ප්‍රා.ආ.නි. කොට්ඨාශයක් සඳහන් වීම සම්බන්ධයෙන් පාරිභෝගිකයෙකු කල විමසීමක්ද ඒ සඳහා උදාහරණයක් ලෙස දක්වමි. මෙය බහුලව දැකිය හැකි අවස්ථාවකි.

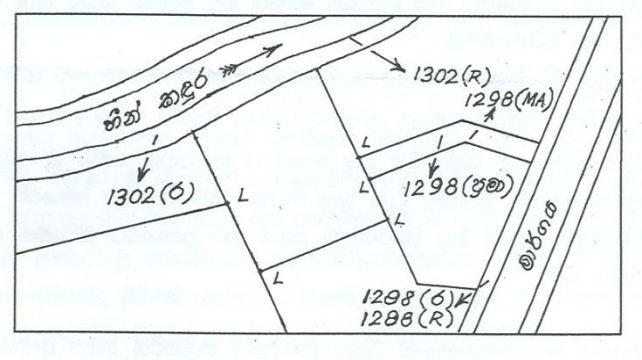
පැරණි ක්ෂේත්‍ර පත්‍රයක කැබලි අංක 105 හි උපයෝගීතාවය වෙනස්වීම හේතුනේ පරිපුරක ඉඩම් විස්තර ලැයිස්තුවක් සකස් කර ඇති අවස්ථාවක් සලකා බලමු. කැබලි අංක 105 ට බටහිර මායිමේ වූ කැබලි අංක 104 නැවත මැන අතිරේක පිඹුර අංක 14 කර ඇති බව ක්ෂේත්‍ර පත්‍රයේ අංක 104 අවලංගු කර සඳහන් කර ඇත. ක්ෂේත්‍ර පත්‍රයේ D.R.O's Division – Bintenna ලෙස සඳහන් වන අතර ඉඩම් විස්තර ලැයිස්තුවේ ප්‍රාදේශීය ලේකම් කොට්ඨාශය - රිදීමාලියද්ද ලෙස සඳහන් වේ. එය නිවැරදි තොරතුරයි. අදාල පිඹුරේ අතිරේක අංක 14 පරීක්ෂා කිරීමේදී කැබලි අංක 1213 හා 1222 ට නැගෙනහිරෙන් කැබලි අංක 105 මායිම් වන බව දක්වා ඇත. එයද යාවත්කාලීන වූ තොරතුරකි.

ඒ අනුව ක්ෂේත්‍ර පත්‍රයෙන් කැබලි අංක 105 යි සත්‍ය උධෘතයක් සකස් කිරීමේ දී ප්‍ර.ආ.නි. කොට්ඨාශය, කැබලි අංක 104 දැක්විය යුතු අතර ඒවා සාවද්‍ය තොරතුරු වේ. අප සතුව නිවැරදි තොරතුරු ඇතත් ඒවා "සත්‍ය උධෘත" යකට ඇතුලත් කිරීමට හැකියාවක් නොමැති බව පැහැදිලිය.

මෙම ගැටළු වලට විසඳුම නම් "සත්‍ය උධෘත" (සත්‍ය පිටපත්) රාමුවෙන් ඉවත් වී පෙර දැක්වූ උදාහරණය පරිදි අවශ්‍යතා සපිරෙන (පිඹුර, ඉඩම් විස්තරය, මායිම් විස්තරය) සම්මත ආකෘතියක් හදුන්වා දී එයට පිඹුරෙන් හා ඉඩම් විස්තර ලැයිස්තුවෙන් උපුටාගත් යාවත්කාලීන වූ තොරතුරු ඇතුලත් කිරීමේ ක්‍රම වේදයන් හදුන්වා දීමයි. එම නිෂ්පාදනය "යාවත්කාලීන උධෘත" ("UPDATED EXTRACT") යක් ලෙස හදුන්වා දීම වඩාත් සුදුසු වේ.

පහත දැක්වෙන පරිදි විශේෂිත උපයෝගීතා සඳහා වෙන් කර ඇති බිම් කැබලි පිඹුරේ හදුන්වා දීමත්, ඒ අනුව ඉඩම් විස්තර ලැයිස්තුවේ ද අදාල තොරතුරු දැක්වීමත් මඟින් පිඹුරේ ගුණාත්මක බව වැඩි වන අතර උධෘත නිකුත් කිරීමේ දී තොරතුරු මහ හැරීම අවම වේ. (පහසුව සඳහා භාෂා දෙකෙන් එකවර දක්වා ඇත.)

පිඹුර



ඉඩම් විස්තර ලැයිස්තුව

1288 (ර)	මාර්ගයට වෙන් කල රක්ෂිතය
1288 (R)	Reservation for Road
1302 (ර)	ඇල දිගේ වෙන් කල රක්ෂිතය
1302 (R)	Reservation along the channel
1298 (ප්‍රමා)	ප්‍රවේශ මාර්ගය
1298 (MA)	Means of access

අනෙක් අත්දැකීම වුයේ දුම්රියේදී හමුවූ සංචාරකයෙකි.

ආගන්තුක රටක වල්මත් වේ දෝ යන බියෙන් දුම්රිය නැවැත් වූ සෑම විටක සිය අත් බෑගයෙන් ශ්‍රී ලංකා මාර්ග සිතියම පරීක්ෂා කිරීමටත් එහි සුදු වට තීරුවේ සටහන් කර ගැනීමටත් ඔහු කරන වෑයම නිරීක්ෂණය කලෙමි. කැඩුනු ඉංග්‍රීසියෙන් තාවකාලික මිතුරු කමකු ඇති වූ පසු පෝලන්ත ජාතික ඔහුට ඔහුගේ ගමන්ත්තය වූ හික්කඩුව හා ගාල්ල ප්‍රදේශ පිලිබඳ සුළු විස්තරයක් ලබා දී ඔහු අත තිබූ සිතියමද මා සේවය කරන ආයතනයේ නිෂ්පාදනයක් බව අභිමානයෙන් යුතුව පවසා සිටියෙමි. දශක කීපයක් තිස්සේ වැඩි වශයෙන් අලෙවි වන මාර්ග සිතියම් තොරතුරු යාවත්කාලීන කලද එහි සැකැස්මේ වෙනසක් සිදු කිරීමට උත්සාහ කර නොමැත.
මෙම අත්දැකීමද විශ්ලේෂණය කිරීමේදී පහත සඳහන් නවතම අංග ඇතුලත් කර ඵලදායී නිශ්පාදනයක් අපට හදුන්වා දිය හැක.

1. සනකම කවරයක් (Folder)
2. තොරතුරු ලිවීමට නවන ලද සිතියමේ ප්‍රමාණයට සකස් වූ පිටු සහිත පොතක් (පිටු කොටසක සංචාරක තොරතුරු ඇතුලත් වෙළඳ දැන්වීම් ඇතුලත් කල හැක)
3. පෑන් රඳවනයක්

තවද අපට ජාතික ගුවන් සේවාවන් දෙකක් මේ වන විට තිබෙන බැවින් එම සේවාවලින් මෙරටට පැමිනෙන සංචාරකයන් තව ඉහත අයුරින් සකස් කරන ලද මාර්ග සිතියමත් තිළිණයක් ලෙස ලබා දීමට එම ආයතන

වලට හැකිය. ඉන් ගුවන් සේවාවද අප දෙපාර්තමේන්තුවද සංචාරකයන්ගේ මතකයේ රැඳවීමටත් නිත්‍ය වාර්ෂික ඉලක්කයක් අනුව අපගේ නිෂ්පාදනයන් සැපයීමට ද හැකියාව ලබා ගත හැක. මෙය ද අපට අලෙවිකරනය වැඩි කර ගැනීමට හැකි අවස්ථාවකි.

2009 අප්‍රේල් මස උෆව වෙල්ලස්ස විශ්වවිද්‍යාලයේ සංවත්සරය වෙනුවෙන් "පාදාංකරය" නමින් ප්‍රදර්ශනයක් පැවැත්වුනි. එහිදී අප දෙපාර්තමේන්තුවේ ප්‍රදර්ශණ කුටියේ තිබූ ජාතික සිතියම් සංග්‍රහයේ නව මුද්‍රණය කෙරෙහි විවිධ පීඨවල සිසුන්ගේ අවධානය දිනා ගැනුනු අතර පොතේ පටුනෙන් තමන්ගේ විෂයට අදාල තේමා ඇතුලත් පිටු පරීක්ෂාවට ලක් කෙරුනි. පොතේ මිල දෙබැම ඉහල දැමූ නමුත් බොහෝ අයගේ අදහස වුයේ එය ඊට වඩා වටිනා බවයි.

ඔවුන්ගේ හැසිරීම් නිරීක්ෂණය කිරීමේදී හැඟුනේ ඔවුන්ගේ විෂයට අදාලව ඇති පිටු ස්වල්පය ඔවුනට වැදගත් වූ බවයි. දැකුම්කලු ඝනකම කවරය වෙනුවට ඔපවත් මතුපිට සහිත (Glossy) තුනී කාඩ්බෝඩ් වලින් මුද්‍රිත කවරයක් සහිතව විවිධ පිටු ගණනකින් යුතු පොත් 11 ක්, අදාල තේමා 11 අනුව සැකසිය හැකි බව ජාතික සිතියම් සංග්‍රහය පරීක්ෂා කිරීමේදී දැක ගත හැකිය. තනි වෙළුමට අමතරව වෙළුම් 11 හි පිටපත් සීමිත සංඛ්‍යාවක් (පිටු ගනන අනුව මිල තීරනය වූ) සකස් කර ප්‍රකාශනය කිරීමෙන් හඳුනාගත් පාරිභෝගික අවශ්‍යතාවයන් සපුරාලිය හැක.

මෙවන් අත්දැකීම් දෙපාර්තමේන්තුවේ සියළු ක්ෂේත්‍ර වල නිලධාරීන් සතුව ඇතැයි සිතමි. මෙම ලිපියේ සඳහන් කරුණු විසංවාදී ද නොවේ. දෙපාර්තමේන්තුවේ පිලියෙල කරන මැනුම් හා සිතියම් නිශ්පාදන වල උපයෝගීතා, පාර්භෝගික අවශ්‍යතා, අලෙවිය පිලිබඳ තොරතුරු එක් රැස් කිරීමත්, ඒ අනුව වෙනස් කිරීම් කාලීනව ඉටු කිරීමට ආකල්පමය වෙනසක් ඇති කර ගත යුතු කාලය එලඹ ඇතැයි සිතමි.

මූලාශ්‍ර : Public relation & Customer care - SLIDA
මාරුපොල - අලෙවිඅරුම තීරු ලිපි මාලාව, අතුල කුඩගමගේ - "රිවිර" ඉරිදා සංග්‍රහය.

SDI Development Approach in Sri Lanka

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Senior Supdt. of Surveys

1.0 Current Situation

Information is considered as currency for the future in the today's modern digital information era. Accumulation of data and information is a wealth and a resource which helps us to make correct decisions. However, collection of data and information over a lengthy temporal dimension is particularly difficult. This is further aggravated when the involved data are spatially distributed and dynamic. Spatial data is the key to planning and sustainable management & development of our natural resources at national, regional and local levels. It is also fundamental to the development of the economic and social infrastructure, provision of community services, effective government administration and resolution of community conflicts. In other words, information infrastructure is a pre-requisite for any development agenda.

Data are acquired by different agencies at different times and in different formats as per their immediate thematic and application requirements. Different institutions have adopted a variety of spatial data platforms which make it impractical to derive and integrate data from different sources. Data formats are so diverse that even with the sophistication of the information technology it is not possible to combine data obtained from different sources. Further, there is considerable duplication of data as inter-agency coordination is a rare phenomenon.

Most of our data are collected by government institutions utilizing public funds. Therefore, the public should have a right of access to these data and information. In the past, some of the Government Departments has denied the public to have any information from their data archives. Data were not released even for a research project. Because of these restrictions, those who hold the data had the opportunity of demanding lucrative business deals from global and regional level institutions. Survey Department could not issue aerial photographs without permission of Defense Ministry.

It is an urgent need to introduce regulations regarding the public domain data and information and also the policies related to the ownership of the data. Copy right issues of the digital spatial data need to be dealt with to ensure the legal ownership of data products.

Generation of digital spatial data such as cadastral data, land use data, topographic data, etc. is extremely difficult and costly. Further, maintenance of up-to-date dynamic digital spatial databases is very much restricted due to resource constraints and the limitations of technological sophistication available at individual institutions. In this situation, it is of utmost important to pool and share the resources available Processes of data sharing should be facilitated among various institutions in order to utilize these data for national planning and development endeavors. In addition, an approach should be introduced to regularize the data sharing mechanisms.

Lack of standard metadata compilation is another serious drawback in locating the required data archives. Metadata systems allow users to explore and determine whether the data set is useful or not without having to go through the data in detail. The general public and the research scientists are mostly not aware of the possible sources for their data and information needs. Both at national and regional level, creation of accessible metadata sources have become a vital need today.

While Survey department is digitizing existing topographic maps, National Water Supply & Drainage Board (NWSDB) and Urban Development Authority (UDA) are also digitizing topographic maps. It means that duplication of data. If we have data sharing facility NWSDB and UDA can use Survey department's frame work data.

Studying the above situation it is identified that Sri Lanka lacks a well structured information system based on database technology, effective data sharing utility **Spatial-data infrastructure (SDI)**, Spatial data updating, sound concepts & tools for the management of information, operations, performance & quality, interoperability between other organizations to exchange data & GIS services and a front door in order to obtain metadata and to search required data through clearinghouse by users.

2.0 Goals of SDI

The first formal definition of the term 'National Spatial Data Infrastructure' was presented in the US and published in the Federal Register on April 13, 1994. It states that National Spatial Data Infrastructure (NSDI) means the technology, policies, standards, and human resources necessary to acquire process, store, distribute, and improve utilization of geospatial data. Another definition states that Spatial Data Infrastructure encompasses the data sources, systems, linkages, processes, standards and institutional arrangements involved in delivering spatially-related information (both commercially and publicly held) to the widest possible group of potential users. SDI would provide solutions to a number of spatial data problems that exist in the spatial data user community. Goals of the SDI are

- Improve access to information hosted in different organizations
- Facilitate the formation of integrated views from various data sets (improve interoperability among GIS systems)
- Develop of related standards and policies.
- Stimulate and support the development and use of GI, as result of cost reduction for data collection and use of remote GIS services.

2.1 Customer involvement

The survey department is responsible to produce frame work data to the country.There are many situations in which the framework will help users. A regional transportation planning project can use base data supplied by the localities it spans. Government agencies can respond quickly to a natural disaster by combining data. A jurisdiction can use watershed data from beyond its boundaries to plan its water resources. Organisations can better track the ownership of publicly held lands by working with parcel data.

Geographic data users from many disciplines have a recurring need for a few themes of basic data. While these layers may vary from place to place, some common themes include: geodetic control, ortho-imagery, elevation, transportation, official geographic names (gazetteer), hydrography, governmental units, and cadastral information. Many organisations produce and use such data every day. The framework provides basic content for these data themes, and by defining a common schema, it can also provide a common means of information exchange and value-adding.

User requirements can be decide conducting a survey through public. User requirements can be change on following facts;

- Interest of Land information
- On time
- Price
- Quality
- One stop shopping

2.2 Contents of SDI

The urgent need is to encapsulate the national holdings of spatial data in digital format so that a national repository of the map information is available. The digital infrastructure would also enable greater sharing and better access to high quality spatial data and would also improve the well being of our communities. Responsible stewardship of our natural resources for sustainable development depends on making sound scientific information available to local decision makers. Quality of life in a free society is determined by the collective decisions of its individual citizens acting in the home, the workplace, and together as members of the community and these decisions requires the foundation of information, of which spatial information would be a major element. Collective decisions cannot be arrived at in a vacuum.

2.3 Development methodology

When establish a SDI following methodology can be applied.

- Develop information policy concerning the coordination of data collection; data sharing; commitments to standards; right of use; copyrights, privacy; and pricing.
- Develop regulations to minimize obstacles for data sharing and cultural impact.
- Address economics and funds for SDI development.
- Initiate political support and commitments.
- Develop network facilities through all Institutions.
- Establish a front door office, Redesign workflows & Data collection methods as customer oriented way.
- Design a web portal to access the customers
- Training of people to work with new technology.
- Design a database to keep metadata.
- Conduct awareness programs /Advertising for the customers

(See appendix 1 for sample workflow)

2.4 Components of GI Infrastructure

Components of SDI are given below.

- Databases hosting diverse data sets, operating under variety of institutional and technical regulations. The contents and conditions of these DBs are described in a standard form (Metadata). The structure of these data sets is transparent.
- Network (Internet, Intranet) networking user community with these databases, and communication protocols.
- Mechanism to advertise the contents of these databases (Clearinghouse: data and service catalogue and metadata to describe them), and tools to search and access the required service.
- Standards for metadata , data Exchange, quality
- Tools to access DBs, harmonize and integrate heterogeneous data sets.
- Regulations for data sharing, right of use, copy right, pricing policy, responsibility and accountability of stockholders (data/service providers, users, data brokers, politicians.)

3.0 Conclusion

Survey Department is responsible for production of frame work data whole country. Integrating of workflows and spatial data production processes through all GI providers it can implement the SDI. The urgent need is to encapsulate the national holdings of spatial data in digital format so that a national repository of the map information is available. The digital infrastructure would also enable greater sharing and better access to high quality spatial data and would also improve the well being of our communities.

4.0 References

Developing GIM strategies in a Geodata Infrastructure (GDI) Context; GIM Module 6 lecture notes of ITC
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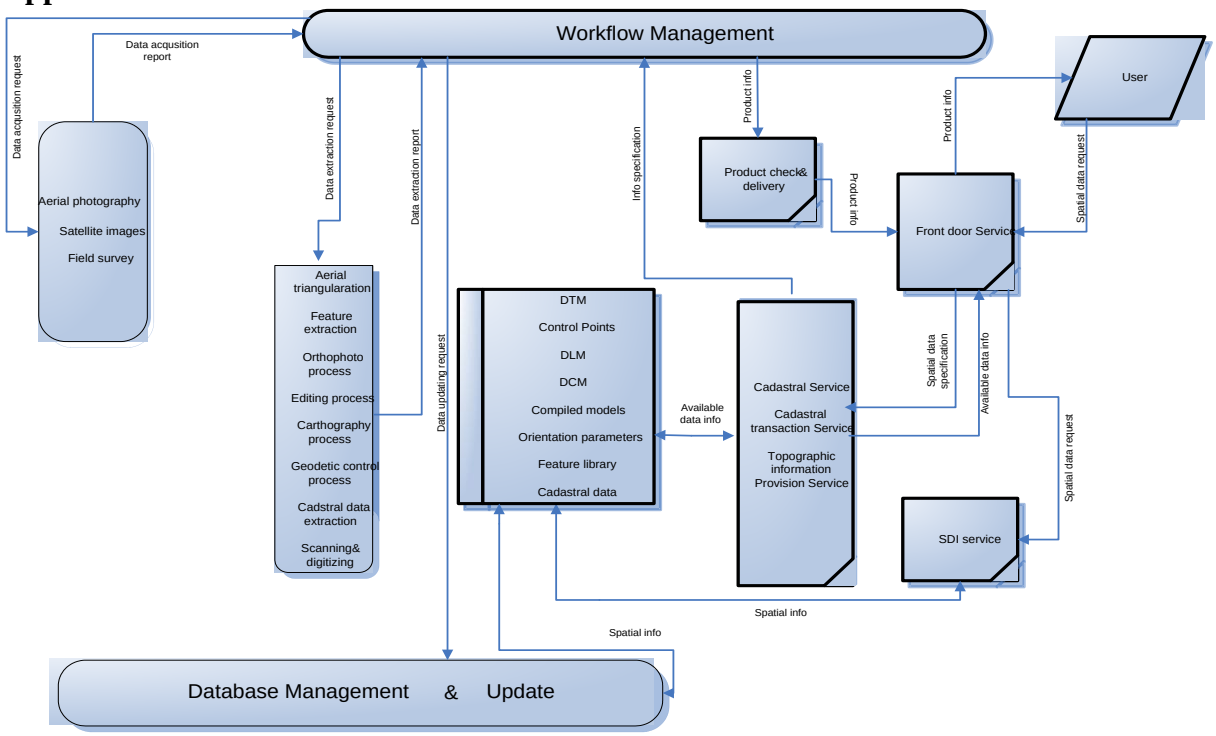
http://www.gisdevelopment.net/proceedings/nsdi/nsdi3.htm
http://www.gisdevelopment.net/proceedings/nsdi/nsdi4.htm

Appendix 1



Largest, Smallest and Greatest in World

Bird, Fastest	- Swift
Bird, Largest	- Ostrich
Bird, Smallest	- Humming Bird
Day Longest	- June 21st
Day Shortest	- December 22nd
Lake, Largest built	- Lake Mead(Boulder Dam)
Lake, Deepest	- Balkal (Siberia) 2,300 ft
Lake Highest	- Titicaca (Bolivia) 12,645ft from sea level
Lake Largest (Fresh Water)	- Lake Superior
Lake Largest (Salt Water)	- Caspian Sea

APPLICATION OF REMOTE SENSING AND GIS FOR FLOOD RISK ANALYSIS: A CASE STUDY AT KALU- GANGA RIVER, SRI LANKA.

By

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ABSTRACT:

Advances in remote sensing technology and new satellite platforms such as ALOS sensors widened the application of satellite data. One of the many fields that these technologies can be applied is to validate flood inundation models. For a long time flood extent from flood inundation models were validated using the ground truth surveys which was not very much reliable. In this study flood extent was extracted from satellite images available for one in 50 year flood event occurred on June 2008 in Kalu-Ganga River, Sri Lanka. Then that was compared with the flood extent derived from the flood extent obtainedfor the 50-year rainfall using HEC-HMS and HEC-RAS. Base on the flood extent, this project is to develop, demonstrate and validate an information system for flood forecasting, planning and management using remote sensing data with the help of Flood Hazard Maps for different return periods (10, 20, 50 and 100 years).

1. INTRODUCTION

Sri Lanka being located in the Indian Ocean between Bay of Bengal and Gulf of Mannar, pressure variations in the Bay of Bengal with high winds give rise to unexpected heavy rains. Further to that Sri Lanka experiences two monsoonal rains and two inter-monsoonal rains in a year. Due to these factors, lower reaches of rivers Kalu-Ganga, Kelani-Ganga and Gin-Ganga are subjected to frequent floods.It is a question that the existing morphology of a river system can accommodate these frequent and prolonged high floods. The other question is the increasing human population encroaching and modifying the floodplains of river systems.

Those factors emphasis the importance of mitigating flood related disasters in Kalu-Ganga River. Application of GIS and remote sensing technology to map flood areas will make it easy to plan non structural measures which reduce the flood damages and risks involved. It will be a great benefit to the people to implement a flood management program that consists of flood forecasting and flood hazard and vulnerability mapping.This paper focuses on analyzing the flood risk in the lowerreaches of the Kalu-Ganga River, inKalutara District.

2 . STUDY AREA

The study area is the Kalu-Ganga River basin andriver located in the western hill slopes of the island, which receives most of the south-west monsoon rainfall making the river basin vulnerable for frequent floods. Watershed covers 2,658 km^2.

3 . DATA USED

3.1 Satellite Data

Polarization combination HH (horizontal polarizations in transmitting and receiving directions) provides a better discrimination of flooded areas than polarization combination HV or VV. In this study also ALOS/PALSAR HH polarization was selected to detect flood extent. Satellite scenes were acquired during the dry season (March, 2008) as well as wet seasons (June, 2008) covering the study area.

3.2 Topographic and GIS Data

Topographic and GIS data used in this study consists of Digital Contour Maps, Spot Heights, Land use maps and LiDAR data. Contour maps used were in 1:10,000 scale with a contour interval of 5 m.

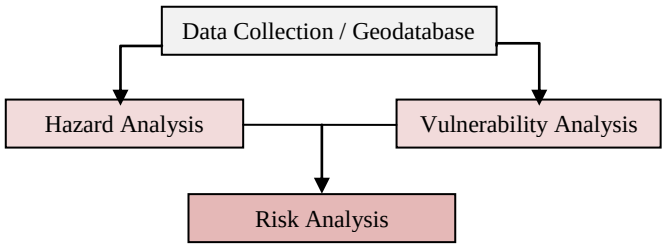
3.3 Hydro-Meteorological Data

Rainfall from 13 meteorological stations and stream flow data at 3 gauging stations were used. Discharges at three gauging stations from 1986 to 1996 were obtained from Department of Irrigation.

Daily rainfall data of 13 rainfall gauging stations for the same period were obtained from the Department of Meteorology.Field Survey Data and Census Dataalso obtained for the project and corresponding flood depths were quarried from the people.

4 . METHODOLOGY

The methodology consists of data collection and data basing required for Hazard analysis and Vulnerability analysis. Based on the Hazard analysis and Vulnerability analysis, the Flood Risk analysis is carried out.



4.1 Hydrologic Analysis

Hydrologic analysis consists of application of HEC-HMS model. As availability of stream flow data was limited, a calibrated rainfall runoff model for the basin based on HEC-HMS was used to predict runoff for rainfall of 50 year return period.

To model rainfall runoff relationship for the basin, *HEC-HMS* was used. The basin model for HEC-HMS was prepared using Geospatial Hydrologic Modeling Extension *(HEC-Geo HMS)*,which uses ArcView and the Spatial Analyst extension of it. Using meteorological data, HEC-HMS model for the Kalu-Ganga River is developed. The model parameters were calibrated and verified on event basis using the rainfall runoff data available. Runoff data required for the HEC-RAS was computed using this calibrated and verified model.

4.2 Hydraulic Analysis

Application of HEC-RAS to obtain flood extent and depth.HEC-GeoRAS andHEC-RAS software were used.

HEC-GeoRAS is specifically designed to process geospatial data for use with the Hydrologic Engineering Center's River Analysis System (HEC-RAS). The tools allow users to pre and post process the data for HEC-RAS. It creates an input file for HEC-RAS containing geometric attribute data from an existing DTM and complementary data sets.

HEC-RAS is a 1D flow model in which the stream morphology is represented by a series of cross sections indexed by river station.Each cross section is defined by a series of lateral and elevation coordinates that are typically obtained from DTM. The flow chart of procedure to obtain the flood extent is explained in Figure 3.

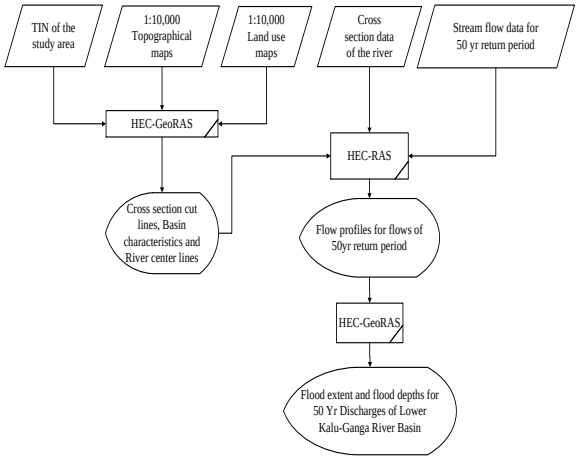


Figure 3: Steps applied for HEC-RAS modeling

4.2.1 Model Inputs

Implementation of HEC-RAS requires inputs which come from three basic categories of data; (i) Geometric data (ii)Basin characteristics and (iii) Flow data

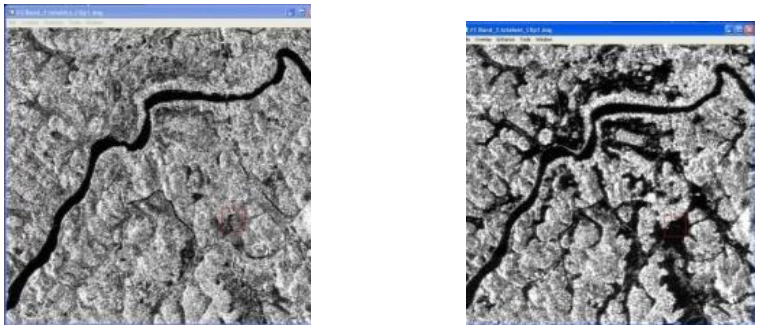
Geometric Data: The requisite geometric data includes stream centerlines and cross section cut lines and these are prepared using the HEC-GeoRAS user interface. The creation of the import file requires a digital terrain model (DTM) of the river system.

Flow Data: Discharge and water level values make the upstream and downstream boundary conditions. For computing flood extent for rainfall of 50 year return period, flows computed using HEC-HMS was used as upstream boundary condition. The water level at river mouth is given as Sea water level (0m).

Flood Simulation: Having completed the setup of the system with the requisite model parameters and variables, a calibration run was performed using the peak discharge value corresponding to the 50 yr return period flood event. The initially used Manning's 'n' values were varied to give the downstream boundary condition. HEC-RAS model simulation results were exported to HEC-GeoRAS for further processing and visualization of flood extents. Results of this simulation are then checked against flood extent delineated from the satellite data which was at the scale of 50 year return period.

4.3 Data Analysis

The extraction of maps of the study area and development of the Triangular Irregular Networks (TIN) using contour maps, spot heights and LiDAR data were carried out. A geodatabase in Arc GIS environment was developed to the study area.The development of microwave remote sensing, particularly radar imageries, solve the problem
To determine the threshold value the images were converted into decibel images (DB). Regions of Interest (ROI) were selected from both images which exhibit sharp changes in the pixel tone.After analyzing the statistics of ROI's a threshold value is determined from DB images to be used in image classification and masking. Using Band math operations the difference of these two images were calculated and masking was done according to the previously determined threshold value. Finally using the masking method the image was classified into two classes' flooded area and not flooded area. Finally flood extent derived from the ALOS/PALSAR image and the Flood Model HEC-RAS was compared.(Figure 4)



ALOSPALSAR Images in Dry date and Wet Date.

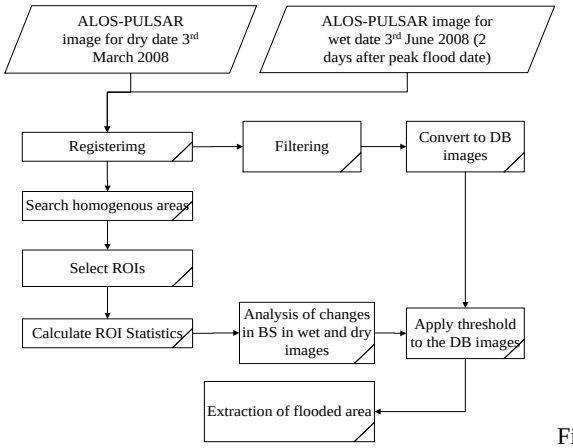


Figure 4: Methodology for flood extent delineation

4.5 Flood Hazard Mapping

Flood hazard is categorized based on the level of difficulties in daily life and/or damage to properties. Flood hazard assessment is the estimation of overall adverse effects of flooding. It depends on many parameters such as depth of flooding, duration of flooding, flood wave velocity and rate of rise of water level. One or more parameters can be considered in the hazard assessment. In the present study, depth of flooding was considered for hazard assessment. A smaller hazard rank was assigned for a lower depth or low hazard while larger hazard rank was used to indicate a higher hazard.

4.6 Vulnerability Analysis.

Mainly two data sets were used for assessment of vulnerability of flood prone areas. First vulnerability was assessed for each GN division using population data and building data.
Secondly, a comprehensive household survey was conducted in the area of interest to collect data on the vulnerability of each household for flood.

4.6.1 Vulnerability Analysis with Census Data.

Vulnerability of all GN divisions was assessed using the age wise population data and construction materials used for the buildings. In the population vulnerability analysis, population of each GN division was categorized according to the age groups and assigned vulnerability rankings. Using the vulnerability ranking assigned to each age group, a population vulnerability

index was calculated for each GN divisions from following formula.

$$PVIGN(i) = \sum_{(i=1-4)} FP\ GN(i)R(i) \qquad (1)$$

Where:***PVIGN(i)*:**The population vulnerability,

***FP GN(i)*:**Fraction of each age group and

R(i): Vulnerability ranking of each age group.

4.6.2 Household Vulnerability Survey

Vulnerability can be defined as a function of contributing factors: exposure, sensitivity and adaptive capacity. Many more variables may also act as major contributing factors. However, from the previous vulnerability assessment done using population and building data. So in order to overcome this deficiency, a comprehensive household vulnerability survey was carried out to ascertain the total vulnerability of households in the region.
Each of these contributing factors is then subdivided in to major component factors while they are also divided to sub component factors. The questionnaire was designed in such a way that each question is tied to a sub component. According to the answer given to a question a numerical value

was assigned to each sub-component and its standardized index value [***Index (sHH)***] was calculated according to following equation.

$$Index\ (sHH) = (Shh - Smin)/(Smax - Smin) \quad (3)$$

Where:***Shh*** is the original sub-component value for the household, ***Smin*** and***Smax*** are the minimum and maximum values, respectively, for each sub- component determined using data from the household survey. Using the sub-component values, major component values [***M(HH)***] are calculated. Then the major contributing factors are calculated utilizing following equation.

$$M(HH) = \sum_{(i=1-n)} Index\ (sHH)i / n \quad (4)$$

Where:***n*** is the number of sub-components belonging to amajor component. These major component values were used to calculate the major contributing factor [***CF (HH)***] in terms of sensitivity, adaptive capacity and exposure.

A weighting system (*Wi*) was introduced according to the relative importance of each major component within a certain contributing factor. Considering the weighting factors assigned to major components contributing factors are calculated using following equation.

$$CF(HH) = [\sum_{(i=1-n)} Wi\ M(HH)i\ ] / [\sum_{(i=1-n)} Wi] \quad (5)$$

Where:***CF(HH)*** is contributing factor (exposure, sensitivity, or adaptive capacity) for each household, ***M(HH)i*** are the major components for Households, ***Wi*** is the weight of each major component, a***n*** is the number of major components in each contributing factor.

Finally, contributing factors are used to calculate the Flood vulnerability index [***FVI***] of each household utilizing the following equation.

$$FVI = [E(HH) - A(HH)\ ] * S(HH) \quad (6)$$

Where:***E(HH)*** is the calculated exposure score,***A(HH)*** is the calculated adaptive capacity score,***S(HH):*** calculated ensitivity score for the household

4.6.4 Results of Household Vulnerability Survey.

The vulnerability distribution of the households closely resembles a normal distribution. According to the distribution, most households had a vulnerability ranging from 0.3 – 0.6 and they fall into moderate vulnerability category. The total number of households was 203.

4.7 Flood Risk Analysis

Considering risk as a function of Hazard &Vulnerability, map multiplication was done in ArcGis environment to generate the Risk Maps corresponding to 10, 20, 50 and 100 yr flood event with respect to both population and buildings.

It was assumed that:

"Risk Index"= "Hazard index X Vulnerability index" and considering the risk index distribution, it was categorized in to 4 sets .

4.7.1Results from Flood Risk Analysis.

Flood risk analysis with respect to population revealed that approximately 11.3 km^2 area is under high risk category while 65.1 km^2 and 33.1 km^2 areas are under moderate and low risk categories respectively for the 100 yr return period flood.

Flood risk analysis with respect to buildings revealed that approximately 5.4 km^2 area is under high risk category while 45.8 km^2 and 58.3 km^2 areas are under moderate and low risk categories respectively in the 100 yr return period flood. Figure 9

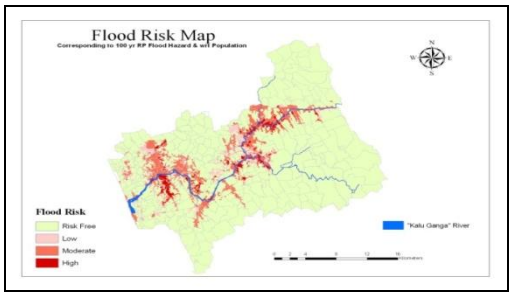


Figure 9: Flood Risk Map for 100 Year period

5.0 RESULTS AND DISCUSSIONS: Flood extents derived from the satellite image satisfactorily matches that of the HEC-RAS model. The area near stream is dry according to the flood extent derived from satellite images. This can be expected as the images were taken on receding limb of the flood as flood peak had been occurred around two days before the satellite image was taken. However, the results are promising. The flood extents derived from the satellite image and the HEC-RAS matches very well though the extent was less in the satellite image.

6. 0 CONCLUSION :

Remote sensing, GIS, and GPS together with flood modeling technique have successfully been applied to prepare the first ever set of Flood Risk Maps for the lower reach of the Kalu Ganga River-Sri Lanka in support of disaster preparedness and mitigation activities.

For the first time in Sri Lanka ALOS/PALSAR derived remote sensing data was utilized successfully for extracting flood extent and thereby to calibrate/validate HEC-RAS model output.

The study had produced a series of (10, 20, 50, 100 yr return period) Hazard maps followed by Vulnerability and Risk Maps corresponding to the above return period events and considering the vulnerability of population and buildings.

The study reveals that about 11.5 km^2 and 5.41 km^2 are at high risk with respect to population and buildings respectively for a 100yr return period flood event. Statistics for the moderate and low risks were found to be as follows; 65.5 and 46 km^2, and 33 and 58.5 km^2, respectively.

A household survey further revealed that approximately 19% of population is highly vulnerable for a 100yr return period flood event whilst the remaining 74% and 7% of them fall into moderate and low vulnerability classes, respectively.

7.0 ACKNOWLEDGEMENT: Authorwould like to acknowledge the **JAXA,Japan** and**GIC, AIT, Thailand** for providing fundsand training for carrying out this project. Special Thanks to **Dr. LalSamarakoon, GIC, AIT**, Thailand Mrs. **H.K.Nandalal,** University of Peradeniya, Sri Lanka and Mr. **D.P.Weliwitiya,**Arthur C Clark Center, Moratuwa, Sri Lanka.

LOW COST DRIVING

by
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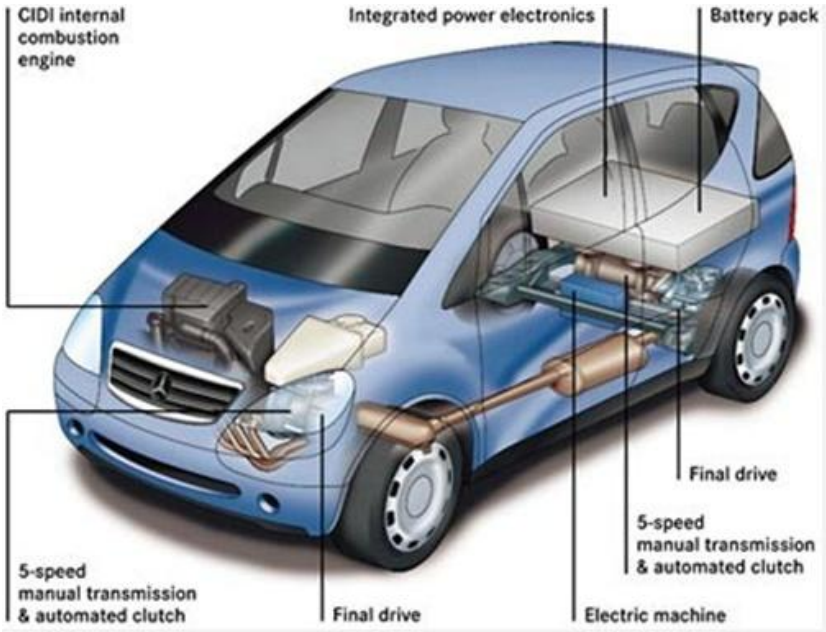
Have you pulled your vehicle up to the gas pump lately after increase of prices and been shocked by the high price of gasoline? As the pump meter passes Rs. 1000, Rs 2000, Rs 3000 or even Rs 5000 still the tank is not full you may be thought about changing your car for something that gets better saving. Or maybe you're worried your vehicle is contributing to the greenhouse effect or else the green test will be unsuccessful.

The auto industry has the technology to address these concerns. It's the hybrid car. There is lot of hybrid models in the market these days, and most automobile manufacturers have announced plans to manufacture their own versions. Unfortunately no one has properly communicated neither had a dialog nor made aware of how does a hybrid automobile work and benefit its users. What goes on under the hood to give you 20 or 30 more kilometers more per litre than a standard automobile? Does it pollute less just because it gets better gas mileage? Many people have probability owned a hybrid vehicle at some point. For example, a moped (a motorized pedal bike) is a type of hybrid because it combines the power of a gasoline engine with the pedal power of its rider. Of course hybrid vehicles are all around us. Most of locomotives we see pulling trains are diesel – electric hybrids. Some main cities in developed countries have diesel – electric hybrid busses. (e.g. Cities like Seattle in the U. S. A.) . Giant mining trucks are often diesel – electric hybrids. Submarines are also hybrid vehicles some are nuclear – electric and some are diesel – electric. Any vehicle that combines two or more sources of power that can directly or indirectly provide propulsion power is a hybrid.Most hybrid cars on the road right now are gasoline – electric hybrids, although French car market Peugeot and Citroen has two diesel - electric hybrid cars in progress.



Hybrid cars usually have a front engine and rear battery pack. The battery packs are used to store energy that is lost through braking and decelerating.

Low - speed Driving

A gas/petrol engine is not energy efficient in running a car in the low speed range. On the other hand, electric motors are energy efficient in running a car in the low speed range. Therefore, specially Toyota hybrid vehicles use the electric energy stored in its battery to run the car on the electric motors in low speed range. If you are expecting the maximum benefit out of a hybrid vehicle it is recommended on slow driving under these circumstances. Anyhow finally it is up to you to make the best choice depending on other factors such as replacement of the new batteries, our road conditions , climate conditions and second hand demand in the local market of hybrid vehicles in the days to come.

Source : Internet

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தேசவழமைச் சட்டம் - ஓர் அறிமுகம்
Intruduction of "Law of Thesawalamai"
P. Sivananthan, Snr. Supdt. of Surveys, Batticaloa

அறிமுகம்

இலங்கை மக்களாகிய நாங்கள் பல்வேறு வகையான சட்டங்களால் ஆளப்பட்டுவருகிறோம். அவற்றுள் தேசவழமைச் சட்டமும் முக்கியமானதாகும். தேசவழமைச் சட்டமானது ஆதனங்கள் தொடர்பிலும் ஆட்கள் தொடர்பிலும் இன்னும் வடமாகாணத்தில் பயன்படுத்தப்பட்டுவரும் ஒரு வலிமையான சட்டமாகும்.

டச்சுக்காரர்கள் இலங்கையை ஆட்சி செய்து கொண்டிருந்த போது 1704ம் ஆண்டிலே யாழ்ப்பாணத்தில் வாழ்ந்த தமிழ் மக்களின் வழக்காறுகள் பற்றி விசாரணைசெய்து அவற்றைத் தொகுக்கும்படி டச்சுக் கவர்னர் சைமன்ஸ் அவர்கள் யாழ்ப்பாண பட்டினத்தின் திசாவையாக இருந்த கிளாஸ் ஐசக் (Class Isac) என்பவரைப் பணித்திருந்தார். அவரால் டச்சு மொழியில் தொகுக்கப்பட்ட இந்த ஆவணம் பின்னர் ஒன்றுதிரட்டப்பட்டு தமிழில் மொழி பெயர்க்கப்பட்டது. இது 1814 ஆம் ஆண்டில் பிரதம நீதியரசரான சேர் அலக்சாண்டர் ஜோன்சன் அவர்களால் ஆங்கிலத்தில் மொழிபெயர்க்கப்பட்டது. அக்காலத்திலிருந்து தேசவழமைச்சட்ம் சட்ட நூலில் இருந்து வருகிறது.

தேசவழமைச்சட்டம் யாருக்கு ஏற்புடையதாகும்.

1806 ஆம் ஆண்டின் 18 ஆம் இலக்க ஒழுங்கு விதி வட மாகாணத்தில் தமிழ் மக்களுக்கு இடையேயான எல்லாப் பிரச்சனைகளும் அல்லது தமிழ் மக்கள் வழக்கில் எதிராளியாக இருக்குமிடத்து அவை தேசவழமை வழக்காறுகளுக்கு இணங்க முடிவுசெய்யப்படல் வேண்டும் எனக்கூறுகிறது. மேலும், தொடர்ந்து நோக்கினால் தேசவழமைச் சட்டமானது இரு பகுதிகளைக் கொண்டது. ஒன்று ''ஆள்சார்'' சட்டமாகும், மற்றயது ''இடம்சார்'' சட்டமாகும்.

வழக்குத் தீர்ப்புக்களை நோக்கினால் ஆள்சார் சட்டம் எனும்போது ''யாழ்ப்பாணவாசி'' என்ற பதத்திற்கு உட்படும் ஒருவர் அதாவது தற்போதைய யாழ்ப்பாண மாவட்டம், கிளிநொச்சி மாவட்டம், முல்லைத்தீவு மாவட்டம், வவுனியா மாவட்டம், மன்னார் மாவட்டம் ஆகிய மாவட்டங்களில் ஏதாவது ஒன்றில் நிரந்தர வதிவிட உரிமையையும் வதிவிட எண்ணத்தையும் கொண்ட தமிழர் ஒருவர் தேசவழமைச் சட்டத்தால் ஆளத்தகுதியுடையவராவார். அடுத்து தேசவழமைச் சட்டமானது இடம்சார் சட்டம் என்ற கருத்தில் மேலே குறிப்பிட்ட ஐந்து மாவட்டங்களில் உள்ள அசையா ஆதனங்கள் அவை எவருக்கு (தமிழர், சிங்களவர், முஸ்லிம், மற்றையோர்) சொந்தமாக இருப்பினும் தேசவழமைச் சட்டதாலேயே ஆளப்படும்.

வாழ்க்கைத்துணையைப் பொறுத்தவரை 1911 ஆம் ஆண்டின் 1ஆம் இலக்க கட்டளைச்சட்டத்தின்(யாழ்ப்பாண திருமண உரிமைகளும் வழியுரிமைகளும் கட்டளைச் சட்டத்தின்) 3ஆம் பரிவு பின்வருமாறு கூறுகிறது.

- தேசவழமைச் சட்டம் ஏற்புடையதான பெண் தேசவழமைச் சட்டம் ஏற்புடையதாகாத ஆண் ஒருவரை திருமணம் செய்கின்றவிடத்து, அத்திருமணம் நிலைத்திருக்கின்ற காலத்தின்போது அவள் தேசவழமைச் சட்டத்திற்கு அமைந்தவள் ஆகமாட்டாள்.
- தேசவழமைச் சட்டம் ஏற்புடையதாகாத பெண் தேசவழமைச் சட்டம் ஏற்புடையதாகின்ற ஒரு ஆணைத் திருமணம் செய்கின்றபோது அத் திருமணம் நிலைத்திருக்கின்ற காலத்தின் போது, அவள் தேசவழமைச் சட்டத்திற்கு அமைந்தவள் ஆவாள்.

தேசவழமைச் சட்டத்தில் திருமணம் தொடர்பான விடயங்கள்.

தேசவழமைச் சட்டத்தால் ஆளப்படுவோருக்கு திருமண உரிமைகளும் வழியுரிமைகளும் கட்டளைச்சட்டம், மணப்பெண்டிர் ஆதனச்சட்டம் ஆகிய சட்டங்கள் ஏற்புடையனவாகாது. இவர்களை யாழ்ப்பாண திருமண உரிமைகளும் வழியுரிமைகளும் கட்டளைச்சட்டம்(1911), 1947 ஆம் ஆண்டின் 58 ஆம் இலக்க திருத்தக் கட்டளைச் சட்டம் ஆகியன ஆளுகின்றன. செல்லுபடியாகக் கூடிய ஒரு திருமணத்திற்கு தேசவழமைச் சட்டத்தின்படி பின்வரும் ஆறு முக்கிய விடயங்கள் தேவையாகவுள்ளன.

1. திருமணம் செய்யப்போகும் ஆணினதும் பெண்ணினதும் சம்மதம்.
2. பெற்றோரின் சம்மதம்.
3. தடுக்கப்பட்ட உறவுமுறைக்குள் திருமணம் செய்யலாகாது.
4. இருவரும் திருமண வயதை அடைந்திருக்க வேண்டும்.
5. ஏற்கனவே திருமணம் செய்தவர்கள் அத்திருமணம் வலுவில் இருக்கும் போது இன்னுமொரு திருமணம் செய்யலாகாது.
6. தேவையான சடங்குகள் நிகழ்த்தப்பட வேண்டும்.

பதிவு செய்யப்பட்டாலொழிய எந்தத் திருமணமும் செல்லுபடியாகாது என்று 1895 இன் 2 ஆம் இலக்க கட்டளைச்சட்டம் வெளிப்படுத்தியது, ஆனால் இக்கட்டளைச்சட்டம் அடுத்த ஆண்டில் 1896 ஆம் ஆண்டின் 10 ஆம் இலக்க கட்டளைச் சட்டத்தால் நீக்கப்பட்டது.

செல்லுபடியாகும் திருமணமொன்று செய்யப்பட்டதும் அதனால் ஏற்படும் புதிய அந்தஸ்த்தினால் சட்ட விளைவுகள் சில எழுகின்றன. தேசவழமைச் சட்டத்திற்குட்பட்ட திருமணமான பெண் அசையா ஆதனம் தொடர்பாக எந்த உறுதியையும் தனது கணவனுடன் சேர்ந்தே(கணவரின் சம்மதத்துடன்) எழுத வேண்டும் என்பது கட்டாய விதியாகும். அது அவளது தனிப்பட்ட சொத்தாக இருந்தாலும் சரி, தேடிய தேட்டப்பங்கு அல்லது சீதனம், நன்கொடை யாவற்றுக்கும் இது பொருந்தும். எனினும் 1911 ஆம் ஆண்டின் 1 ஆம் இலக்க கட்டளைச் சட்டத்தின் 8 ஆம் பிரிவின்படி சில காரணங்களை நிரூபித்து மாவட்ட நீதிமன்றின் அனுமதியைப் பெற்றபின்னர் கணவரின் சம்மதமின்றி அவளது அசையா ஆதனத்தையும் கைமாற்றமுடியும.

திருமணமான ஆண் தான் திருமணம் செய்வதற்கு முன்னர் வாங்கிய அறுதி ஆதனத்தையும் அவனுக்கு நன்கொடை, முதுசொம், உரிமைவழி வந்தடைந்த ஆதனத்தையும் கைமாற்றம் செய்ய முழு உரிமையுடையவன். அதே போல் திருமணத்தின் பின் வாங்கிய தேடிய தேட்டத்தில் சரி அரைப்பங்கை தன் விருப்பப்படி எதுவும் செய்யலாம்.

குடியியல் வழக்கு ஒன்றில் தேசவழமைக்குட்பட்ட திருமணமானபெண் ஒருவர் அவளது கணவனுடன் இணைந்தே வழக்காளியாகவோ எதிராளியாகவோ தோன்ற முடியும். மேலும், குற்றவியல் வழக்கிற்கு இது பொருந்தாது. விதிவிலக்காக திருமண நீக்க வழக்குகளிலும் தனது தனிப்பட்ட ஆதனத்தையும் மீட்பதற்காக கணவனுக்கெதிராக வழக்குத் தொடுக்கும் உரிமை மனைவிக்குண்டு.

ஆதனங்கள் தொடர்பான தேசவழமைச் சட்ட ஏற்பாடுகள்.

தேசவழமைச் சட்டத்தின் கீழ் ஆதனங்கள் பின்வருமாறு வகைப்படுத்தப்பட்டுள்ளது.

- முதுசொம்
- சீதனம்
- தேடிய தேட்டம்.
- உரிமை

ஒருவரது பெற்றோர் இறப்பதால் அல்லது பெற்றோர் வழி மூதாதையர் இறப்பதால் வழிவழியாக ஒருவரை வந்தடையும் ஆதனமே "முதுசொம்" எனப்படும். கணவனுடைய முதுச ஆதனத்தில் மனைவிக்கோ அல்லது மனைவியினுயை முதுச ஆதனத்தில் கணவனுக்கோ எவ்வித உரிமையும் கிடையாது. இறந்த ஒருவரின் முதுச ஆதனம் அவரது பிள்ளைகளையே சென்றடையும். அவரது வாழ்க்கைத்துணை அவ் ஆதனத்தில் உரிமைகோரமுடியாது. முதுச ஆதனத்தை விற்று வரும் பணத்தில் வாங்கும் ஆதனமும் முதுசம் ஆதனமேயாகும்.

முறையான திருமணம் செய்துகொள்ளும் பெண்ணுக்கு திருமணத்தை முன்னிட்டு கொடுக்கப்படும் ஆதனமே சீதனமாகும். திருமணத்திற்கு முன்னரோ திருமணத்தன்றோ அல்லது திருமணத்தின் பின்னரோ சீதனம் கொடுக்கப்படலாம். சீதன ஆதனமானது சீதன உறுதி மூலமே கொடுக்கப்படும். சீதன ஆதனம் மனைவிக்கு மட்டுமே உரிய தனிச்சொத்தாகும். சீதனம் கொடுக்கப்பட்டால் அதன்பின் எக்காரணம் கொண்டும் அதனை கைமீட்க முடியாது. சீதனத்தைப் பெற்றுக்கொண்ட பெண் அந்த ஆதனத்தை கைமாற்றம் செய்யாமல் இறந்தால் மட்டுமே அவளது பிள்ளைகளை அது சென்றடையும். பிள்ளைகள் இன்றி இறப்பாராயின் சீதனத்தை யார் கொடுத்தார்களோ அவர்களை அவ் ஆதனம் மீளச்சென்றடையும். அவர்களும் இறந்திருப்பின் அவளது சகோதரங்களுக்கு சமபங்காக சென்றடையும். அசையா ஆதனத்தை சீதனமாக பெற்றுக்கொண்ட பெண் அதன்பின் அவளது பெற்றோர் இறந்தபின் அவர்களது மேலதிக சொத்தில் பங்கு கோரமுடியாது. ஆனால் அசையா ஆதனத்தை சீதனமாகப் பெறாது நன்கொடையாக பெற்றுக் கொண்ட பெண் பெற்றோர் இறந்த பின் அவர்களது சொத்தில் பங்கு கோரமுடியும். மேலும் சீதன உறுதி எழுதப்படும்போதும் நன்கொடை உறுதி எழுதப்படும் போதும் அசையா ஆதனத்தைக் கொடுப்பவர் தங்களுக்கு சீவிய உரித்தை வைத்துக்கொண்டு அதனை உறுதியில் தெளிவாகக் காட்டி எழுதமுடியும்.

திருமணம் நிலைத்திருக்கும் காலத்தில் கணவனால் அல்லது மனைவியால் அல்லது இருவரும் சேர்ந்து விலை கொடுத்து வாங்கும் ஆதனம் தேடிய தேட்டம் என அழைக்கப்படும். தேடிய தேட்டத்தில் அரைவாசிப்பங்கு கணவனுக்கும் மிகுதி அரைவாசி மனைவிக்கும் சொந்தமாகும். கணவன் தன் தேடிய தேட்டப் பங்கை தன் விருப்பப்படி கைமாற்றமுடியும். ஆனால் மனைவி தேசவழமைச் சட்டத்திற்குட்பட்ட திருமணமானபெண் என்பதால் கணவனுடன் சேர்ந்தே தன் தேடிய தேட்டப் பங்கை கைமாற்றமுடியும். தேடிய தேட்டமுடைய குடும்பத்தில் கணவன் அல்லது மனைவி ஒருவர் இறந்தால் இறந்தவருக்குரிய பங்கில் அரைப்பங்கு அதாவது முழு ஆதனத்தின் கால் பங்கு வாழ்க்கைத்துணைக்கும் மீதி அதாவது முழு ஆதனத்தின் கால் பங்கு இறந்தவரின் பிள்ளைகளுக்கு சமபங்காக சென்றடையும். பிள்ளைகள் இல்லாவிடின் இறந்தவரின் பெற்றோர் சகோதரங்களுக்கு உரிமை வழியாக சென்றடையும். எனவே உயிருடனிருக்கும் வாழ்க்கைத்துணைக்கு முக்கால்(3/4) பங்கு சொந்தமாகிவிடும். பிள்ளைகளுக்கு கால்(1/4) பங்கு சொந்தமாகும். தேடிய தேட்டம் பிள்ளைகளை சென்றடையும் போது அது முதுசொம் என்ற பெயரைப் பெறும் சீதனம் வாங்கித் திருமணம் செய்த பெண் பிள்ளைகளுக்கு இந்த பங்கைப்பெற தகுதியில்லை.

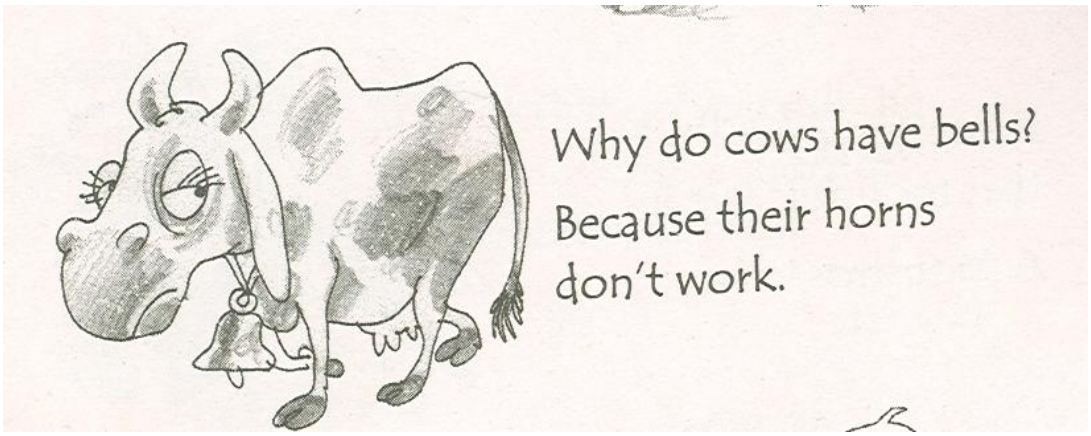
பெற்றோர் அல்லது மூதாதையர் தவிர்ந்த உறவினர் ஒருவர் இறக்கும் போது வழிவழியாக ஒருவரை வந்தடையும் ஆதனம் உரிமை(அடிநிலை) ஆதனம் அல்லது மலட்டுச்சொத்து எனப்படும். உரிமை வழியாக ஒரு ஆதனத்தைப் பெறுபவருக்கு அது அவரது தனிப்பட்ட ஆதனமாக அமையும் என்பதோடு அவர் அதனை தன் விருப்பப்படி கைமாற்றம் செய்யமுடியும். இது பெரும்பாலும் சொரியல் பங்காகவே இருக்கும்.

எமது நாட்டில் பொதுச்சட்டமே இலங்கை முழுவதற்கும் வலுவுடையதாக இருப்பினும் தேசவழமைச்சட்டம் , கண்டியர் சட்டம், முஸ்லிம் சட்டம் என்பவையும் நடைமுறையிலுள்ளன. இவற்றுள் தேசவழமைச் சட்டமானது இந்த நாட்டில் வாழும் தமிழ் மக்களை அடையாளப்படுத்திக் காட்டும் ஒரு சட்டமாக இருப்பதுடன் தமிழ் மக்களின் தொன்றுதொட்டு நடைமுறையில் இருக்கும் வழக்காறுகளை மிகத் தெளிவாக கையாளுவதை உறுதிப்படுத்தும் சட்டமாகவுமுள்ளது. மேலும் இது பெண்களின் பொருளாதார உரிமைகளை சட்டரீதியாகப் பாதுகாக்கும் ஒரு சட்டமாகவுமுள்ளது. குறிப்பாக நிலஅளவையாளர்களுக்கு நாட்டிலுள்ள சட்டங்கள் பற்றிய தெளிவான அறிவு அத்தியாவசியமாகிறது. மேலும் வடபகுதியில் நிலஅளவையில் ஈடுபடும் நிலஅளவையாளர்கள் தங்கள் கடமைகளை சரியாக மேற்கொள்வதற்கு தேசவழமைச் சட்டம் பற்றிய ஆழ்ந்த அறிவுடையவர்களாயிருக்க வேண்டும். இக்கட்டுரையில் தேசவழமைச் சட்டம் பற்றி முழுமையாக ஆராயவிட்டாலும் முக்கிய விடயங்கள் பற்றி சுருக்கமாக அறிமுகப்படுத்தியுள்ளேன்.

உசாத்துணை

(i) Law of Thesawalamai by Saba Raveendran, Attorney at Law & Notry Public

(ii) The Laws and Customs of the Tamil of Jaffna by Dr. H.W. Tambiah.



Photos of 210th Anniversary of the Survey Department of Sri Lanka

Surveyor General, former Surveyor Generals with Minister and Deputy Minister at 210th Anniversary

Surveyor General addresses the 210th Anniversary Meeting.

210th anniversary exhibition

210th anniversary exhibition

210th anniversary exhibition

210th anniversary exhibition