INTRODUCTION TO FLOOD INUNDATION MODEL

INTRODUCTION

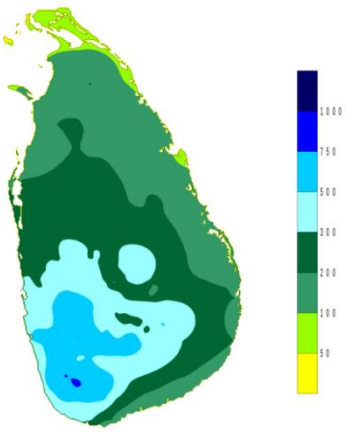
1. Sri Lanka is a well richest country in all aspects especially on natural resources. The country has more than 2500 years of written history, but it also has been discovered that well-developed society was there from the beginning. An ancient document reveals that, Sri Lanka's economy was based on farming and early settlements were mainly made near the rivers which had the water necessary for farming the whole year round. When population increases and modification of people's way of earnings, they have gradually shifted to the mountains and other areas.

CLIMATE PATTERN OF SRI LANKA

2. Sri Lanka's is in the Indian Ocean in between latitudes 5° and 10°N, and longitudes 79° and 82°E. The climate is tropical and warm, due to the moderating effects of ocean winds. The rainfall pattern is influenced by the monsoon winds of the Indian Ocean and Bay of Bengal and is divided by four seasons.

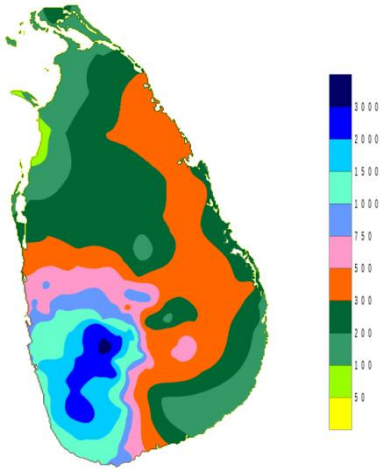
a. First Inter Monsoon Season (March – April)

In this season, Sri Lanka can experience thunderstorm-type rains, particularly during the afternoon or evening. The distribution of rainfall during this period shows that the entire South-western sector at the hill country receiving 250 mm of rainfall, with localize area on the South-western slops experiencing rainfall in exceeds of 700 mm.



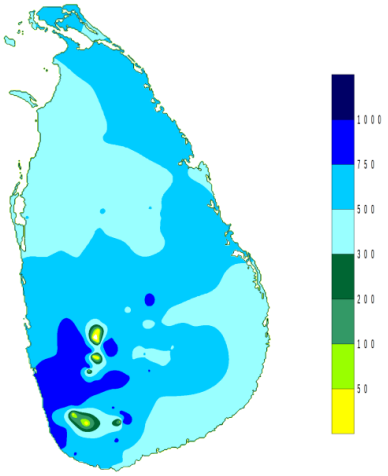
b. South-West Monsoon Season (May – September)

In this season, Sri Lanka can experience at any times of the day and night, sometimes intermittently mainly in the Southwestern part of the country. Amount of rainfall during this season varies from about 100 mm to over 3000 mm. The highest rainfall received in the mid-elevations of the western slops (Ginigathhena- 3267 mm, Watawala- 3252 mm, Norton- 3121 mm). Rainfall decreases rapidly from these maximum regions towards the higher elevation, in Nuwara-eliya drops to 853 mm. The variation towards the Southwestern coastal area is less rapid, with the Southwestern coastal belt experiencing between 1000 mm to 1600 mm of rain during this 5 month long period.



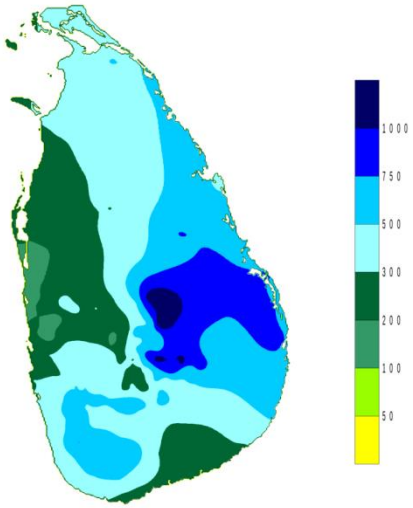
c. Second Inter Monsoon Season (October – November)

The thunderstorm-type of rain, particularly during the afternoon or evening, is the typical climate during this season. But unlike in the Inter-monsoon season, the influence of weather system like depression and cyclones in the Bay of Bengal is common during the second Inter-monsoon season. Under such conditions, the whole country experiences strong winds with wide spread rain, sometimes leading to floods and landslides. The second Inter-monsoon period of October – November is the period with the most evenly balanced distribution of rainfall over Sri Lanka. Almost the entire island receives in excess of 400 mm of rain during this season.



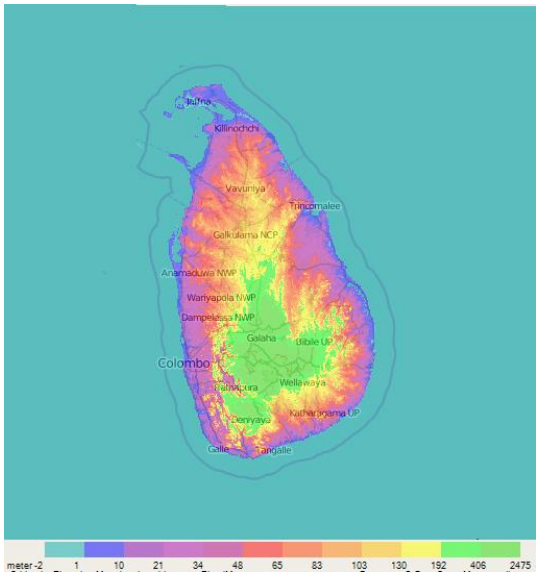
d. North-East Monsoon Season (December – February)

Cloud-free skies provide days full of sunshine and pleasant and cool night. During this period, the highest rainfall figures are recorded in the North, Eastern slopes of the hill country and the Eastern slopes of the Knuckles/Rangala range. The maximum rainfall is experience at Kobonella Estate (1281 mm), and the minimum is in the Western coastal area around Puttalam (Chilaw-177 mm) during this period.



THE TOPOGRAPHY

3. The central part of the southern half of island is mountainous with heights more than 2.5 Km. The core regions of the central highlands contain many complex topographical features such as ridges, peaks, plateaus, basins, valleys and escarpments. The remainder of the island is practically flat except for several small hills that rise abruptly in the lowlands.



STREAM NETWORK

4. Most of the water source areas are at the central hills and rivers are flowing down radially through the central hill mass towards the flat land.

FOREST AND SPONGE EFFECT

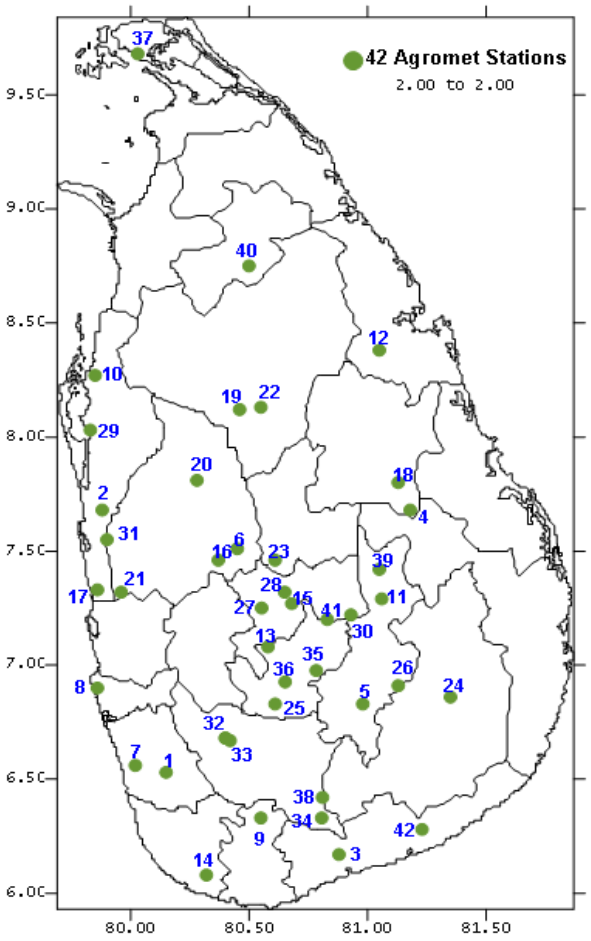
5. Natural forests cover in the central hills captures the monsoon rains. This is identified as sponge effect of the forest cover and promotes gradual absorption of storm water into the soil mass and reduces the speed of water droplets and minimizes soil erosion in steep slopes.

6. Canopy of the forest cover act as a sponge and absorb water from storms and clouds creating humid environment throughout the year. Water within the soils in central hills provides year round ground water supply to water springs, streams, tributaries and rivers while flourishing reservoir network at the flat lands.

AGROMETEOROLOGY

7. Agro-meteorological network was started in 1973 with the guidance and donations given by United Nations Development Program (UNDP) as a result of it, so many agrometeorological stations were established island wide under certain institutions such as coconut research

rubber research agriculture research paddy research and tea research at the beginning.



1. AGALAWATTA
2. AMBEKELLE
3. ERAMINIYAYA
4. ARALAGANWILA
5. BANDARAWELA
6. BATHALAGODA
7. BOMBUWELA
8. COLOMBO
9. DENIYAYA
10. ELUWANKULAMA
11. GIRADURUKOTTE
12. KANTALE
13. KOTHMALE
14. KOTTAWA
15. KUNDASALE
16. KURUNEGALA
17. B'DIRRIPPUWA
18. MADURU OYA
19. MAHA ILLUPPALLAMA
20. MAHAWA
21. MAKADURA
22. MARADANKADAWALA
23. MATHALE
24. MONERAGALA
25. NORWOOD
26. PASSARA-TRI
27. GANNORUWA(PERA)
28. POLGOLLA
29. PUTTALAM
30. RANDENIGALA
31. RATHMALAGARA
32. RATHNAPURA
33. RATHNAPURA-TRI
34. SEVANAGALA
35. SEETHAELIYA
36. THALAWAKELLE
37. THIRUNALVALI
38. UDAWALAWE
39. ULHITIYA
40. VAVUNIYA
41. VICTORIA
42. WEERAWILA

WHY FLOOD?

8. Flood has been affected to Sri Lanka in every year due to many reasons.

a. Shrinking of open space due to illegal construction.
b. Lack of proper waste disposal .
c. Insufficient and improper drainage system.
d. Filling up low lands for construction.
e. Choked storm water drains /streams.
f. Unpredictable short time heavy rain.

WHY LANDSLIDE?

9. In general, there are many reasons for landslides but in Sri Lanka, it is mainly because of common human causes like,

a. Deforestation.
b. Excavation.
c. Loading.
d. Water Management. (Ground water draw down and water leakage)
e. Land Use. (construction of roads, houses etc.)
f. Mining and Quarrying.
g. Vibration.

HUMANITARIAN ASSISTANCE

10. Humanitarian assistance is the assistance provided for humanitarian purposes such as material or logistical assistance, typically in response to humanitarian crises such as natural disasters and man-made disaster. The primary objective of humanitarian aid is to save lives, relieve suffering, and maintain human dignity.

DISASTER RESPONSE

11. Disaster response is the second phase of the disaster management cycle. It consists of number of elements, for example; warning/evacuation, search and rescue, providing immediate assistance, assessing damage, continuing assistance and the immediate restoration of infrastructure. The aim of emergency response is to provide immediate assistance to maintain life, improve health and support the morale of the affected population. Such assistance may range from providing specific but limited aid, such as assisting refugees with transport, temporary shelter, and food, to establishing semi-permanent settlement in camps and other locations. It also may involve initial repairs to damaged infrastructure.

AGENCIES INVOLVED FOR HA/DR

12. As per the details published under The National Council for Disaster Management (NCDM), it comprises with following government ministries,

a. Disaster Management Center

b. Social Services

c. Rehabilitation and Reconstruction

d. Home Affairs

e. Health

f. Science and Technology

g. Housing

h. Coastal Construction

i. Irrigation

j. Power

k. Defense

l. Police

m. Finance

n. Land

o. Fisheries and Aquatic

p. Foreign Affairs

q. Water Supply

r. Highways

s. Urban Development

t. Education

u. Environment

THE PROBLEM

13. At the beginning of the civilization of Sri Lanka, all responsible authorities are knowledgeable enough about the result of monsoon rains and it's affected areas, but every year, as a country, have to work on flood reliefs, disaster responses and humanitarian assistance. According to the viewpoint, in any flood situation ,focus should be not only on a disaster recovery system, but also a right mechanism to avoid flood occurs.

14. In 2017, a flash flood situation occurs after the rain started and it continues for few days but, no any single responsible authority was able to issue a disaster warning or was not able to take any pre action to evaporate people who can be affected. Finally, tri services and the police came in action and performed the salvation part.

15. Above worse scenario was applicable for later landslide situations as well. All responsible agencies were waited until the disaster to happen to work on disaster recoveries after landslide.

16. As mentioned above, there are more than 20 government agencies which operating with the aim of HA/DR, We have to re-consider that, whether they have achieved their primary objective successfully or is that they efficient enough or have they gained best interest to the country.

SOLUTION

17. Sri Lanka should have the flood inundation model with long term plan to avoid such situation and to safe guard the life and properties of the people. The scope of the flood inundation model as follows,

MEASURING OF RAIN FALL AND FLOOD WATER

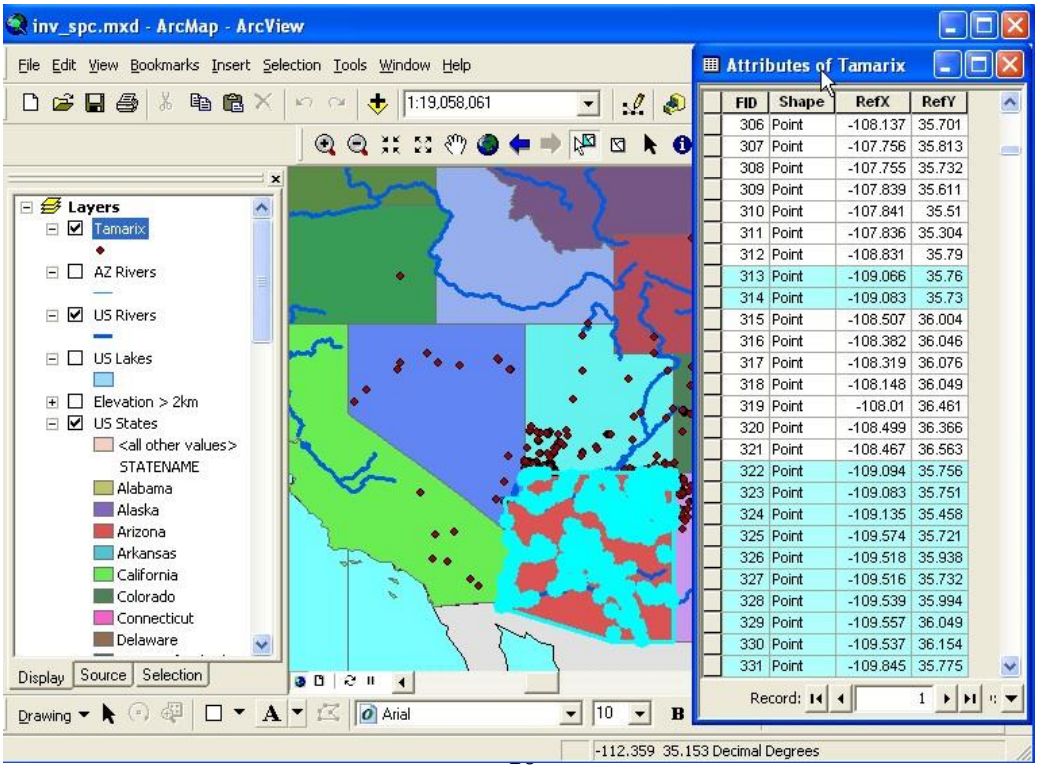
18. As mentioned above, there are only 42 Agro-met Stations located to measure rain fall but, those were established to get information for agricultural purposes not to produce information for flood recoveries. The information provided by these stations are not sufficient to build up a logical ratio against the flood. Hence we should established an Automated Rainfall Measuring Unit and a Flood Water Measuring Unit by using GSM (Global System for Mobile Communication), in order to generate data automatically. And these units should place in various remote areas according to the requirement.

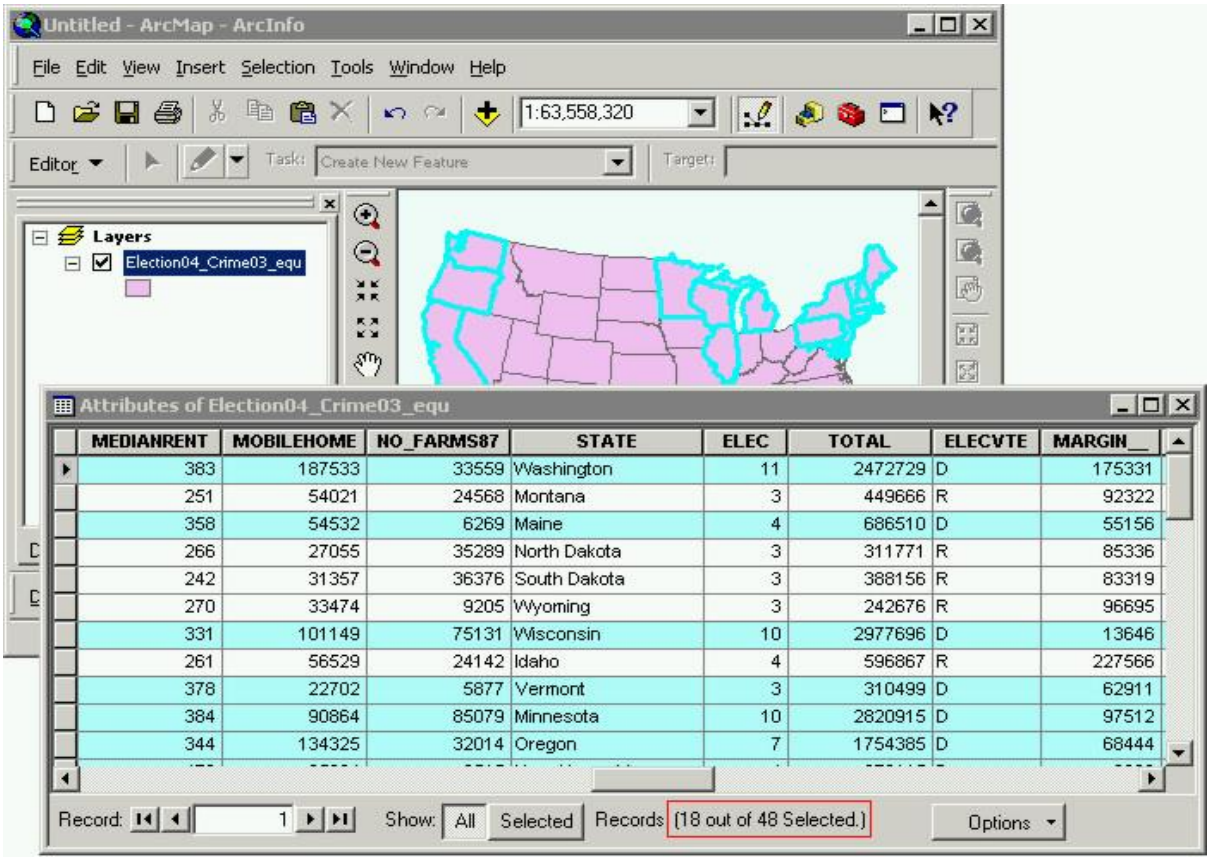
WHAT IS GIS?

19. A geographic information system (**GIS**) is a system designed to capture, store, manipulate, analyze, manage, and present spatial or geographic data. What goes beyond a GIS is a spatial data infrastructure, a concept that has no such restrictive boundaries.

20. GIS applications are tools that allow users to create interactive queries (user-created searches), analyze spatial information, edit data in maps, and present the results of all these operations. GIS can refer to a number of different technologies, processes, and methods. It is attached to many operations and has many applications related to engineering, planning, management, transport/logistics, insurance, telecommunications, and business

21. By using GIS mapping can store any kind of data like square meters in a ground area, floor area, height of a ground, elevation etc…. These data are stored in a database using relevant computer software. There for can easily retrieve the available data for many purposes like new projection, education, research etc. It is very easy to make several copies and secure the data because of this reason. Some of the data which stored in a GIS database are shown below.





PREPARATION OF GIS BASE SYSTEM

22. It is required to design a map based on GIS (Geographical Information System) with following features.

a. Road Network.

b. Stream Network.

c. Government Offices.

d. Hospitals.

e. Tri Services Camps / Police Stations.

f. GN Divisions including details of Grama Niladari.

g. Previous Flood Details.

h. Details of Families in Affected Areas.

i. Safety Locations.

j. Details of Community Leaders.

k. Marking of RED Zones and Coloring of Other Affected Areas.

l. Details of emergency deployment places.

m. Details of emergency deployment equipment.

n. Details of emergency deployment teams.

o. Details of government stake holders.

p. Details of media .

q. Details of other non-government organizations related to DR/HA.

23. Furthermore with the support of all those details system should have facilitate to do the real-time analytical capability and generate real-time decision support information for all the relevant authorities.

IMPLEMENTATION

23. If Sri Lanka has implemented above described system, the responsible authorities will be able to experience the effectiveness and the community will not be needed any further discussions on flood relief or Disaster Management.

14. Through above mentioned system, it will be able to calculate a ratio between rain and flood.

For an example: If the rain is 100 ml flood water will be 2m.

15. Based on that ratio and previously collected flood database, system will identify the areas that going to be affected and those areas can be colored differently on the map prior to the disaster.

16. By various ground surveys and data available in local authorities, system will be able to filter out information on people and their properties which located in those particular zones.

17. Then, responsible parties will be able to introduce an early warning system to evaporate the peoples systematically. It will be more like alarm

system which has already been used for Tsunami warnings or telephone calls and system generated SMS.

18. Safety locations should be identified and marked prior to all this and the community should educate on those locations as they can figure out which process should follow at any disaster. In addition to that, adequate rehearsals should be given to the community, in order to avoid unnecessary ambiguities.

19. If this process works properly, it will not be required to re-calculate number of people at any safety locations, since the system itself can generate people's data age wise, gender wise etc. Then it will be very easy to facilitate foods and other requirements they needed.

20. As per the data generated by the system, the disaster recovery centers should maintain adequate number of ration packs to cater initial rush at any disaster any time.

21. The system should highlighted feasible areas that affected people can move and it will also be helpful to evaporate people and their valuable properties from colored areas.

22. Responsible authorities should not give approval to build up new permanent structures on colored areas and policy decision should be taken in order to refrain people from settle down on those areas.

CONCLUSION

"Prevention is better than the cure"

23. This famous quote saying was about health but considering the HA/DR of flood and landslide, it can also get prevention actions rather than people to undergo bad situations and to salvage.

24. It is the best time to all responsible authorities for HA/DR get to gather and prepared this type of computer based system and using that to mitigate the disasters like floods and landslides.

25. On that day, it can be stop talking of words HA/DR against flood in Sri Lanka.

Reference:-

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