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MAPPING OF FLOOD ANALYSIS USING GIS IN METTUR RIVER BASIN

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Abstract - *Flood is an overflow of large amount of water beyond its normal limit, which is the most devastating natural hazards in the world. It submerges land that is usually dry. Flood causes greater damages to the life and the property. People living in the flood affected area are lack of food, fresh water, clothes, shelter and power. GIS is a computer based tool for mapping and analysis which it is the recent advance techniques in flood mapping environmental health risks in the community. GIS operation is to improve the efficiency of flood disaster monitoring and management. The main goal is to mapping of flood risk zones in Mettur River Basin. Digital thematic maps namely Base, Geomorphology, Aspect, Local body, Hill shade, Geology, Soil and Slope are prepared using satellite imageries on Arc GIS platform.*

Key Words: Devastating, GIS, efficiency, monitoring, hazard, aspect

1.INTRODUCTION

GIS technique is used to find the flood affected zone. Recent flooding in 2013 of Mettur causes greater damages to life and property. Max flood occurred in 1924 and the release was around 456000 cusecs. Again flood occurred during 2005, 2010, and 2013. The public works department plans to divert water through the colemon from the upper Anicut, located on the outskirts of trichy city. Surjit singh sainil et al. (2012) have conducted a study on risk and vulnerability assessment of flood hazard in part of Ghaggae Basin, they have find out that GIS based long term inundation maps which can offers a cost-effective solution for planning mitigation measures and preparedness in flood prone area. They have studied environmental factors like hydrology, slope, soil type, drainage density; landform and land use/land cover to propose a flood risk Index. Rank sum method is used to calculate the weights of factors contribute to flood hazards. M.Mehdi et al. have studied Mandal level information system of Prakasam district, Andhra Pradesh, India using Arc GIS. The study is providing complete information for decision making based on their existing resources and capabilities. Kevin musungu et al. has studied flood risk analysis in informal settlements of Cape Town using multi-criteria evaluation and GIS. This study sought to investige a methodology that the Cape Town city council could use to improve flood risk assessment. Ajin.R.S et.al has studied flood hazard assessment of vamanapuram River Basin, Kerala. They have prepared risk zone maps to reduce the risk of these hazards in vamanapuram river basin. They have used weighted overlay analysis method to prepare flood hazard zone map. Ramya fadlalla abdella elsheik et al. has studied Terengganu Malaysia for flood risk map based on GIS and Multi criteria techniques. A map flood risk areas was generated and validated with a view to assisting decision makers on the menace posed by the disaster. The Mettur dam flow depends on seasonal rains, which has been observed to be low. The flood Causes greater damages to life, public and private property and also affects the normal cultivating cycle. Flood poses a risk to the municipality in the downstream areas. Flood affected area is to be identified and implement the most effective responses to flood hazards. Villagers in Erode, Bhavani, Sithar, Ammapet and Kodumudi areas have been alerted. The main aim of this study is to generate a composite map for decision makers by using effective factors causing the flood. Arc GIS 10.1 was used for working with grids and shape file. This new technology can reduce the time and the cost to the decision makers. The sequence of operations followed is schematically shown in fig. Our study is to find the exact prediction of flood affecting area by overlaying the slope map, geology, geomorphology, soil map, land use land cover by using Arc GIS.

2. STUDY AREA

Mettur dam is the major irrigation source in Tamilnadu. It is the largest reservoir in the state and has been responsible for stabilization of irrigation of Cauvery basin including thanjavur delta, which is known as 'Rice bowl of Tamilnadu'. The Flow in Cauvery is mainly dependent on the south west monsoon which influences large part of its upstream catchment in Karnataka and Kerala in the month of July and August. The study area selected for the project is Mettur River basin including districts of Salem, Namakkal, Erode, Dharmapuri of Tamilnadu in India. Mettur dam is a remarkable project situated at 11°49'N latitude and located at 52 km from Salem. It is 270 km downstream of KRS and just downstream of the Karnataka. Features of Mettur are fishery, tourist spot, hydroelectricity power, Stanley dam, Mettur Park. The mettur river basin flows through Poolampatti, Ammapettai, Konneripatti, Pullagoundampatti, Bhavani, Samayasangali, Agraham, Kokkarayanpattai, Unjalur, Vengampudur, Kodumudi. Our Study area of Mettur river basin is about 5375.57660188700km^2.

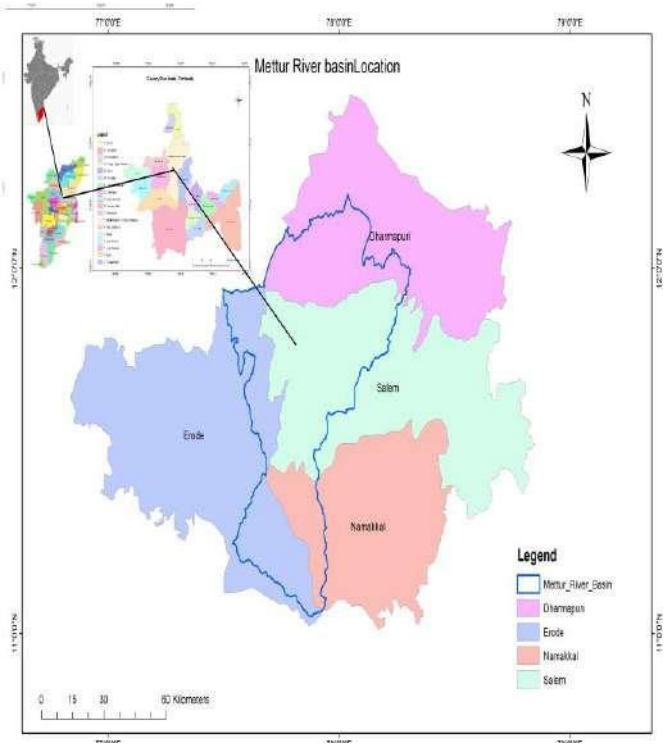

Fig -1: Study area location

3. METHODOLOGY

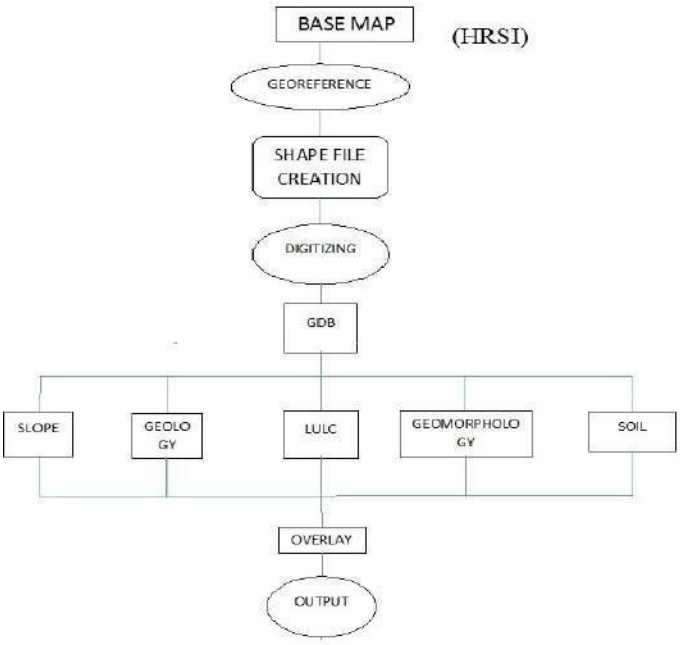

Fig 2: Methodology

i) Base map is generated.
ii) Satellite images are Geo- referenced
iii) Digitization process is carried out
iv) Overlay analysis is conducted

i) Base map: Base map is prepared by using survey of India topographic maps on 1:25,000 scales. All the settlements, road network, water bodies and forest areas are taken into consideration. It is used as a base map when using the desktop mapping software.

ii) Geo-referenced: Geo referencing is the process of aligning spatial data (layers that are shape files: polygons, points, etc.) to an image file such as an historical map, satellite image, or aerial photograph.

iii) Digitizing: Digitizing is the process of converting Analog information into a digital representation.in regards to spatial information one application of it is the process of creating a vector digital database by creating point, line and polygon objects.

iv) Overlay analysis: Overlay analysis is one of the spatial GIS operations. Overlay analysis integrates spatial data with attribute data. This overlay can integrate data of different types such as soils, vegetation, land ownership, jurisdictions, etc… with assessor's parcels.

4.OUTPUT

4.1 SOIL:

Soil map is a geographical representation showing diversity of soil types and/or soil properties. Different types of soils have differing capacities. The chance of flood hazard increases with decrease in soil infiltration capacity, which causes increase in surface runoff.

Table 1: Ranking of Soil

OBJECTID	ID	SHAPE LENGTH	SHAPE AREA	RANK
1		3.89503248202	0.01691871119	
2	Clayey-skeletal, mixed	4.94936366354	0.04146076071	5

3	Fine-loamy, mixed	7.28230049312	0.08471937370	2
4	Fine, mixed, Rhodic Paleustalfs	7.82688842246	0.08466371942	4
5	Loamy-skeletal , mixed	7.64298638063	0.13882178166	3
6	Rock land & Loamy	6.24852327023	0.08149007237	1

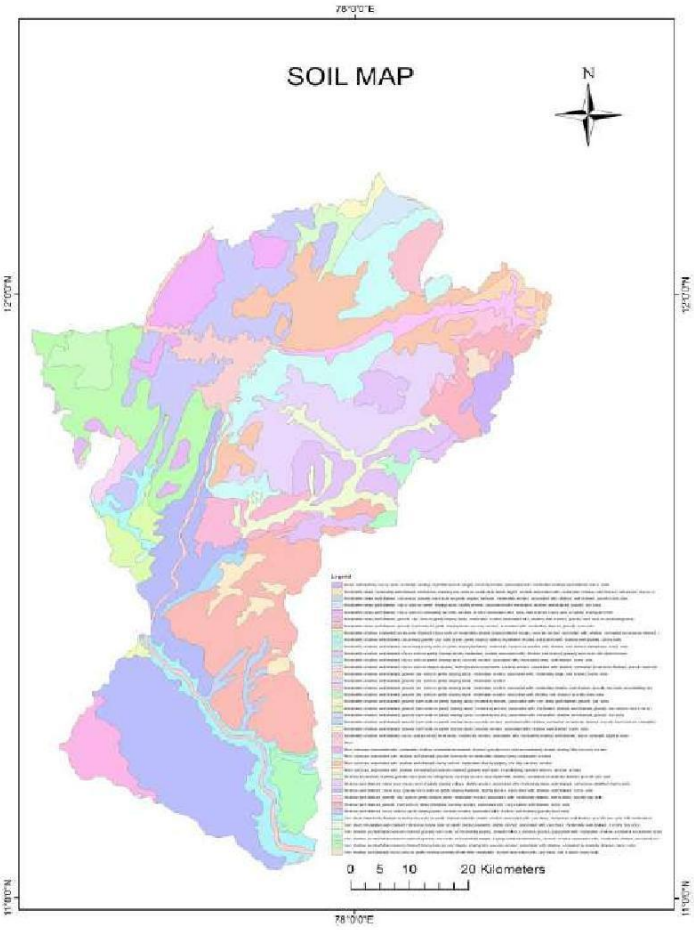

Fig 3: Showing Soil map of study area

4.2 Slope:

Slope refers to the measures of rate of change of elevation of surface location. It describes the rise or fall of the land forms and also percentage of slope. The slope influences the direction of and amount of surface runoff or surface drainage reaching a site. The slope map was prepared using the DEM and slope generation tool in Arc GIS software.

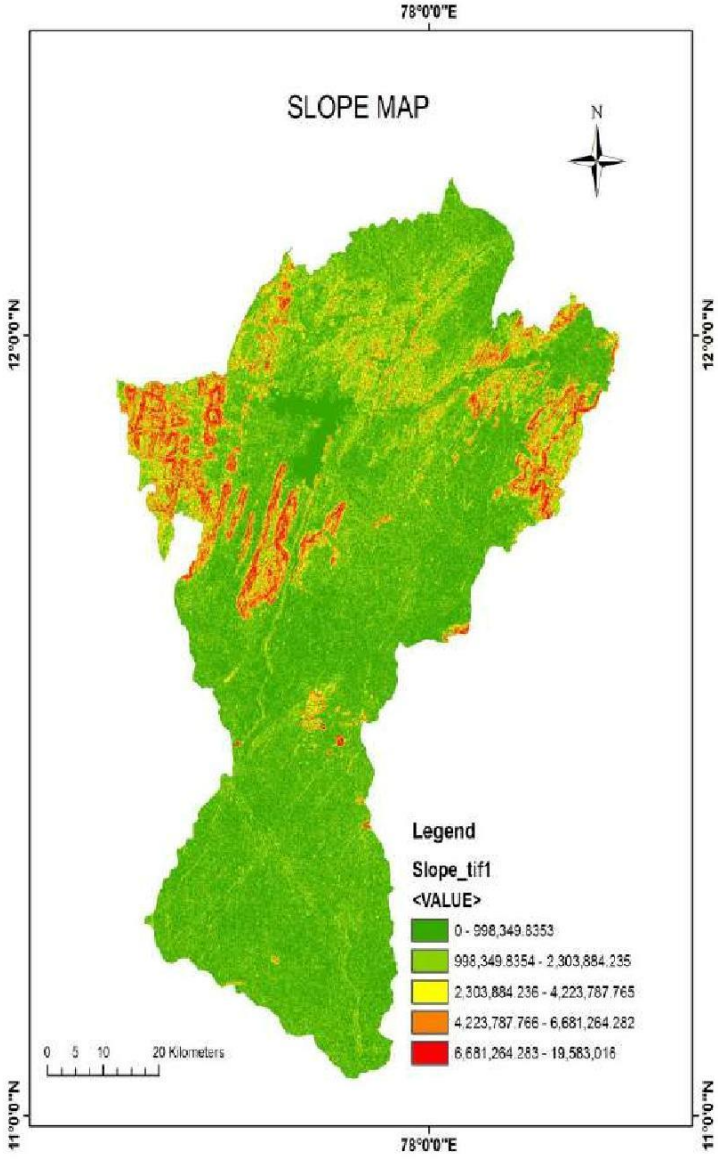

Fig 4: Showing Slope map of study area

4.3 Geology:

Geology is the study of the Earth materials and the structure of those materials, and the processes acting upon them.

Table 2: Ranking of Geology

OBJECTID	LITH_UNIT	SHAPE LENGTH	SHAPE AREA	RANK
1	Alluvium - Sand / Silt dominant	214405.20553500000	73995317.90370000000	7
2	Charnockite	620142.10937900000	2141617185.43000000000	5

3	Granites / Acidic rocks	284571.9730 4100000	230942376.640 00000000	2
4	Granitoid gneiss / Gneissic granitoid / Granitoid Complex	373687.0245 9100000	748564143.568 00000000	3
5	Migmatite / Migmatite Complex	1064138.068 43000000	1988692654.21 000000000	6
6	Quartzite	29407.20978 730000	2382076.55299 000000	1
7	Ultrabasic / Ultramafic rocks	279353.5801 7500000	219660946.495 00000000	4

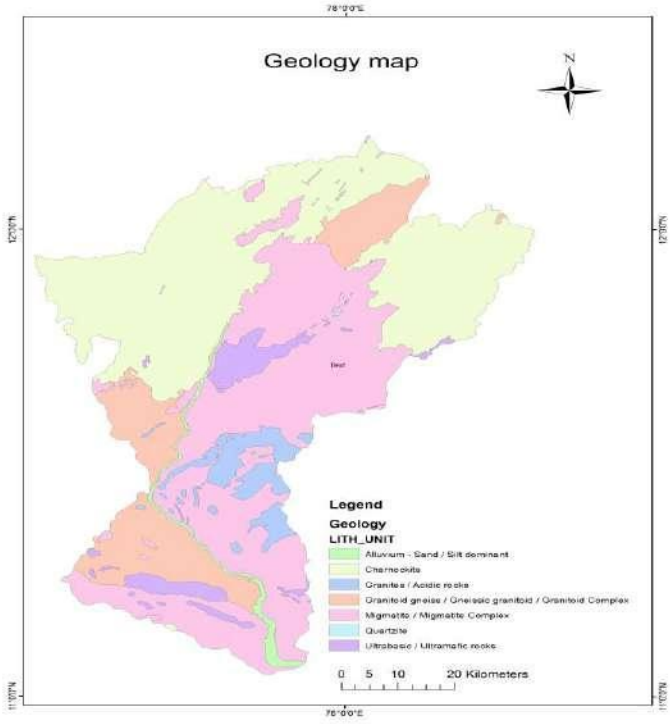

Fig 5: Showing Geology map of study area

4.4 Geomorphology:

Geomorphology is the scientific study of landforms and the process that shape them. Geomorphology is practiced within physical geography, geology, geodesy, engineering geology, archaeology and geotechnical engineering, this broad base of interest contributes to many research styles and interests within the style.

TABLE 3: Ranking of Geomorphology

OBJECTID	DESCR_L1	SHAPE LENGTH	SHAPE AREA	RANK
1	Hills & Plateau	2413045.551 72000000	1360430255.15 000000000	1
2	Piedmont Zone	3288334.608 35000000	832885975.454 00000000	2
3	Plains	2443450.848 15000000	3212538459.97 000000000	3

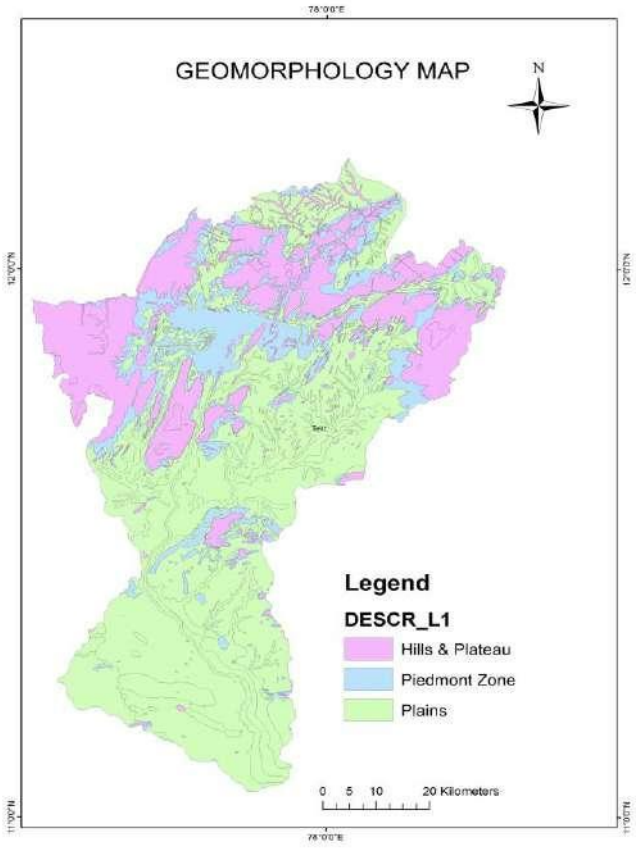

Fig 6: Showing Geomorphology map of study area

4.5 Local body:

Local body mostly present in my study area is village panchayat.

Table 4: Ranking of Local body

OBJECTID	PANCHAYAT TYPE	SHAPE LENGTH	SHAPE AREA	RANK
1	Corporation	0.14368094805	0.00062347686	6
2	Municipality	1.64660088513	0.01093198415	5
3	Reserved forest	7.88864050613	0.08086211446	1
4	Special village panchayat	6.09561883842	0.04127074192	3
5	Town panchayat	0.00205528298	0.00000017590	4
6	Village panchayat	15.34051687030	0.31389717247	2

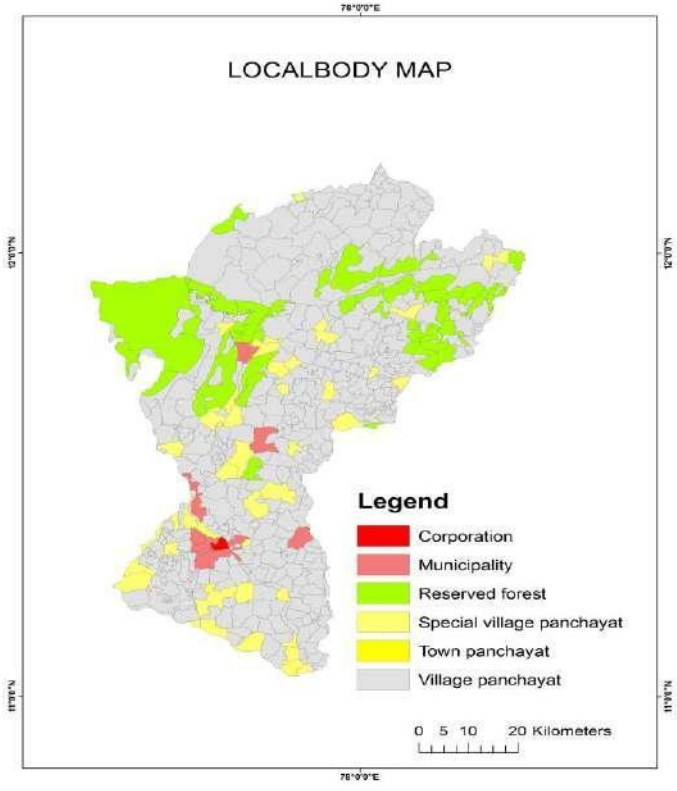

Fig 7: Showing Local body of study area

4.6 Aspect map:

Aspect is simply the measure of the direction of slope. It begins with 0° at the north, and then in a clockwise direction ends at 360° again at the north. Aspect is often classified into four major direction; north, east, south and west.

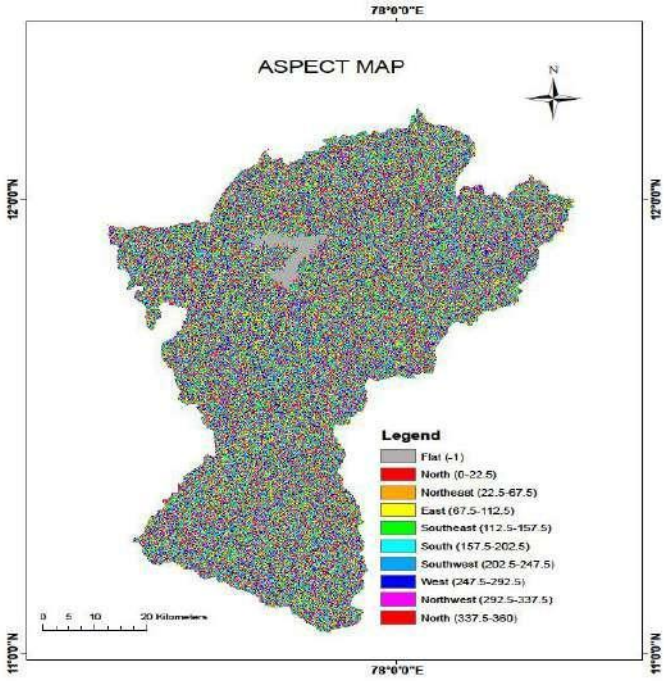

Fig 8: Showing Aspect map of study area

4.7 Hill shade map:

Hill shade is the 3D representation of surface. Hill shading is to highlight the location of hills and mountain.

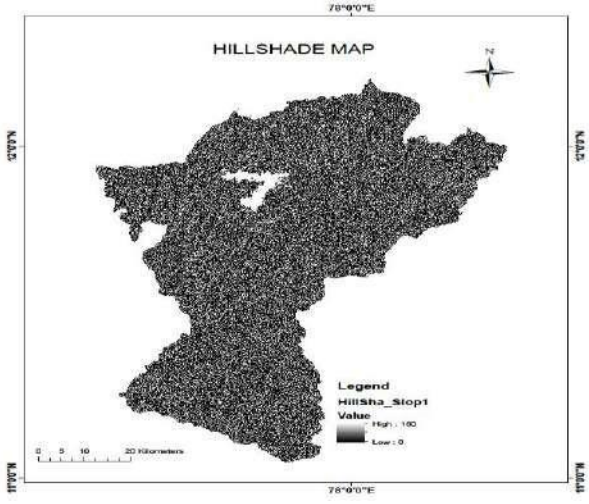

Fig 9: Showing Hill shade map of study area

5. RESULT:

The net probability of occurrence of flooding in each flood hazard zone is estimated from the total sum of the weight of each contributing factor maps was overland. To obtain this total sum weight, all of contributing factor maps was overland.

Table 5: Risk factor

OBJECTID	GRIDCODE	SHAPE LENGTH	SHAPE AREA	AREA		RISKFACTOR
1	1	1699167.107960000000	362249443.5040000000000	362.2494435 0400	6.738801627	Very low risk zone
2	2	3792307.315890000000	737820974.5300000000000	737.8209745 3000	13.72542946	Low risk zone
3	3	5369704.433780000000	1675325427.780000000000	1675.3254277 8000	31.1655019	Medium risk zone
4	4	4528467.958930000000	1940230929.710000000000	1940.2309297 1000	36.09344771	High risk zone
5	5	2050559.482170000000	659949826.3630000000000	659.9498263 6300	12.27681931	Very high risk zone
Total study area = **5375.57660188700 Km^2**						

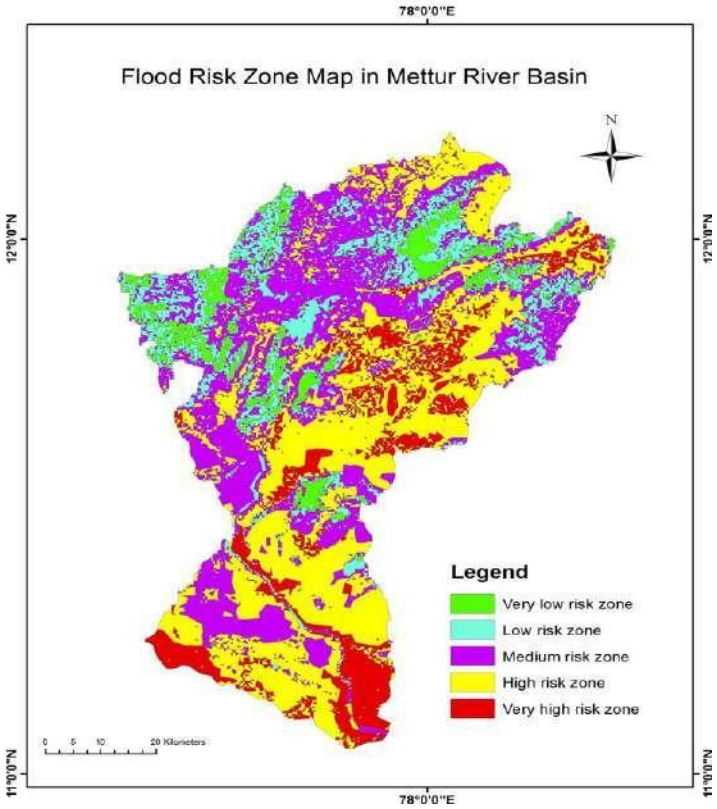

Fig 10: Showing Flood risk zone of study area

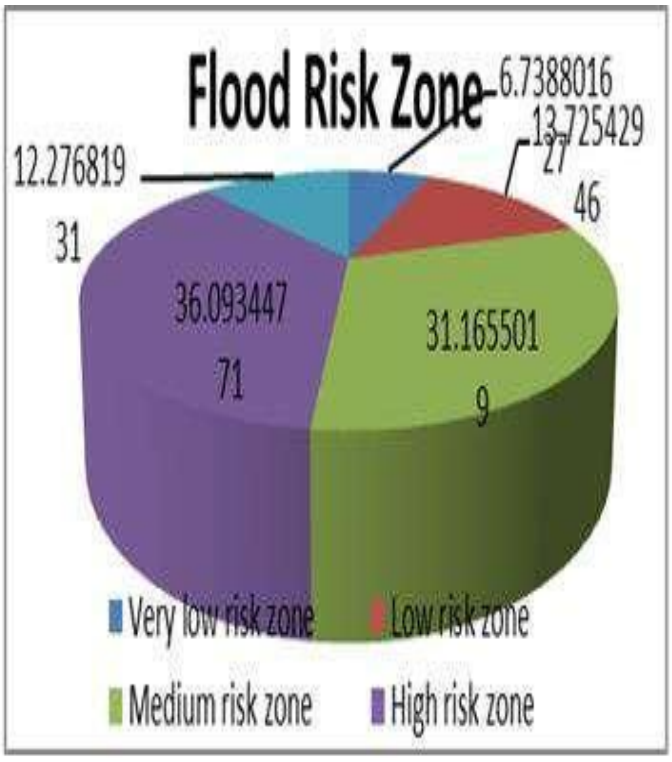

Chart 1: Showing Flood risk zone pie chart of study area

6. CONCLUSION:

The present study shows a simple and cost effective way of using geographical information system for creating flood risk map from available database. It is clear that soil permeability does play a very large role in flooding. In this study an attempt has been made to prepare flood risk zone map using Arc GIS 10.1. Flood prone areas can be identified, which will assist in appropriate planning of development works. Here the areas are classified as high risk zone, medium risk zone, low risk zone and very low risk zone. It will be useful for the decision makers to take prompt action to the affected area in Mettur River Basin.

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BIOGRAPHIES

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