

PROFESSIONAL TRAINING REPORT
At
Sathyabama Institute of Science and
Technology
(Deemed to be University)

Submitted in partial fulfillment of the requirements for the
award of Bachelor of Technology Degree in
Information Technology

By
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DEPARTMENT OF INFORMATION TECHNOLOGY
SCHOOL OF COMPUTING

SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Accredited with Grade "A" by NAAC
JEPPIAR NAGAR, RAJIV GANDHI SALAI, CHENNAI – 600119

April 28, 2022



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DEPARTMENT OF INFORMATION TECHNOLOGY

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the Bonafide work of **Dhaneshwar. V (Reg. No: 39120022)** who carried out the project entitled "**Flood Inundation by QGIS and Machine learning approach**" under my supervision from June 2021 to November 2021.

Internal Guide

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Submitted for Viva voice Examination held on _____

Internal Examiner

External Examiner

DECLARATION

I, **Dhaneshwar.V** hereby declare that the project report entitled **Flood Inundation by QGIS and Machine learning approach** done by me under the guidance of **Dr. V. Maria Anu, M.E., Ph.D.** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering Degree in Computer Science and Engineering.

DATE:

PLACE:



SIGNATURE OF THE CANDIDATE

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I am pleased to acknowledge my sincere thanks to **Board of Management** of **SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. I am grateful to them.

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I wish to express my thanks to all Teaching and Non-teaching staff members of the **Department of Information Technology** who were helpful in many ways for the completion of the project.

**TRAINING
CERTIFICATES**
(Interdisciplinary project)

OTHER CERTIFICATES:



ABSTRACT

Year 2015, Chennai experienced intense rains and flooding yet again, bringing the city to a standstill for days. Excess flooding in the city has been associated with poor planning and urban development projects over the years. Rapid urbanization in erstwhile agricultural lands and wetlands, and increased concretization have altered the natural flow of rainwater. This is what has often led to debilitating floods.

Model validation was performed using two statistical error indices and the area under the curve (AUC). Our results show that the Bagging–Cubic–KNN ensemble model outperformed other ensemble models

The objective of the project is to find out the flood affected area and by KNN model to predict the inundation of flood area. By this project we accumulate the area of flood and we can give preventive measures to that Area. The final extracted flood map which contained the data and features

Of original and potential flood maps had been analysed and affected Villages list out.

TABLE OF CONTENTS

CHAPTER No.	TITLE	PAGE No
	ABSTRACT LIST OF FIGURES LIST OF ABBREVIATION	9 12 13
1	INTRODUCTION 1.1 Brief Intro 1.2 Flood inundation	14 14 14
2	AIM AND SCOPE 2.1 Aim 2.2 Problem Statement 2.3 Scope	15-16 15 15 16
3	SYSTEM ANALYSIS AND DESIGN 3.1 General 3.2 User Interface (UI) 3.3 Software's Used 3.4 System Requirement	18-19 18 18 19 19
4	PROJECT DISTRIBUTION 4.1 General 4.2 Modules Involved	20-21 20 21

5	RESULTS AND DISCUSSION, PERFORMANCE ANALYSIS	24-25
	5.1. Results	24
	5.2. Discussion	24
	5.3. Performance Analysis	25
6	SUMMARY AND CONCLUSION	26
	6.1. Summary	26
	6.2. Conclusion	26
	Reference	
7	APPENDIX	26-31
	A. Screenshots	26-31

LIST OF FIGURES

FIGURE NO.	FIGURE NAME	PAGE NO.
Fig.4.3.1	Workflow	22
Fig.4.3.2	DEM	23
Fig A.1	Performance Analysis	26
Fig A.2	Roadmap	27
Fig A.3	Elevation map	27
Fig A.4	floodlessthan1m	28
Fig. A.5	floodlessthan2m	29
Fig. A.6	floodlessthan3m	30
Fig A.7	Final map with buildings	31

LIST OF ABBREVIATIONS

ABBREVIATION	EXPANSION
QGIS	Quantum Geographical information system
DEM	Digital elevation Model
SRTM	Shuttle Radar Topography Mission

INTRODUCTION

1.1. BRIEF INTRO:

Recently, the area of free and open source geospatial data and software has experienced a significant development and progress. Since the start of geospatial open source “revolution” in the early 2000 (that began with QGIS launching), a transition from commercial software to open source alternatives has been noticed among researchers, professionals, local administrations, etc. This study focuses on using available open source solutions in order to obtain useful information regarding the delineation of flood hazard and flood risk areas. QGIS, a free and open-source geographic information system software was used for spatial data visualization, editing and analysis. River GIS is a QGIS plugin that allows the creation of 1D or 2D geometric flow models using the QGIS environment.

1.2 Flood inundation

Open source” software is defined as software in which the source code is available for modification and redistribution by the general public [1]. Open Source Software (OSS) gained more and more credibility as a large number of initiatives regarding this topic emerged over the last two decades, especially in the GIS market [2, 3]. Geo-spatial open source movement/ revolution began as a reply against the numerous limitations imposed by the commercial code (which is traditionally expensive proprietary software) [4, 5]. In this way, many GIS application capabilities and functionalities were developed and distributed without any usage restriction, being guaranteed for free to the public use. Moreover this phenomenon, gather large communities of users which are working to develop better computer software, leading to continuous progresses and constant updates. The Open Source Geo-spatial Foundation (OSGeo) is one of the best examples of such community(<https://www.osgeo.org>). Therefore, as a consequence, many of these applications concentrate on developing software for geographic/spatial data management, storage, analysis and visualization.

CHAPTER 2

AIM AND SCOPE

2.1 AIM

My main Objective is to discover the flood prone area by Digital elevation map. The chosen area is Chennai and accurate inundation map.

2.2 PROBLEM STATEMENT

Chennai has experienced major floods during the last three decades in the years 1976, 1985, 1996, 1998 and 2005 and then the big one in 2015. The drainage system has been found wanting because of several reasons. These include:

- (i) reduction in the vent way caused by the construction of bridges, (ii) sand bar
- (ii) formation at the mouths of rivers, (iii) clogging of the drains due to indiscriminate
- (iii) dumping of solid waste and construction debris,
- (iv) inadequate design capacity,
- (v) lack of connectivity of storm sewers with macro drainage, and
- (vi) encroachments. While successive governments have focused on dredging of rivers and desilting of major drains, maintenance of minor drains is neglected due to scarcity of funds as well as public apathy. In this context it is important to bring out the effect of bad solid waste management on the condition of drainage channels, both major and minor. Although a road network to the length of 6000 km (387 km of bus route and 5623 km of interior roads) is maintained by the Greater Chennai Corporation, only about 1660 km of storm drains exist (about 205 km of these drains have a width of 0.6m or more). Storm Water Drains are usually provided only for roads with 12 m width or more. Earlier, storm water drains were designed for a rainfall intensity of 31.39 mm/h (storm duration of 1hr with 2-yr return period). However, this was subsequently revised in 2014 to 68 mm/hr based on recommendations from 17 World Bank (TNUIFSL, 2014), though it is not immediately clear as to which return period this intensity corresponds.

Chennai city has been urbanizing very rapidly over the last few decades. Population in Chennai city has increased from a mere 500,000 in the year 1901 to more than 45 lakhs in the year 2011 [Source: Census of India, 2011]. The progression of urbanization and consequent land use change in and around Chennai in recent years is shown (Murawski, 2015). It is estimated that the area covered by the high density urban areas increased from 81.32 km² in 1988 to 330.30 km² in 2014. The area covered by low density urban areas increased from 53.79 km² in 1988 to 303.14 km² in 2014 (Murawski, 2015). A major consequence of this urbanization is the reduction in the infiltration component of the hydro-logic cycle, which would increase the peak run-off discharge. Another consequence of urbanization is the disappearance of many minor and medium water bodies. These water bodies served as detention basins and resulted in decrease in the peak discharge. Urbanization has reduced the detention effect.

2.1 SCOPE

During a flood event, the responsible authorities need to make decisions on operation of barriers and on evacuation/rescue strategies. Temporary flood protection is sometimes an option and if so it must be decided on quickly. Also people are served by knowing evacuation routes and a forecast of blocked roads. A decision support system (DSS) can assist the user by quickly showing the available information on water levels, objects at risk, evacuation routes, resident vulnerability, etc. This support can be given during the preparation of flood event management or during the actual flood event.

2.1.1 DISADVANTAGES OF CURRENT SYSTEM

- Hard to use the datasets Manually
- These types of problem only solved by digitalization

2.1.2 ADVANTAGES OVER CURRENT SYSTEM

- Easy to handle and research
- Friendly interface.
- Fast and convenient.
- Easy to update.
- Secure
- Better Understanding

CHAPTER 3

SYSTEM ANALYSIS AND DESIGN

3.1 GENERAL

There is a need for a system that can automatically detect the diseases as it can bring revolution in monitoring large fields of crop and then plant leaves can be taken cure as soon as possible after detection of disease. There are so many diseases that affect cotton and many more crops that affect many filed of agriculture. So those identify this disease and how to recover from it. This objective will satisfy our application which helps for doing the prediction of cotton disease as well as how to overcome it.

3.2 SOFTWARES USED

3.1.1 SOFTWARE USED

QGIS

Quantum Geographical information System used to develop dem models and used edit the elevation models of mapping using osm (open street map)maps

3.1.2 PROGRAMMING LANGUAGEUSED

PYTHON 3

Python is the most used language for every domain the backbone of QGIS is python

Plugins used:

- SRTM downloader
- QGIS2threejs
- Quickmap
- Explorer
- Attribute table

3.2 SYSTEM REQUIREMENTS

Operating System: Windows / MacOS / Linux

RAM: 1GB (minimum)

Processor: 1GHz processor (minimum)

ROM: 20GB (minimum)

CHAPTER 4

PROJECT DESCRIPTION

4.1 GENERAL

Flood assessment is one of many practical applications of GIS. This analysis will focus on the city of Peterborough, a city of Chennai main city. The analysis is particularly relevant due to past flooding events in the Peterborough area. By completing flood risk assessments, the city can identify at-risk infrastructure and populations, as well as develop stronger preparedness measures for future flooding events.

4.2 MODULES INVOLVED

The primary source of data used for this analysis will be the High Resolution Digital Elevation Model (HRDEM) - CanElevation Series, produced by Natural Resources Canada for the city of Peterborough. The dataset is hosted on the Open Data Canada website here: (<https://open.canada.ca/data/en/dataset/957782bf-847c-4644-a757-e383c0057995>); specific download instructions are provided in the next section, below, but first we'll review different forms of elevation data models.

There are two main types of elevation datasets provided as part of the High Resolution Digital Elevation Model (HRDEM). Both datasets have been derived from airborne LIDAR data. The two datasets are in the form of a Digital Surface Model (DSM) and a Digital Terrain Model (DTM). It is important to know the difference between these two elevation datasets and how this can affect your analysis of flooded areas.

A Digital Surface Model or DSM is very similar to that of a Digital Elevation Model (DEM) or Digital Terrain Model (DTM). All three show elevation data of the earth's surface relative to sea level. One major distinction between a DSM and a DTM is the presence of man-made

and natural features. The DSM shows the tops of buildings, houses, highways, tree canopies, vegetated surfaces and all manner of other solid features above the surface of the ground. They are traditionally in the form of a raster image. DSM's are generally used for purposes where it is necessary to see objects protruding from the surface of the earth. This includes tasks such as assessing the encroachment of vegetation or viewshed analysis for a new High-rise [1]. They are not used for hydrologic modelling such as a flood analysis. A Digital Elevation Model or DEM does not include features that protrude from the ground. A DEM represents the ground elevation from sea level. Therefore, the tops of trees, buildings and other features have been removed to reveal the ground underneath. This is very useful for the purpose of hydrologic mapping, such as flood analysis. DEM's are generally in the form of a raster image [2]. A Digital Terrain Model or DTM can have varying definitions. In some cases, Digital Terrain Model and Digital Elevation Model are used interchangeably. This means that the DTM dataset would be a raster image of the Earth's surface excluding buildings and vegetation. In other cases, a Digital Terrain Model can be essentially a DEM represented through point data. The dataset shows the elevation of the earth's surface through a series of equally spaced points (although, in older datasets these points can be unevenly spaced). These points have an associated x and y value along with a third value for elevation. In this case the DTM would be in the form of a vector dataset, such as a shapefile [3]. The DTM dataset available through the High Resolution Digital Elevation Model link is in the form of a geotiff (.tif). This means it is essentially the same as a DEM and can be used with a resolution of 1m and will be projected in the UTM NAD83 (CSRS) coordinate system. Additional vector data will also be used in this analysis from the Peterborough Open Data Hub. This includes building footprints, roads, pedestrian footpaths and hydrography polygons.

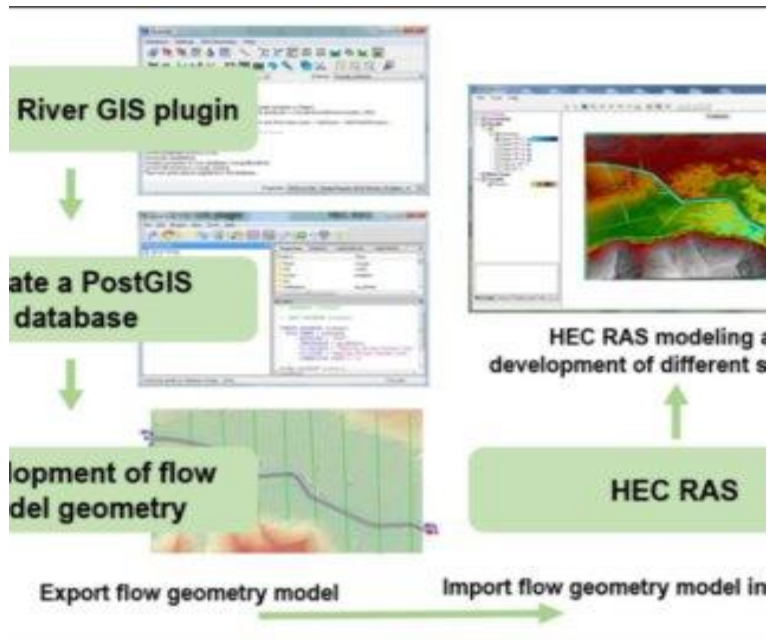


Fig.4.3.1. Workflow

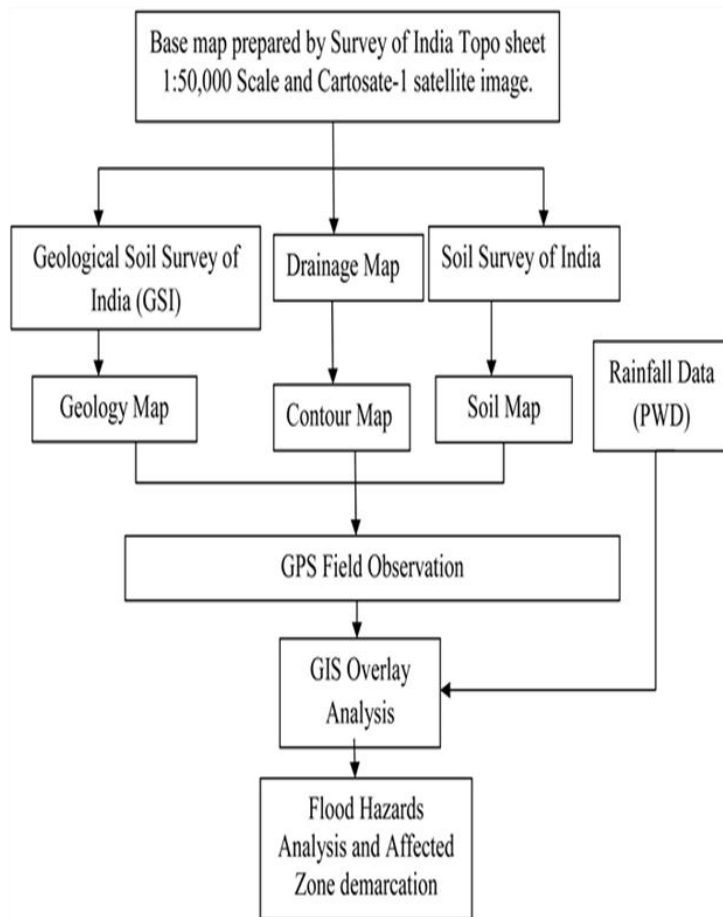


Fig.4.3.2. IDEATION MAP

CHAPTER – 5.

RESULTS AND DISCUSSION, PERFORMANCE ANALYSIS

5.1. RESULTS:

The final Simulated 3d model by QGIS will be used to refer the flood area for flood with 3m.

5.2. DISCUSSION:

Open-source software, QGIS, RiverGIS plugin and QGIS proved to be very efficient tools in the process of flood hazard and flood risk mapping. The methodology proposed by this study can be easily extrapolated and applied to any region characterized by a reasonable Digital Elevation Model availability. The future of open source GIS (QGIS in particular), is likely to be bright, as its performance are improving constantly, becoming more and more precise (with a constant addition of new functionalities). This application presented in the current study and this combination of open source software, demonstrate one more time that mapping and development of geospatial data projects is accessible to anyone with basic GIS knowledge and access to a computer. This is a big step forward for local administrations, researchers, persons responsible with emergency situations which can use these free tools to a better management of flood hazard and risk. Developing scenarios (like the ones presented in this study) can lead to a better planning in case of a flood event occurrence. Production of flood hazard and risk maps is a technique that can be used to improve the training process of the vulnerable people and can teach them how to act in such cases. Another important aspect that can be learned by the population is their vulnerability degree. This means, a faster response in case of an emergency, as well as, more appropriate reaction from the population and increasing security ■

5.3 PERFORMANCE ANALYSIS:

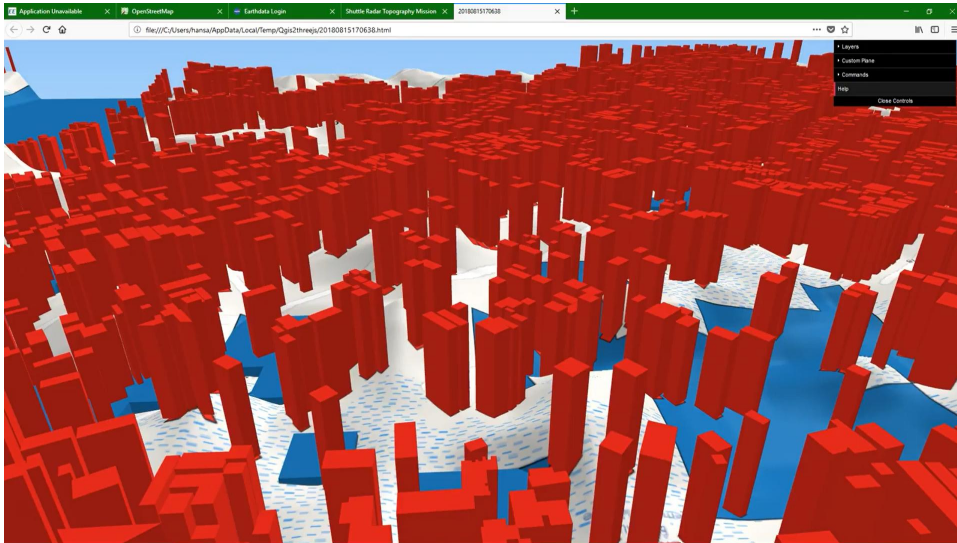


Fig.5.1. Performance Analysis

CHAPTER-6

SUMMARY AND CONCLUSIONS

6.1 SUMMARY

The final Simulated 3d model by qgis will used to refer the flood area for flood with 3m.

6.2 CONCLUSION

Open-source software, QGIS, RiverGIS plugin and HEC-RAS proved to be very efficient tools in the process of flood hazard and flood risk mapping. The methodology proposed by this study can be easily extrapolated and applied to any region characterized by a reasonable Digital Elevation Model availability. The future of open source GIS(QGIS in particularly), is likely to be bright, as its performance are improving constantly, becoming more and more precise (with a constant addition of new functionalities). This application presented in the current study and this combination of open source software, demonstrate one more time that mapping and development of geospatial data projects is accessible to anyone with basic GIS knowledge and access to a computer. This is a big step forward for local administrations, researchers, persons responsible with emergency situations which can use these free tools to a better management of flood hazard and risk. Developing scenarios (like the ones presented in this study) can lead to a better planning in case of a flood event occurrence. Production of flood hazard and risk maps is a technique that can be used to improve the training process of the vulnerable people and can teach them how to act in such cases. Another important aspect that can be learned by the population is their vulnerability degree. This means, a faster response in case of an emergency, as well as, more appropriate reaction from the population and increasing security.

REFERENCES:

- 1) GISGeography, Retrieved: 2019-09-21
- 2) GISGeography, Retrieved: 2019-09-21
- 3) GISGeography, Retrieved: 2019-09-21
- 4) GISGeography, DEM, DSM & DTM Differences – A Look at Elevation Models in GIS,

Last Updated: 2018-02-20, Retrieved: 2019-09-21

5) https://dges.carleton.ca/CUOSGwiki/index.php/Flood_Risk_Assessment_in_QGIS

6) <https://qgis.org/en/site/>

APPENDIX

A. SCREENSHOTS:

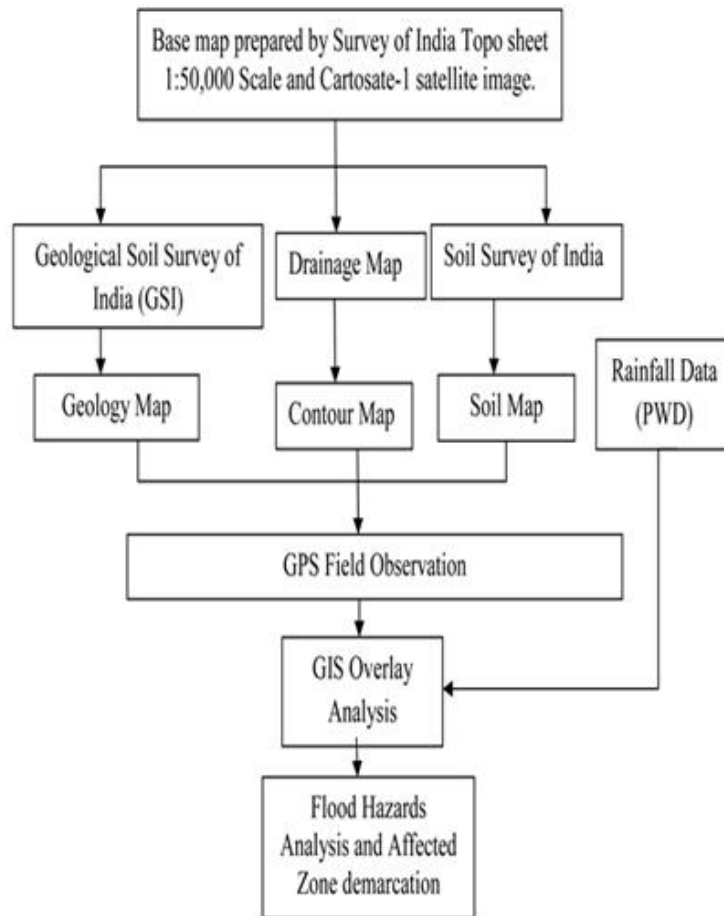


Fig A.1. Roadmap

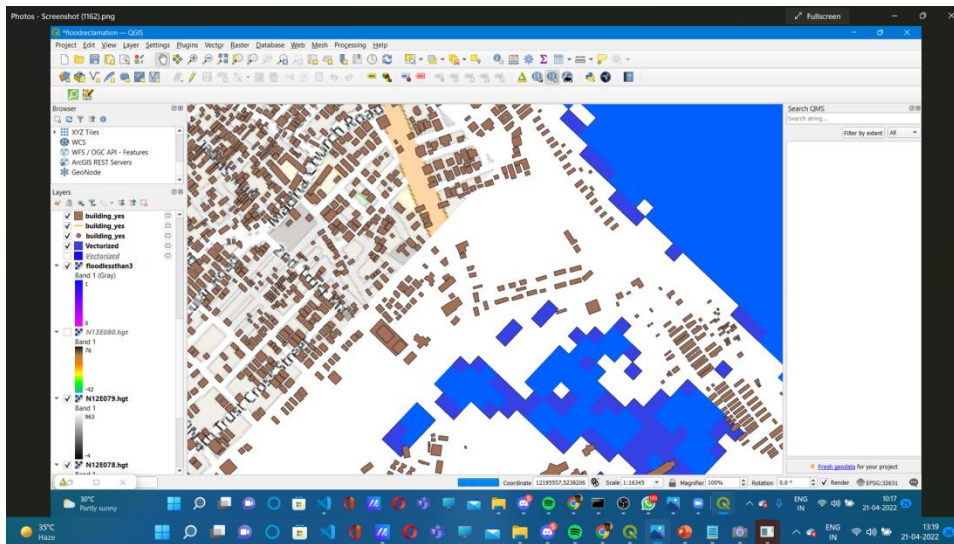


Fig A.2. Building plotting

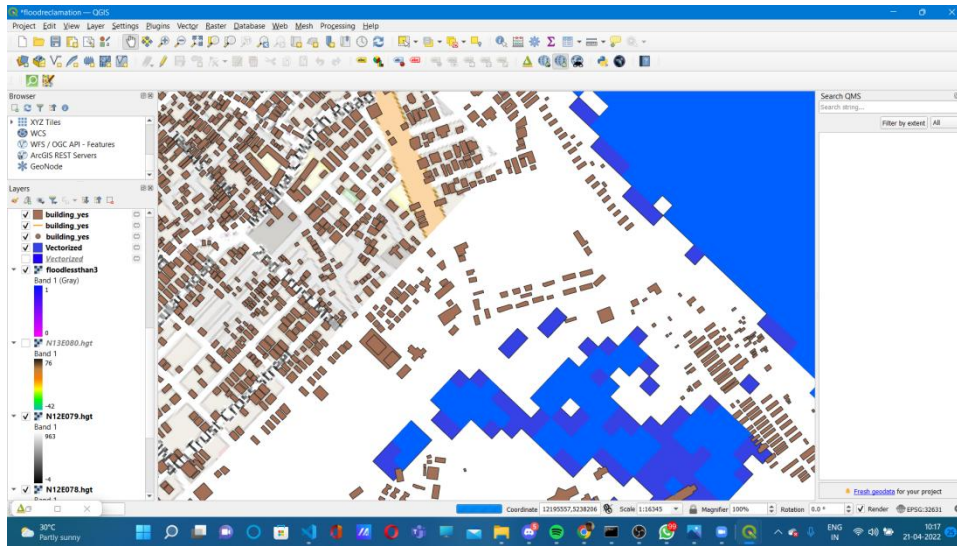


Fig A.3. Rastering

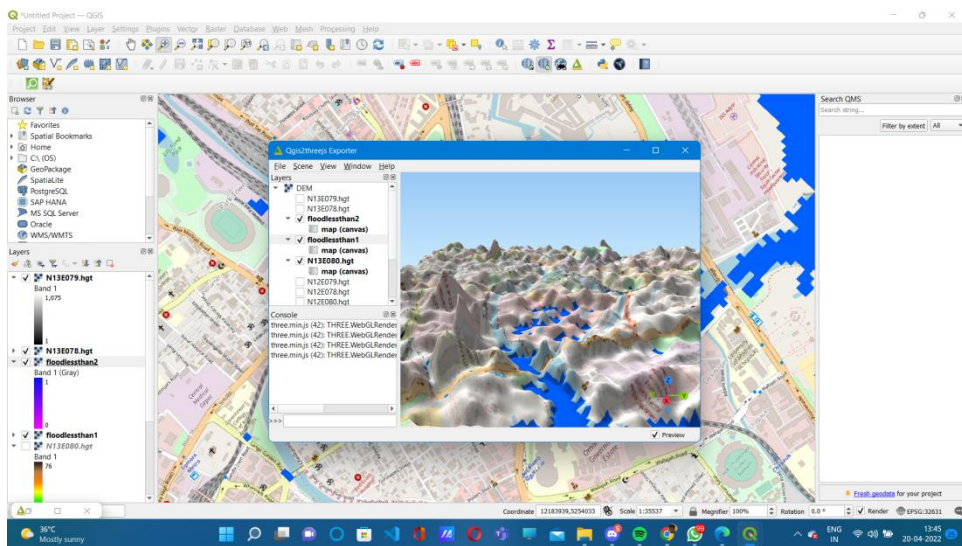


Fig A.4. Simulated image

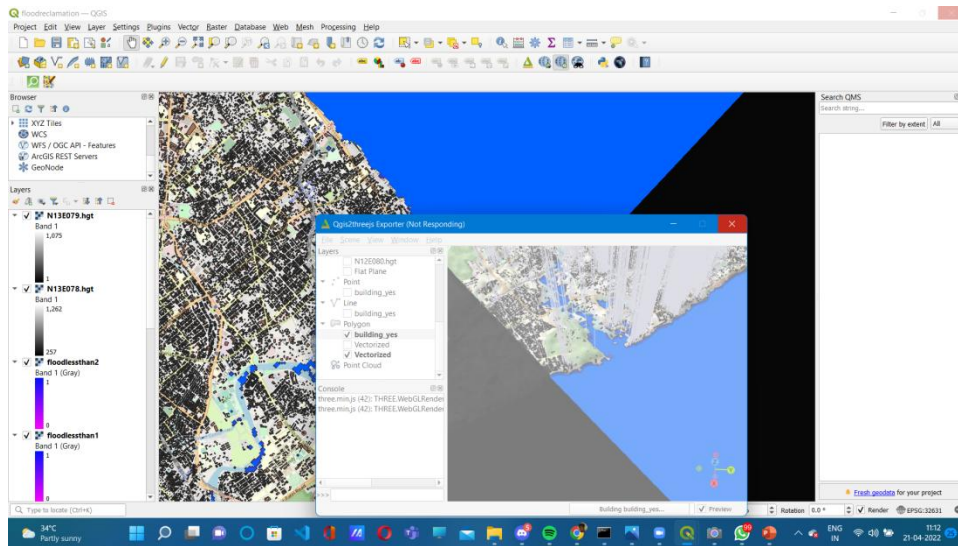


Fig. A.6.BUIDINGS OF CHENNAI

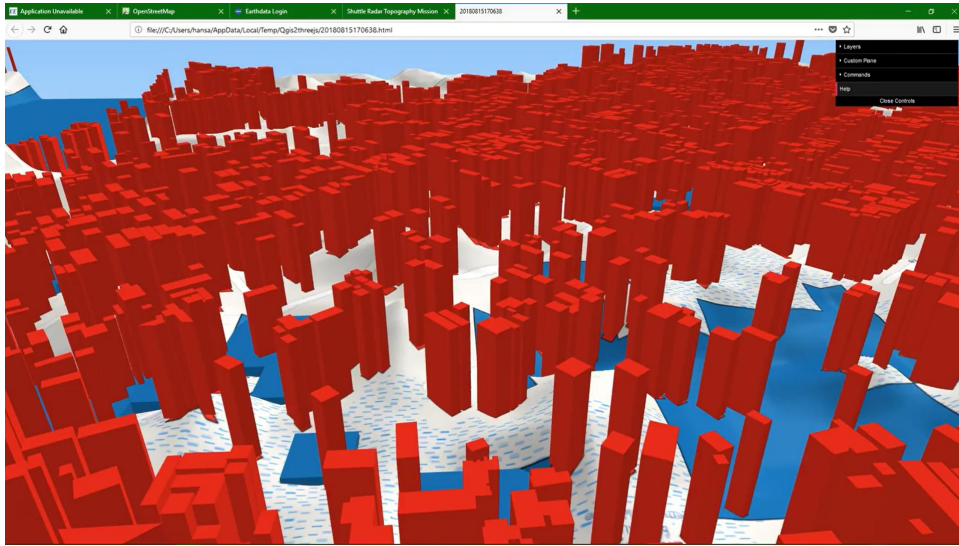


Fig A.7. Image with flood 3metre