

MANAGING FLOOD HAZARDS

Thoraipakkam to Navalur

Submitted in partial fulfillment of the requirements for
the award of Bachelor of Engineering / Technology degree in Civil
Engineering

by
Rachita Nath (38200704)
Nikita Bhowmik (38200704)



DEPARTMENT OF CIVIL ENGINEERING
SCHOOL OF BUILDING AND ENVIRONMENT

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

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SATHYABAMA

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **RACHITA NATH (38200702)** and **NIKITA BHOWMIK (38200704)** who approved the project allowed "**MANAGING FLOOD HAZARDS FROM THORAIPAKKAM TO NAVALUR**" under our direction from October 2021 to April 2022.

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Internal Examiner
Examiner

External

DECLARATION

We **Rachita Nath (38200702)** and **Nikita Bhowmik (38200704)** hereby state that the Project Report allowed **Managing Flood Hazards from Thoraipakkam to Navalur** was done by me under the guidance of **Mr.J. Vanjinathan, M.Tech.** is submitted in fractional fulfillment of the requirements for the award of Bachelor of Engineering degree in **Civil Engineering**.

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PLACE:

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ABSTRACT

With the passing years, current flood management has progressed. Flood management is a crucial aspect of disaster recovery because it includes several essential elements that are important for reducing devastation using appropriate techniques, approaches, and assessments.

India is constantly hit by floods, which wreak havoc on most of its landscape. Research has been carried out on flood risk management to mitigate the effects. For this study, information was collected such as the Flood Prone Zone (from Thoraipakkam to Navallur), Chennai's Annual Rainfall Data (about a year), as well as previous year's rainfall. All of these data can be used to prevent flood damage by maintaining, repairing, and changing the critical existing arrangements. By properly analyzing and studying data, we can build an alternative approach for minimizing future losses.

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CHAPTER 1

Introduction

1.1 General

The ecosystem of the planet and human development is reliant upon water to survive and thrive. The rest of the freshwater in 1400 million km³ is in deep aquifers, and only a small part is available for human consumption. Approximately 2.7 percent of 1400 million km³ area is covered by snow.

Although India's population is 16 percent larger than all others in the world, our land and water resources represent only 4 percent of the world's total. An estimated 3000 km³ of the annual precipitation falls during the short monsoon season between June and September. Therefore, the distribution of available water is neither uniform nor constant over time and space. There are hydrological, topographical, and geological constraints that prevent conventional storage and diversion structures from using more than 690 km³ of surface water on a yearly basis. Groundwater recharge at a rate of 433 km³ per year.

The following paragraphs examine two of the biggest problems facing the country: drought and flooding:

Floods and drought

Drought and flooding are common in the world today, and the coexistence of these two phenomena poses a formidable threat that cannot simply be eradicated but must be dealt with. During the monsoon season, surplus water can be transferred to areas with water shortages. Furthermore, the project would help increase irrigation capacity, generate hydropower, and reduce regional imbalances.

A series of droughts and famines in the second half of the 19th century led to the development of irrigation as a measure to ensure crop success and reduce famine relief expenditures.

Floods in India

The varied climate patterns and rainfall patterns across different places have caused some areas to experience disastrous floods while others have experienced droughts. Due to population growth and urbanization, floodplains have tended to

become occupied, resulting in increasingly catastrophic damages over time. Floods are common in areas that are not normally susceptible to flooding due to the varied rainfall distribution. Floods have thus been the most frequent disaster faced by the country since its inception.

As a result of heavy rains, rivers' banks are unable to contain the huge flows that flow down from upper catchments, causing flooding. Among the causes of flooding are the erosion and silting of riverbeds, which reduces the carrying capacity of river channels; earthquakes and landslides cause the course of rivers to change, encroachment of floodplains, tidal effects, and haphazard development of cities. Coastal regions of Andhra Pradesh, Orissa, Tamil Nadu, and West Bengal are sometimes hit by cyclones that bring heavy rains and flooding.

There is more important to the sense of instability and terror felt by those living near floodplains than the loss of life and property damage. A flood is the most feared natural disaster due to its aftereffects, including the pain it causes survivors, the spread of diseases, the shortage of basic commodities and medications, and the destruction of homes.

Natural calamities such as floods cannot be classified as disasters because they are not as severe as other natural calamities. They are considered disasters when they cause harm to people, their livelihoods, and/or property. In most countries, flooding is the most common and deadliest of the different kinds of catastrophes. In the aftermath of floods, people's lives can be drastically changed in the impacted areas as they suffer severe disruptions.

The word flood is derived from the old English word 'food,' which has similar characteristics to the German term 'flut' and the Dutch term 'vloed,' which refers to water input and floatation. By definition, a flood is an overflow or influx of water exceeding its usual limits, as defined by Oxford Reference Dictionary (ORD). When a water body, such as a river or lake, is overburdened with water, some of its water flows outside its regular boundaries, causing a flood. It is possible to experience a flood in almost every corner of the world, and the severity and consequences may differ.

When the rain pours over a huge area for days or weeks, river levels rise swiftly and recede slowly, inundating large areas and incurring extensive economic losses.

Upstream, regional, and downstream floods are all terms used to describe flash floods.

Floods have a variety of consequences. Flooding has two main effects: physical damage to buildings and structural deterioration.

CHAPTER 2

LITERATURE STUDY AND METHODOLOGY

2.1 LITERATURE REVIEW

Climate change allowances, non-stationarity, and flood frequency were examined by Adam Griffin, Alison Kay, Lisa Stewart, and Peter Spencer, 2022.

This article considered how non-stationarity should be accounted for in flood frequency estimations in catchments where non-stationarity has been observed in measured flow records. In South West England and Wales, some positive percentage differences can be found, even if the study is restricted to stations with positive trends.

Climate change-induced consequences on urban flood risk are influenced by concurrent hazards, according to A.N. Pedersen, P.S. Mikkelsen, and K. Arkbjerg-Nielsen 2022

The main focus of the paper is to establish methods for studying floods caused by many coexisting hazards, as well as to study the impact of climate-induced changes on flooding. Despite doubts, it's also a reason to believe that the shifting relative application of the hazards is a tangible result.

Assessing vulnerability in flooding impact model chains by measuring targeted heuristics, Andres Paul Zischg, David N. Bresch, Margaret Keller, Markus Mosimann, Martina Kauzlaric, Sven Fuchs, and Veronika Roethlisberger, 2021.

The newly constructed vulnerability function was assessed using comparative analysis. The characteristics of the flood scenario, such as the average flood depth at the building scale and the aggregate size of the spatial unit for aggregating damage estimates from the building level; and - the spatial arrangement of exposed communities within the river basin.

In Assam, flood risk management will be implemented in 2020 by Sahab Deen and Atul Debbarma.

This essay will teach them how to prevent flooding. Government and the department of water resources can prevent floods by controlling drainage systems and bank erosion before disaster strikes. The government and state agencies have taken only short-term measures to construct a proper drainage system for food. Assam is building floodwalls, zoning its areas to prevent flooding, providing flood warnings and forecasts, and strengthening riverbanks.

Researchers Aparna Shankar, Megha Periyappilly Radhakrishnan, Lekshmi Narendrakumar, and Sudha Babu Nair discuss elucidating health concerns in flood-affected waterbodies using metataxonomic and antibiotic resistance profiles of microorganisms in Kerala in 2018.

Future research on flood protection and innovative approaches for reducing flood risk are also discussed. To provide early warnings about impending storms, invest in cyclone shelters, and set up a meteorological department.

Flood risk mitigation with low-cost sensors and citizen science: A proof-of-concept study from western Nepal, Jonathan D. Paul, Rishi Ram Sharma, and Bhopal Pandeya; 2020,

In Nepal's many vulnerable river basins, flood risk management is tied to saving human lives and maintaining local livelihoods, creating actionable data and knowledge is crucial. The lack of redundancy in DHM's conventional hydrometeorological monitoring system puts flood predictions at risk when existing sensors do not transmit real-time data to flood predictions and EWS. The lack of local data and knowledge has hindered flood risk assessments in many parts of Nepal.

Intended flood risk management implications for semi-alluvial channels with exceptionally high discharges, Christoph Hauer, Peter Flödl, Helmut Habersack, Christoph Hauer, 2021.

During an unusual flood in Flmselva, Norway, we examined the impact of critical flows on morphological changes. An analysis of step-backwater models based on one-dimensional data revealed that morphological change in semi-alluvial, high gradient rivers caused a partially significant decline in the Froude number, as well as the establishment of near-critical conditions for post-flood river bathymetry.

In 2019 China's Manas River Basin's flood frequency will be affected by non-stationary conditions, according to independent research led by Aihua Long, Xinlin He, Chaofei He, Fulong Chen, Yixuan Wang, Chaofei He, Fulong Chen, Yixuan Wang, Chaofei He.

Research on flood characteristic sequence trends and change-point has been conducted in the dry area in the upper reaches of the Manas River at the Kenswat hydrological station. A comparison is made between the frequency analysis of the two non-stationary flood series and the standard P-III analysis. Accordingly, the year in which the flood sequence changed is 1993, based on the findings of design flood change-point detection.

John Naughton, Walter McDonald, Elizabeth Regier, John Naughton, John Naughton, John Naughton, Hurricane Harvey in the year 2022 .

A case study on flood risk from heavy rainfall events. In this article, the authors provide a method for transferring the flood risk from hurricanes to other locations within their probability landfall path by constructing flood frequency statistics and regional regression equations. An analysis of Hurricane Harvey's precipitation is used to determine what might have happened if it struck two places along the Texas gulf coast at different times. The study suggests engineers and politicians should consider flood potential due to climate-enhanced hurricanes in all locations where they are likely to land.

The stability risk associated with vehicle crossings at stream crossings, Félix Francés and Ricardo A. Bocanegra, 2021.

An automobile traveling across a stream crossing is exposed to flood-related instability hazards, using a statistical method described in the present research. The number of automobiles floating or being dragged by the flow is used to estimate the risk of floatation. A recent study by Gang Zha and colleagues, Jianzhong Zhou, Kandi Huang, Ling Dai, and Quansen Wang suggests that pyroclastic-alluvial aquifer system overexploitation and mismanagement have resulted in lowering groundwater levels in Naples' periurban area (Italy).

Humphrey Waita Njogu, Impact of floods on Kenya's infrastructure users, 2021.

Climate change continues to cause flooding that undermines the reliability and effectiveness of infrastructure services, resulting in significant social and economic disruptions. Many of the infrastructure users in developing countries are affected by flood-related outages, causing them to have longer wait times, travel distances, and incur higher costs. Kenya has not been able to develop flood-resistant infrastructure despite the existence of laws, rules, regulations, and strategies.

Felix Francés and Ricardo A. Bocanegra assessing the impact of floods on vehicle stability in 2021.

The research assessed the likelihood of a vehicle being unstable during flooding for a specific location on the territory when the vehicle is driven or stopped. The yearly average number of at-risk vehicles is calculated by categorizing them based on vehicle type and assuming that they represent the entire fleet of vehicles in a specific location. By establishing a method, the danger of vehicle instability in a specific area resulting from flooding is captured in a detailed spatial view. Maps generated using the generated data let you precisely pinpoint not only high-risk automobile locations, but also high-risk areas for people.

A risk assessment of a multi-reservoir combined flood control system will be conducted in 2021 by Quansen Wang, Jianzhong Zhou, Ling Dai, Kangdi Huang, Gang Zha, Quansen Wang, Jianz Under many uncertainties, a risk assessment of a multi-reservoir combined flood control system will be conducted in 2021 by Quansen Wang, Jianzhong Zhou, Ling Dai, Kangdi Huang, Gang Zha, Quansen Wang.

As a result of the work presented here, a method for evaluating the overall flood control risk of multi-reservoir flood control systems was developed, taking multiple uncertainties into account, which will serve as a theoretical foundation for the reservoir groups' safe and stable operation. This article examined how different uncertainties affect flood control operations by using an explicit probability distribution, but it left out certain uncertainties that are hard to characterize with probability distributions, such as the uncertainty of the decision-makers and the delay in the operation.

Jia Xinhua, Siew Hon Lim, Yue Ge, Gennifer M. Jacobs, using sophisticated technologies to forecast river flooding, Siew Hon Lim, Yue Ge, Gennifer M. Jacobs 2022.

Here is an article discussing the economic benefits of using one of the world's most fertile dry agricultural regions as a forecasting tool for spring river floods using NASA satellites. The region's major industry is agriculture, which accounts for most of its income. NASA product support is on the decline, according to their findings. It was found that past spring river flooding had little effect on the farm's wastewater treatment plant. Because I am a landowner who leases to farm operators, the value of NASA products is further reduced.

A three-pronged approach to using the characteristics of water conveyance to estimate the obstruction of natural floods, Shang-Shu Shih and Po-Chih Chen, 2021.

The study investigates the impact of landcover types and tree blocking on river flood levels with numerical model simulations and UAV surveys. When the trees in the

floodway were removed, the amount of flood diversion increased dramatically, suggesting that wetlands could be restored to provide duck habitat. Molecular interactions between plant bending sections and water surfaces may enhance the resistance coefficients of complex tree structures. Future studies should examine the resistance coefficients of complex tree structures.

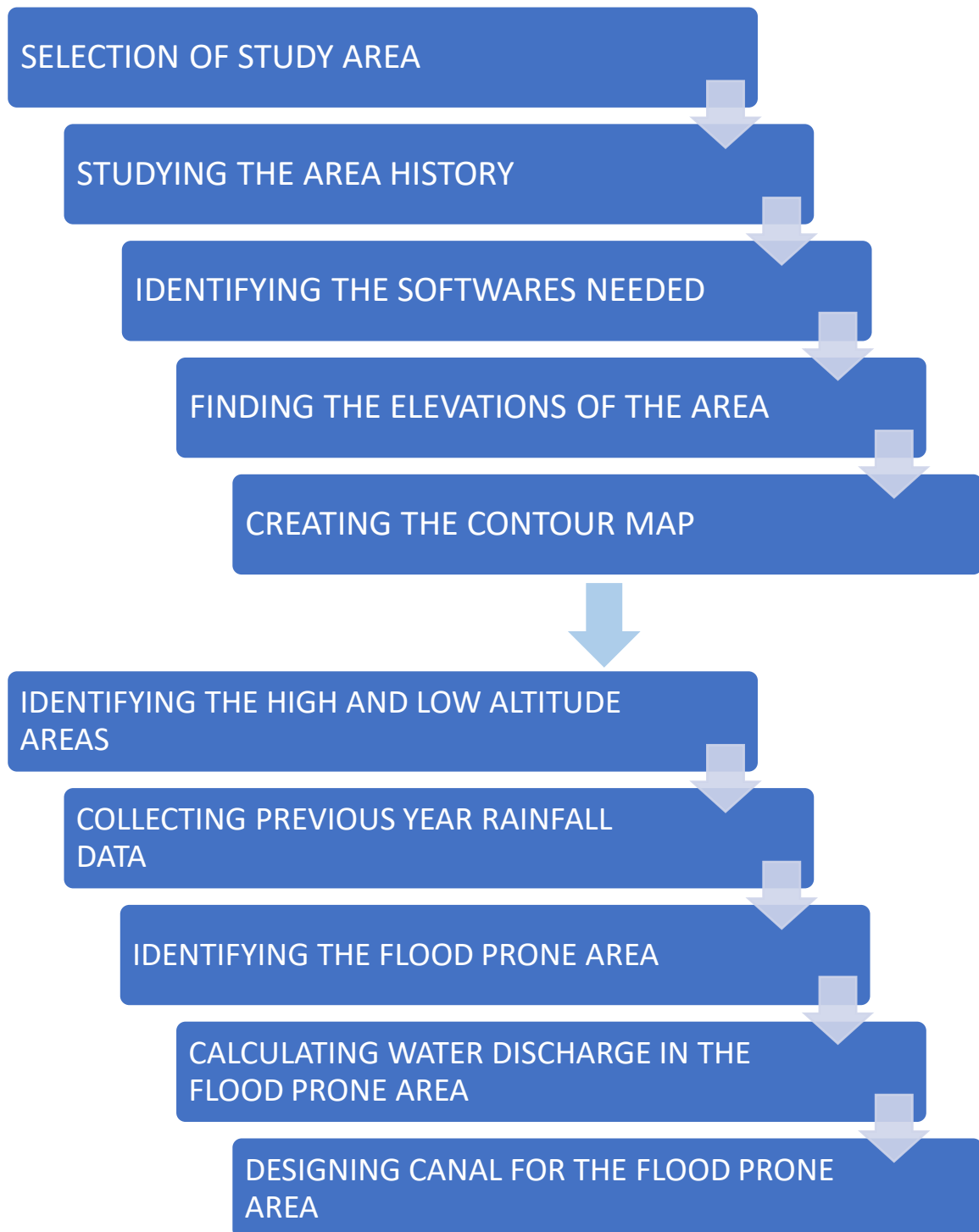
**The effect of flooding on masonry constructions and mitigation strategies
Shiyun Xiao, Shiyun Xiao, Shiyun Xiao, Shiyun Xiao, Shiyun Xiao, and Shiyun Xiao.**

There is significant damage that can be done to masonry structures by flooding, particularly in areas prone to floodings, such as the wall between a window and a door or the wall surrounding a window. Mathematical analysis and comparison are performed on three structures impacted by flooding. Damage, displacement, and failure processes on the structures are examined.

Inclusion of Water Resources Development in Flood and Drought Management in India, S. K. Das, Ramesh Kumar Gupta, and Harish Kumar Varma, 2009.

The purpose of this post is to discuss how to take a good inventory of your resources, identify vulnerable populations, integrate science and technology into your policies, advertise your proposal and elicit public feedback, and create a robust education program. Long-term drought mitigation strategies would typically involve ground- and surface-water storage, the integration of minor reservoirs with larger reservoirs, integrated basin planning, inter-basin water transfer, and so on. Long-term adaptation entails the creation of community-based natural resource management plans that are designed and implemented using a participatory approach while incorporating traditional knowledge.

2.2 METHODOLOGY



CHAPTER 3

AIM AND SCOPE

3.1 OBJECTIVE

- Reduce future damage by maintaining and cost-effectively modifying essential existing flood hazards.
- Making a contour map to examine the research area's terrain.

3.2 SCOPE

1. To get an understanding of the many types of flood risk management decision support systems that have been developed in the past or are now in use.
2. To create a methodological framework that enables the integration of information needed by various end-users.
3. To assess the location and potential implications of natural hazards such as floods on people, property, and the natural environment using the best available data.
4. To strengthen warning and emergency communications systems.

CHAPTER 4

STUDYING THE AREA

4.1 STUDY AREA

Thoraipakkam to Navalur

Table 4.1.1, Area Covered

AREA COVERED	TOTAL AREA	LATITUDE & LONGITUDE
Thoraipakkam	11.605 sq.km	12.9416° N & 80.2362° E
Karapakkam	3.67 sq.km	12.9191° N & 80.2300° E
Sholinganallur	116.20 sq.km	12.9010° N & 80.227° E
Semmencheri	7 sq.km	12.8652° N & 80.2277° E
Navalur	5 sq.km	12°50'41.18"N & 80°13'31.67"E
OVERALL, AREA	143.475 sq.km	-

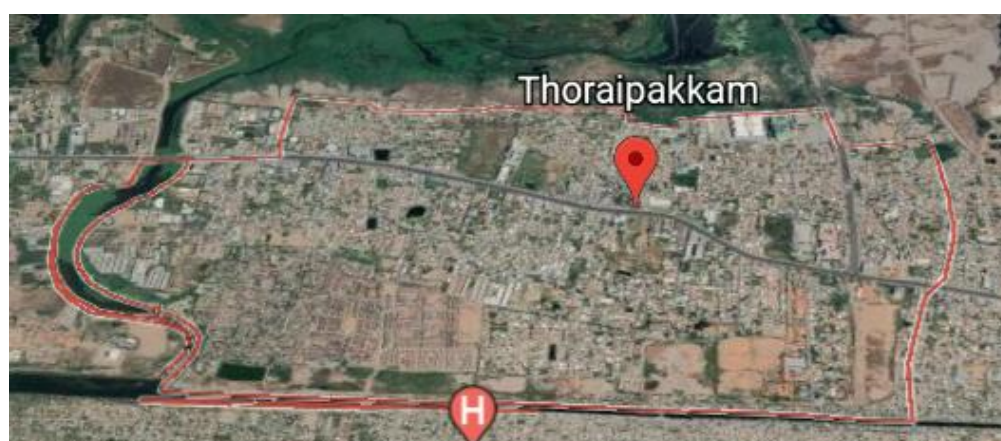


Figure: 4.1.1, THORAIPAKKAM

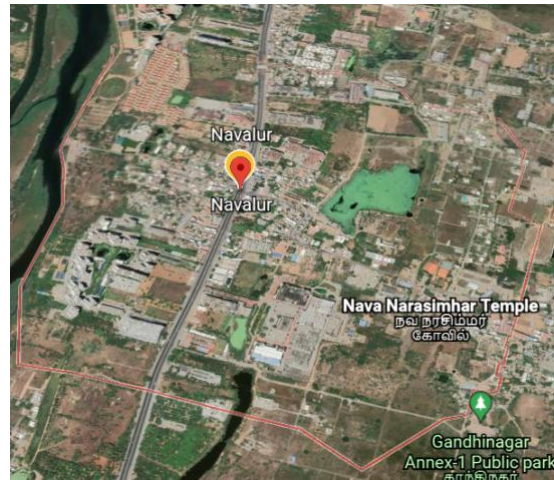


Figure: 4.1.5, NAVALUR

- The photos were gathered using the Google Earth software.
- The graphics depict the research areas chosen for the project.
- The chosen areas are connected by a 40-meter-wide road known as Old Mahabalipuram Road.
- The research area includes five tiny areas: Thoraipakkam, Karapakkam, Sholinganallur, Semmencheri, and Navalur, as well as an artificial canal named Buckingham Canal that flows perfectly along the Old Mahabalipuram Road.

4.2 HISTORY OF RAINFALL IN THE STUDY AREA

The rainy season in Chennai spans from October through December.

However, in 2018, the rainfall total was 603.3 mm, compared to 345.7 mm in 2017, a 75 percent increase over the usual rainfall range, resulting in enormous amounts of water being stored in the state's reservoirs, with surplus water still being released in several areas.

Major Rainfalls that occurred in the area are in:

- 2015 –
Rainfall amount – 1049.3 mm
Duration - November and December
- 2021 –
Rainfall amount – 1044.3 mm
Duration – November, December, and January

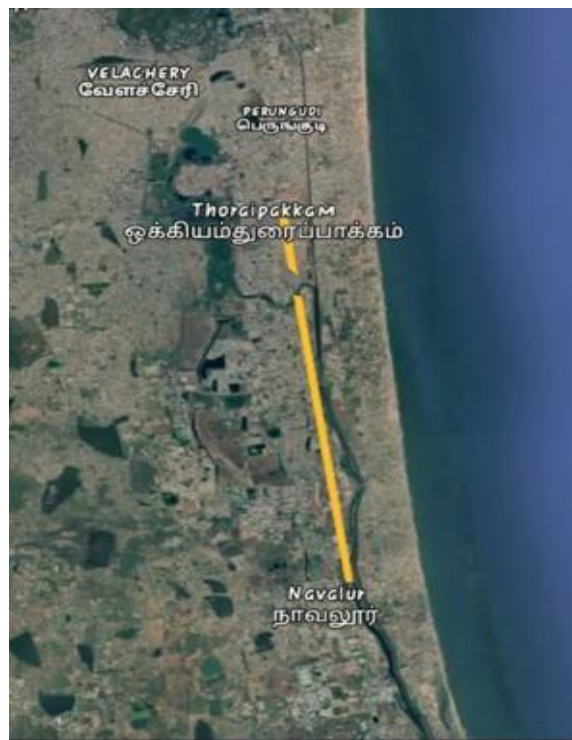


Figure 4.2.1 Study Area (Thoraipakkam to Navalur)

4.3 ELEVATION

The elevation differs from 7.4 to 4 in the area

Thoraipakkam as 7.4m

Karapakkam as 4m

Sholinganallur as 7m

Semmenjeri as 5m

Navalur as 6m

Created a Road Profile according to the elevation of the OMR

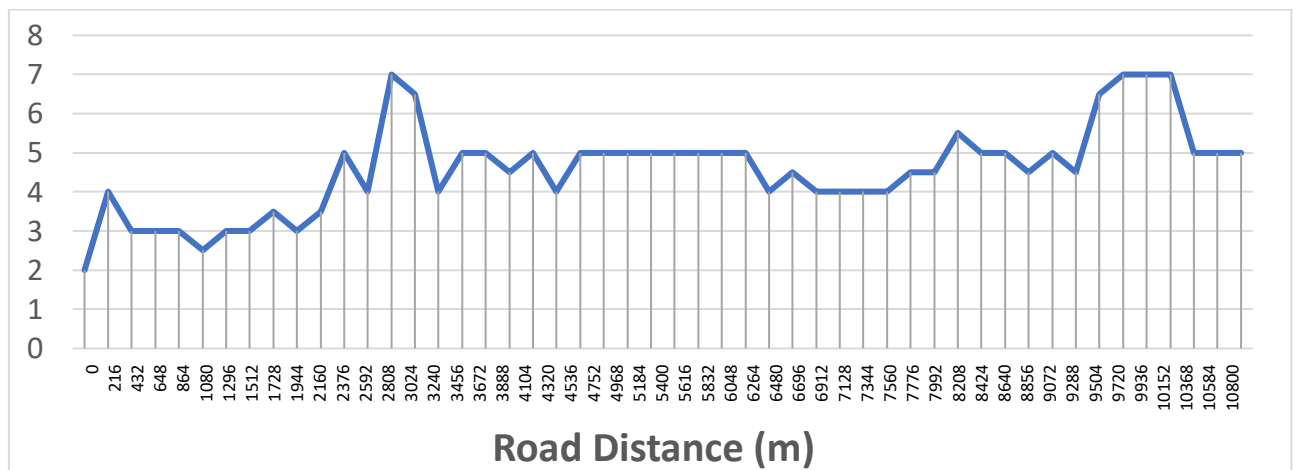


Figure 4.3.1, Road Profile

- We can get the perfect level of the road and find out whether there are any water stagnant regions in the road by developing a road profile.
- It also aids in the formation of the flood-affected area's contour map.

4.4 CONTOUR MAP OF THE AREA

Contour Map:

- It's a topographic map on which contour lines depict the shape of the land surface, with the relative spacing of the lines reflecting the surface's relative slope.
- On the map, depicts the slope and size of various terrain.
- The various elevations of the landscape can be easily calculated by looking at the contour intervals.

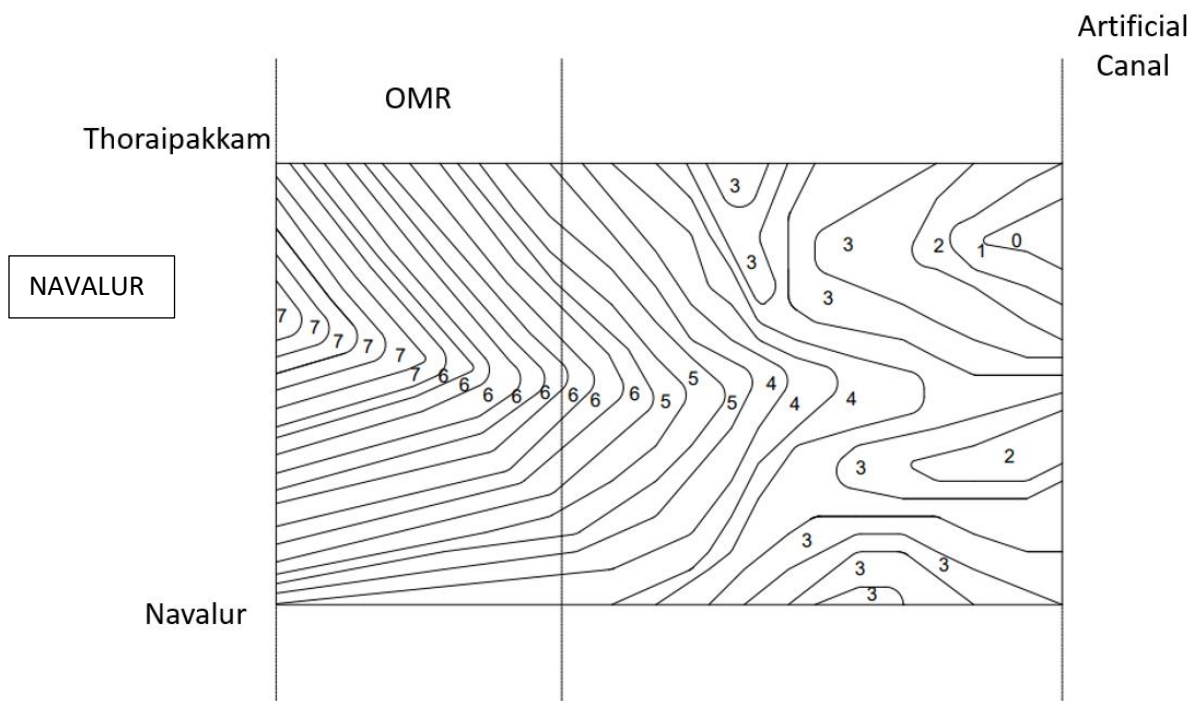


Figure: 4.4.1, Contour Map created by Autocad

Using AutoCAD software, I created a contour map.

The area near the artificial canal is at a low elevation, whereas the area near the old Mahabalipuram road is at a higher elevation, but the area near the artificial canal is at an elevation of 2m, which is higher than the other elevations near the artificial canal, which we can say is a reason for the flood water to stagnate.

4.5 RAINFALL DATA

Rainfall Data Collected from GEOVANNI software of the area

Time Series, Area-Averaged of Rainfall flux monthly 0.1 deg. [FLDAS Model FLDAS_NOAH01_C_GL_M v001] kg m⁻² s⁻¹ over 2016-Jan - 2022-01-01 00:00:00Z, Region 80.2707E, 13.0827N

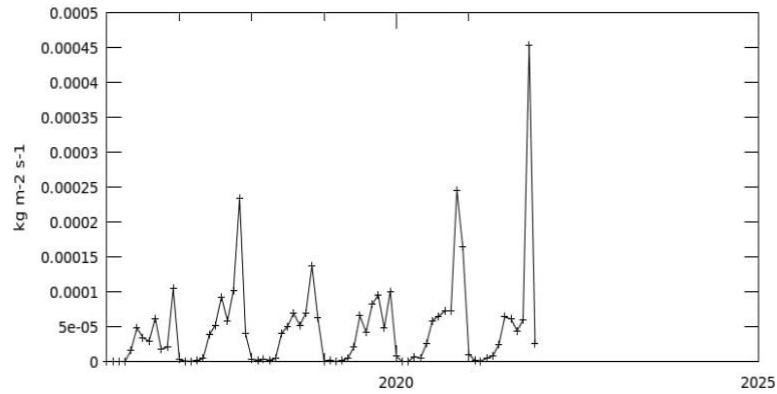


Figure: 4.5.1, Average area rainfall graph from 2016 to 2022.

The camera resolution is 0.1 degree

Region – 80.207 E and 13.082 N

Rainfall is Calculated in mm/day

Time Series, Area-Averaged of Precipitation Rate daily 0.25 deg. [TRMM TRMM_3B42_Daily v7] mm/day over 2016-01-01 01:30Z - 2019-12-31 01:29Z, Region 80.23E, 12.94N

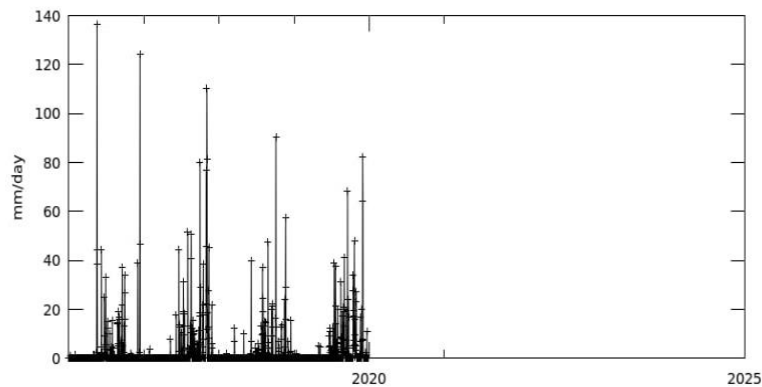


Figure 4.5.2, Average area precipitation graph from 2016 to 2019.

The camera resolution is 0.25 degree

Region – 80.23 E and 12.94 N

Rainfall is Calculated in mm/day

Time Series, Area-Averaged of Precipitation Rate daily 0.25 deg. [TRMM TRMM_3B42_Daily_v7] mm/day over 2016-01-01 01:30Z - 2019-12-31 01:29Z, Region 79.1016E, 12.085N, 80.4199E, 12.7002N

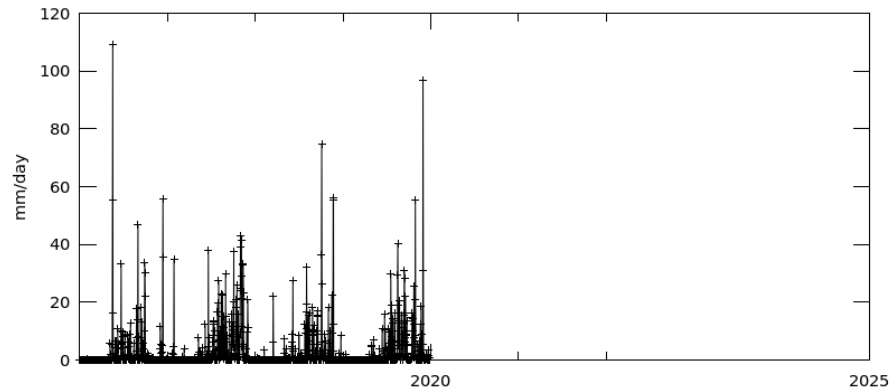


Figure 4.5.3, Average area Daily precipitation graph from 2016 to 2019.

The camera resolution is 0.25 degree

Region – 80.101 E and 12.085 N

Rainfall is Calculated in mm/day

Time Series, Area-Averaged Differences over 2016-Jan - 2022-02-01 00:00:00Z, Region 79.1016E, 12.085N, 80.4199E, 12.7002N of Rain precipitation rate monthly 0.25 deg. [GLDAS Model GLDAS_NOAH025_M v2.1] kg m⁻² s⁻¹ minus Rain precipitation rate monthly 1 deg. [GLDAS Model GLDAS_NOAH10_M v2.1] kg m⁻² s⁻¹

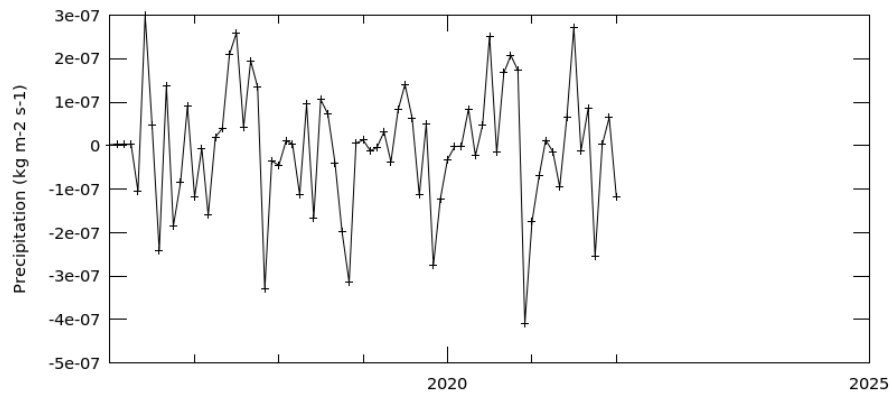


Figure 4.5.4, Average area Rain precipitation graph from 2016 to 2020.

The camera resolution is 0.25 degree

Region – 79.101 E and 12.085 N

Rainfall is Calculated in mm/day

Time Series, Area-Averaged of Near-Real-Time Precipitation Rate daily 0.25 deg. [TRMM TRMM_3B42RT_Daily v7] mm/day over 2016-01-01 01:30Z - 2020-01-01 01:29Z, Region 79.1016E, 12.085N, 80.4199E, 12.7002N

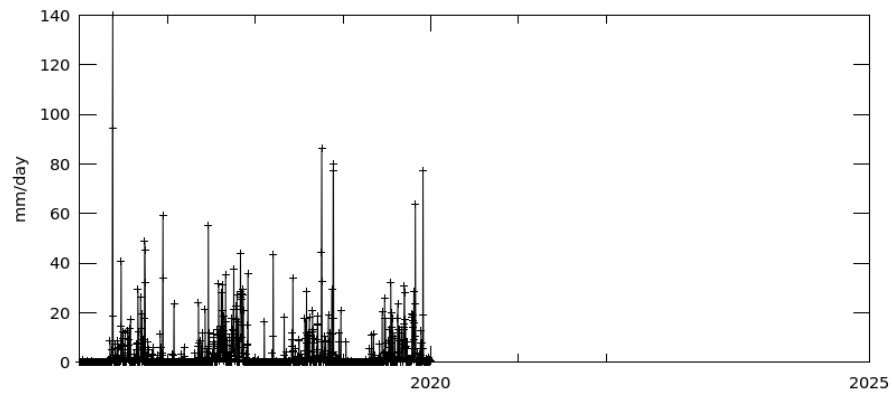


Figure 4.5.5, Average area Daily precipitation graph from 2016 to 2020.

The camera resolution is 0.25 degree

Region – 79.101 E and 12.085 N

Rainfall is Calculated in mm/day

RAINFALL DATA – EXCEL SHEET

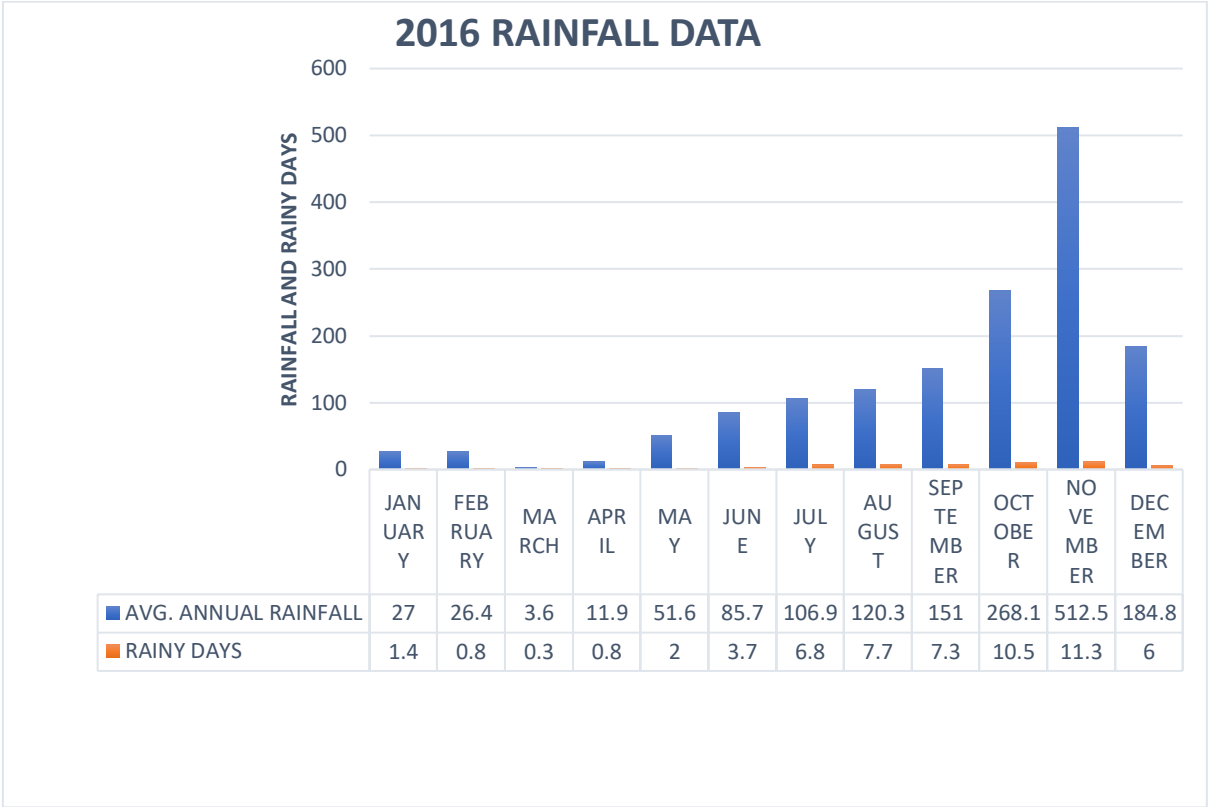
Collected from: JPR Research Centre, Sathyabama

Date	Rainfall (MM)	Date	Rainfall (MM)	Date	Rainfall (MM)	Date	Rainfall (MM)
30-11-2018	0	30-11-2019	122.64225	29-11-2020	0.126755759	30-11-2021	0.088103987
01-12-2018	0	01-12-2019	44.2812538	30-11-2020	2.14662099	01-12-2021	0.137692213
02-12-2018	0	02-12-2019	4.22973156	01-12-2020	8.47418404	02-12-2021	0.015
03-12-2018	14.3088522	03-12-2019	1.58499992	02-12-2020	85.0098114	03-12-2021	0.365748137
04-12-2018	3.5244441	04-12-2019	0	03-12-2020	38.3304939	04-12-2021	0
05-12-2018	0.4960168	05-12-2019	0.119999997	04-12-2020	80.1469345	05-12-2021	0
06-12-2018	0.117741138	06-12-2019	0.203181505	05-12-2020	12.886775	06-12-2021	0.039999999
07-12-2018	0.151668221	07-12-2019	0.524544656	06-12-2020	1.92378867	07-12-2021	0.204467848
08-12-2018	0	08-12-2019	0	07-12-2020	13.9321775	08-12-2021	0.069904089
09-12-2018	0.147977844	09-12-2019	0	08-12-2020	2.95667076	09-12-2021	0.0576411
10-12-2018	1.45360792	10-12-2019	0	09-12-2020	0.000166118	10-12-2021	0.050019726
11-12-2018	0	11-12-2019	0	10-12-2020	0.039703291	11-12-2021	0.138373151
12-12-2018	0	12-12-2019	0	11-12-2020	0	12-12-2021	1.0831126
13-12-2018	2.89998412	13-12-2019	24.5804024	12-12-2020	0	13-12-2021	0.10043636
14-12-2018	0.281107724	14-12-2019	0.325841546	13-12-2020	0	14-12-2021	0.488355339
15-12-2018	1.2465415	15-12-2019	0.28290239	14-12-2020	0.064233661	15-12-2021	0.087819308
16-12-2018	40.5567017	16-12-2019	0	15-12-2020	6.45178318	16-12-2021	0.016894966
17-12-2018	0.241551191	17-12-2019	0.125	16-12-2020	16.7457714	17-12-2021	0.021957114
18-12-2018	0	18-12-2019	0	17-12-2020	2.19075537	18-12-2021	0
19-12-2018	0	19-12-2019	0.56851393	18-12-2020	0.33727622	19-12-2021	0
20-12-2018	0	20-12-2019	0.005573004	19-12-2020	1.27439761	20-12-2021	0
21-12-2018	0.037608773	21-12-2019	2.94991732	20-12-2020	0	21-12-2021	0
22-12-2018	0	22-12-2019	0	21-12-2020	0	22-12-2021	0
23-12-2018	6.03325415	23-12-2019	0.427344739	22-12-2020	0	23-12-2021	0
24-12-2018	0.068955116	24-12-2019	1.25835574	23-12-2020	0	24-12-2021	0.117655918
25-12-2018	0	25-12-2019	0	24-12-2020	0	25-12-2021	0
26-12-2018	0	26-12-2019	0	25-12-2020	0	26-12-2021	0
27-12-2018	0	27-12-2019	0	26-12-2020	0	27-12-2021	0
28-12-2018	0	28-12-2019	0	27-12-2020	0	28-12-2021	0.000392367
29-12-2018	0	29-12-2019	0.209999993	28-12-2020	0.049999997	29-12-2021	0.194462433
30-12-2018	0.012661694	30-12-2019	0.502983034	29-12-2020	0.134342343	30-12-2021	32.6188202
31-12-2018	0	31-12-2019	5.69688511	30-12-2020	0.320805043	31-12-2021	29.7671108
01-01-2019	0	01-01-2020	1.82045078	31-12-2020	0		
02-01-2019	0	02-01-2020	0	01-01-2021	0		

Figure: 4.5.3 Rainfall Data for the years 2018, 2019, 2020 and 2021

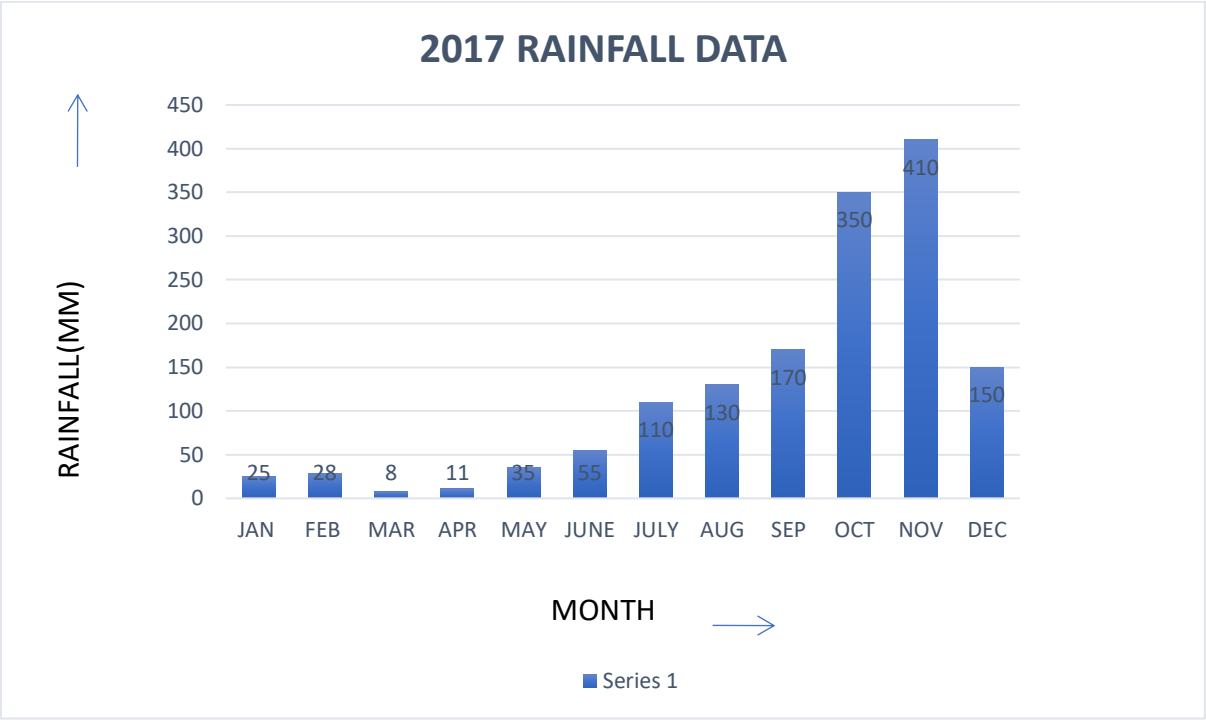
- We have collected the average rainfall data for the area of Sholinganallur, as shown in fig.4.5.3, for the years indicated.
- During November and December, Sholinganallur receives the most rainfall.
- The information gathered is for November and December.
- The most rainfall was experienced in December, compared to the previous two months.

Table 4.5.1, Rainfall data of the year 2016



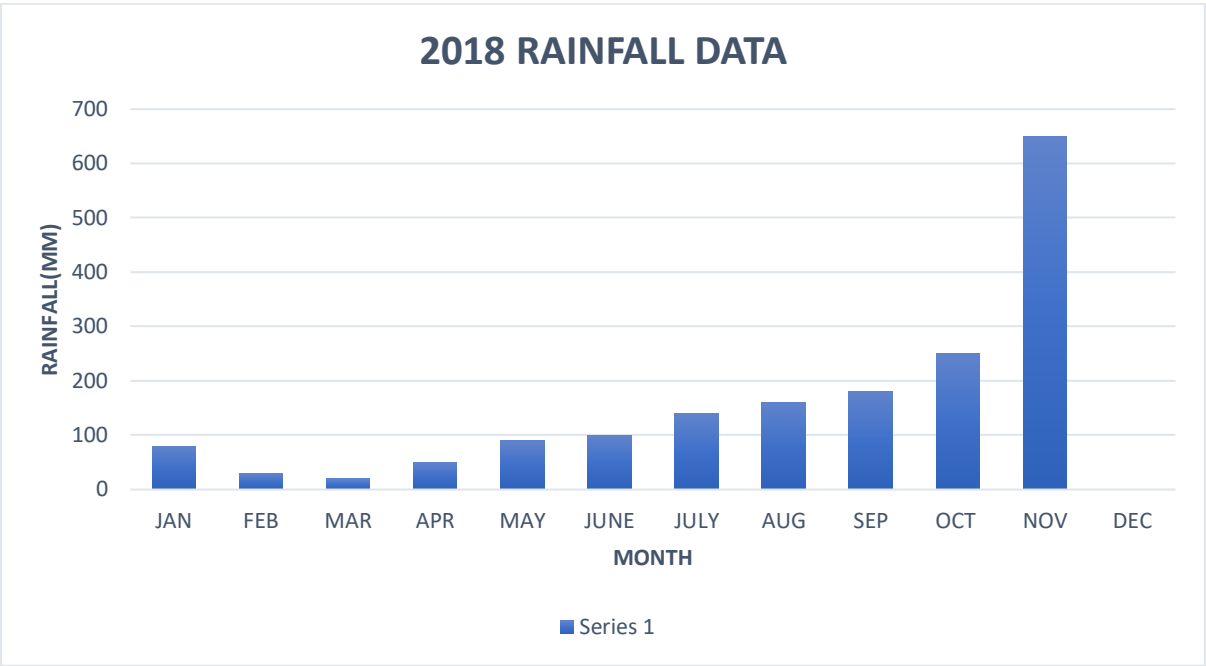
- The months are represented on the x-axis.
- The rainfalls and rainy days are represented on the y-axis.
- We found that the rainfall was highest in November, moderate in December, and lowest in July, August, and September in 2016.

Table 4.5.2, Rainfall data of the year 2017



- The months are represented on the x-axis.
- The rainfalls are represented on the y-axis.
- We found that rainfall was highest in October and November of 2017, moderate in September and December, and lowest in January, February, May, and June of 2017.

Table 4.5.3, Rainfall data of the year 2018



- The months are represented on the x-axis.
- The rainfalls are represented on the y-axis.
- We found that the rainiest months in 2018 were November, October, and September, with the driest months being January, April, May, June, July, and August.

CHAPTER 5

OUTCOME OF THE PROJECT

5.1 OUTCOME

Observation:

- We've noticed that during the rainy season, the floodwater stagnates due to the OMR's higher elevation.
- If we consider Thoraipakkam in the north and Navalur in the south of the OMR, we can see how the western side of the OMR is submerged in floodwater.
- To reach the lake, the water must flow till Okyempet Bridge, after which it will flow towards the Artificial Buckingham Canal.
- We've witnessed that the flood water remains stationary in the area between Okkiyampet bridge and Navalur, causing a flood.
- From the Okkiyampet bridge to Navalur, the floodwater needs a method to flow towards the manmade canal, which it doesn't have.

5.2 DISCUSSION

The major issue identified in the study area is –

- Floodwater from Thoraipakkam travels to Navalur, where it enters a constructed canal and flows back to the sea.
- However, the problem can be rectified if we build small canals that run parallel to the OMR route and directly into the sea, at least two between Thoraipakkam and Navalur.
- The canals must be located in an area where the ground level is lower than the water level.
- We need to identify government property for the culverts before we can build the canal.
- We must construct a canal-based on the water flow and the amount of rain that falls every 30 minutes.

5.2.1 CANAL LOCATION

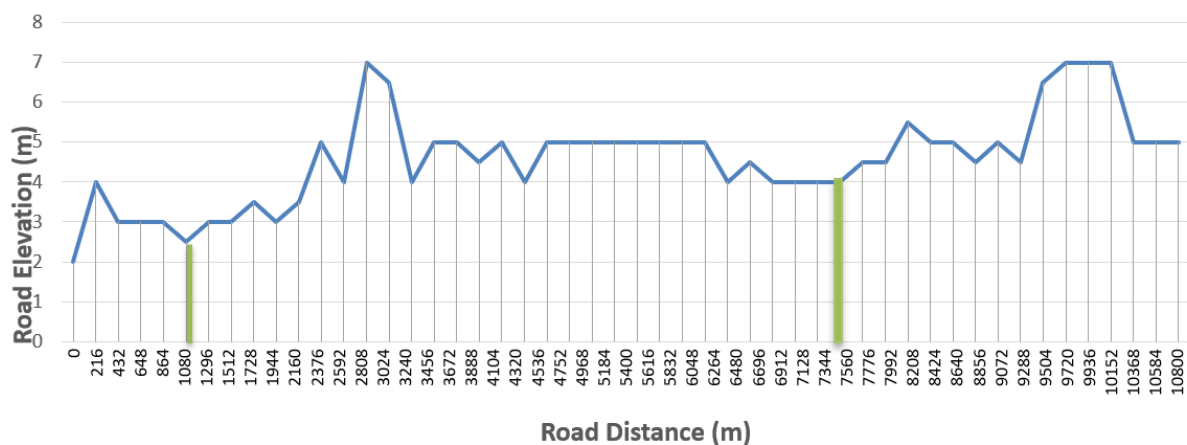


Figure: 5.2.1.1, Road Profile showing Proposed canal locations



Figure: 5.2.1.2, Location of proposed canal-1, Thiruvalluvar Salai

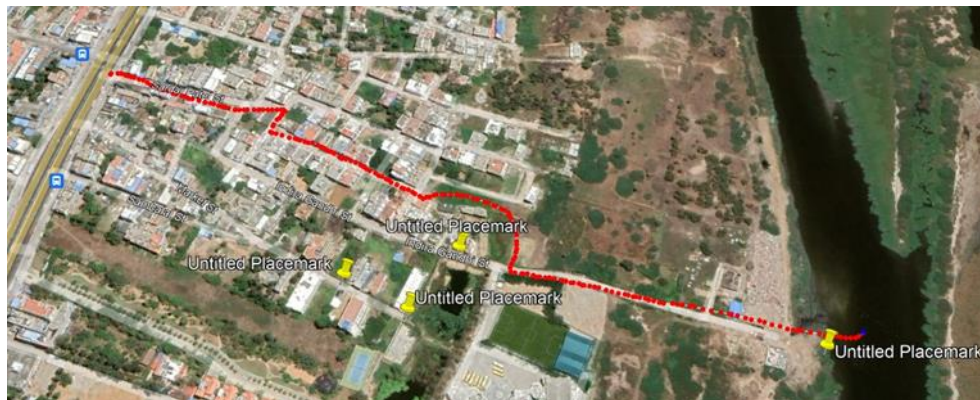


Figure: 5.2.1.3, Location of proposed canal-2

- We were unable to obtain government lands throughout the above two places; nonetheless, a little portion of it is government lands, and most of it is village roads.
- We've double-checked that the road width is sufficient for the projected canals' construction.

CHAPTER 6

CONCLUSION

The data on the flood disaster in Chennai was gathered from newspapers, journals, the internet, and articles, among other sources. Every year, the flood hazard in Chennai and its consequences cause socioeconomic disruption. Every year, severe rainfall causes flooding in Chennai, which is devastating to people's livelihoods and infrastructure. People in those sectors suffer and lose money in their businesses, as well as for the state's general development and vital economic challenges. We investigated and established improved approaches to improve existing flood management methods and adopt new strategies to manage and reduce flood hazards in flood-prone areas in a cost-effective manner in this project report. We can create, as stated in this project report.

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