**POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH**

# A STUDY OF SLUICE GATE IN MITIGATE FLOOD IN TAMAN SRI MUDA

**NUR NADHIRAH BINTI MAT HUSAIMI**

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**JABATAN KEJURUTERAAN AWAM**

**SESI II : 2021/2022**

# DECLARATION OF ORIGINAL AND OWNERSHIP

## TITLE: A STUDY OF SLUICE GATE IN MITIGATE FLOOD IN TAMAN SRI MUDA

1. I, NUR NADHIRAH BINTI MAT HUSAIMI (KP NO: 021003-03-0356), am a Civil Engineering Diploma student at Sultan Salahuddin Abdul Aziz Shah Polytechnic, whose address is Persiaran Usahawan, 40150 Shah Alam, Selangor.

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(No. Identification Card:021003-03-0356)

In front of me,
PUAN ZURINA BINTI SAFEE
(No. Identification Card:820205-03-5498)

As a project supervisor on date:

# ACKNOWLEDGMENT

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ABSTRACT

Regarding the amber warning and subsequently issuing a red warning in the Klang Valley, Selangor and neighboring countries by MetMalaysia in March 2022, it has been raining continuously for four days and has caused flooding. Water locks are one of the methods used to reduce flood rates. A sluice gate is a mechanism used to control water flow. These devices are often used in water treatment plants, mining, dams, rice fields, and cranberry bogs, among other places. We use a qualitative approach which is an interview conducted with one of the JPS staff through personal interaction. While the quantitative is through site survey and measurement of the required data. The geographical situation in Taman Sri Muda is caused by silt and vegetation. has raised the level of the river channel and banks leaving the inside of the bank lower and lying down over time creating a non-flowing bowl. In addition, Taman Sri Muda now stands as one of the densest and overdeveloped areas in the Selangor Kota Kemuning State Assembly area with over 9000 houses and apartments. The result we reached is the function of the water gate where during flood the Tidal Control Gate(TCG) is closed due to hydraulic pressure. Therefore, the TCG water pump is activated to let the excess water flow out. Next, the rainfall pattern collected by the Meteorological Department shows an uneven distribution due to climate change. In addition, the peak discharge was calculated using MSMA 2nd Edition 2012. In conclusion, this study is to achieve a better understanding of the factors that cause flooding, rainfall patterns and the function of sluice gates in Taman Sri Muda, Shah Alam. The general public must play an important role in taking care of the environment to avoid clogging channels. Knowledge about water locks also needs to be disclosed so that they don't blame each other and the city management when there is a flood. Finally, the city management from all aspects needs to upgrade the management of Taman Sri Muda according to the current state of development.

ABSTRAK

Mengenai amaran ambar dan seterusnya mengeluarkan amaran merah di Lembah Klang, Selangor dan negara jiran oleh MetMalaysia pada Mac 2022, hujan turun berterusan selama empat hari dan menyebabkan banjir. Kunci air adalah salah satu kaedah yang digunakan untuk mengurangkan kadar banjir. Pintu air adalah mekanisme yang digunakan untuk mengawal aliran air. Peranti ini sering digunakan dalam loji rawatan air, perlombongan, empangan, sawah padi, dan rawa kranberi, antara tempat lain. Kami menggunakan pendekatan kualitatif iaitu temu bual yang dijalankan dengan salah seorang kakitangan JPS melalui interaksi peribadi. Manakala kuantitatif adalah melalui tinjauan tapak dan pengukuran data yang diperlukan. Keadaan geografi di Taman Sri Muda berpunca daripada kelodak dan tumbuh-tumbuhan. telah menaikkan paras alur sungai dan tebing meninggalkan bahagian dalam tebing lebih rendah dan berbaring dari semasa ke semasa mencipta mangkuk yang tidak mengalir. Selain itu, Taman Sri Muda kini berdiri sebagai salah satu kawasan yang paling padat dan terlalu membangun di kawasan Dewan Undangan Negeri Selangor Kota Kemuning dengan lebih 9000 rumah dan pangsapuri. Hasil yang kami capai ialah fungsi pintu air di mana semasa banjir Tidal Control Gate(TCG) ditutup kerana tekanan hidraulik. Oleh itu, pam air TCG diaktifkan untuk membiarkan lebihan air mengalir keluar. Seterusnya, corak taburan hujan yang dikumpul oleh Jabatan Meteorologi menunjukkan taburan yang tidak sekata akibat perubahan iklim. Selain itu, luahan puncak dikira menggunakan MSMA Edisi Ke-2 2012. Kesimpulannya, kajian ini adalah untuk mencapai pemahaman yang lebih baik tentang faktor-faktor yang menyebabkan banjir, corak taburan hujan dan fungsi pintu air di Taman Sri Muda, Shah Alam. Masyarakat umum perlu memainkan peranan penting dalam menjaga alam sekitar bagi mengelakkan saluran tersumbat. Pengetahuan tentang kunci air juga perlu didedahkan supaya tidak saling menyalahkan antara satu sama lain dan pihak pengurusan bandar apabila berlaku banjir. Akhir sekali, pengurusan bandar dari semua aspek perlu menaik taraf pengurusan Taman Sri Muda mengikut keadaan pembangunan semasa.

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# 1.0 INTRODUCTION

## 1.1 Introduction

MetMalaysia issued an amber warning in March 2022, which was then upgraded to a red alert across the Klang Valley, Selangor, and surrounding nations. It poured consistently for four days before a month-long storm produced floods in the area. Four rivers in the vicinity of Kuala Lumpur burst their banks, and the flood at Taman Sri Muda, Shah Alam, had reached hip level by December 18. This has a significant influence on flood-affected areas. The unexpected and quick rise in water level in Taman Sri Muda was caused by an abnormally large volume of water moving downstream, and the entire community effectively became a watershed. The rainwater retention pond cannot handle the amount of rainfall that occurs at that time. The dam couldn't be opened, and the sluice gates couldn't open fast enough to let the surging water out. As a result of the sluice's inability to work effectively, a variety of claims have been made public. Control structures are frequently structures that establish a link between the discharge and the depth of the surrounding flow.

Sluices are utilised in a variety of environments and come in a variety of shapes and sizes. The valve that controls the water gate is referred to as the "water gate." These valves have a one-way seal and are often used to control water levels and flow rates in rivers and canals. It is also employed in waste water treatment facilities. A sluice is a hydraulic construction that ancient civilizations used to manage upstream water levels in rivers, streams, and open irrigation networks by regulating gate openings. To manage flow, the sluice gates move up and down on a vertical plane above the spillway. As water runs up the spillway, it passes through the gate. As a result, they are also known as vertical gates or down flow gates. The sluice gate's width must be established. Management and monitoring should be implemented in the irrigation network's control and distribution of water to prevent water waste, and flow control structures such as gates should be carefully selected and fitted to the demands of each area. A sluice is traditionally a wooden or metal barrier that slides in a groove at the margin of a river and might be compared to a lower aperture in a wall.

The flooding in Taman Sri Muda and the surrounding area is caused by an unexpected rain pattern over the past few years and a drainage system that is ineffective in managing and releasing water from one direction to another. We will identify the variables that cause flooding and recognize the purpose of sluice design in this study. In this study, we will identify the problem and the best solution will be determined through analysis and evaluation. We will also describe some data in finding the best solution for this flood problem.

## 1.2 Problem Statement

Natural processes such as siltation and vegetation will gradually raise the level of the river channel and the bank at Taman Sri Muda, causing the inside of the bank to sink over time. Which will result in a non-flowing bowl. The quick and rapid rise in water level was caused by an exceptionally large volume of water moving downstream, and the entire neighbourhood effectively became a watershed (Rahman, 2022).

Taman Sri Muda is presently one of the most densely populated localities in the Kota Kemuning Selangor state assembly region, with over 9,000 homes and flats occupied mostly by the M20 and B40 age groups (Azim Idris, 2022). As a result, Taman Sri Muda is overdeveloped and lacks ideal urban planning. This is due to the presence of badly situated industrial sites and shop houses, as well as inappropriate monsoon drains that cause harm to public property.

The government's response was poor, since they left the victims stuck on the roof for days owing to a lack of assistance and organised rescue by the government and other authorities. After watching the victims stuck on the roof for hours, the Malaysian Armed Forces (ATM) decided to begin relief efforts even without orders from the National Disaster Management Agency (NADMA), as per established practise. The Fire and Rescue Department was also affected by the water, but they hastened to assist save the victims (Rahman, 2022).

## 1.3 Objectives Research

- To recognise the design function of a sluice gate in mitigate the flood.
- To obtain rainfall pattern intensity in 11 years from 2012 to 2022.
- To find peak Q(discharge) of a drain in Taman Sri Muda.

## 1.4 Scope of The Research

This study is to achieve better understanding on different types of design of sluice gates that is suitable in Taman Sri Muda Shah Alam. Therefore, the intent of this study is to identify velocity, discharge, depths and flow rate. Recent studies and researches will be used as reference in finding out what affects the condition and performance of different kinds of sluice gate. A survey and interview will be carried out which will include JPS (Jabatan Pengairan dan Saliran Selangor) help to get some data and the information will then be collected as a guideline of this study.

# 2.0 SUMMARY OF LITERATURE REVIEW

## 2.1 Literature Review

| Title | Country | Author | Purpose |
|---|---|---|---|
| Gate Lip Hydraulics under Sluice Gate | Iraq | Mohammed, A. Y., & Khaleel, M. S. (2013). Gate lip hydraulics under sluice gate. | The study flow characteristics of coefficient of contraction, coefficient of velocity and coefficient of discharge flow pass underneath vertical and inclined sluice gates with (45)˚ angle with and opposite flow |
| Analysis of Rectangular Side Sluice Gate | India | Swamee, P. K., Pathak, S. K., & Ali, M. S. (1993). Analysis of rectangular side sluice gate. Journal of irrigation and drainage engineering, 119(6), 1026-1035. | The study of prismatic and broad-crested sluice gate, discharge coefficient for an elementary strip along gate length |
| Flow Measurements Using a Sluice Gate, Analysis of Applicability | Poland | Kubrak, E., Kubrak, J., Kiczko, A., & Kubrak, M. (2020). Flow measurements using a sluice gate; analysis of applicability. Water, 12(3), 819. | To determine the measured downstream water depth for submerged doors, installed in channels with a rectangular cross section, to ensure a good fit between the measured and calculated flow rates. |
| Application of Sluice Gate in Different Positions and Its Effect on Hydraulic Parameters in Free-Flow Conditions | Iran | Daneshfaraz, R., Abbaszadeh, H., Gorbanvatan, P., & Abdi, M. (2021). Application of Sluice Gate in Different Positions and Its Effect on Hydraulic Parameters in Free-Flow Conditions. | ● Evaluate the effective application of sluice gate<br>● Analyze the dimensions of the sluice gate |

| | | | |
|---|---|---|---|
| | | Journal of Hydraulic Structures, 7(3), 72-87. | |

## 2.2 Introduction of Taman Sri Muda

Sri Muda is a major township in Section 25, Shah Alam, Selangor, Malaysia. This township is located in Klang District at the south of Shah Alam, between Kota Kemuning and Alam Megah. Located between the sprawling suburbs, Southwest of Kuala Lumpur and Northwest of Port Klang, Taman Sri Muda (TSM), is a major township in the Shah Alam district. It is a fully mature and successful multi-racial middle class residential, commercial and industrial development with a handful of busy commercial centres. According to Sugan.S (2013), Taman Sri Muda is also known as Merton Estate, and it is located in Lot 28, Mukim Klang and spans 58475 hectares. Initially, Indians fill the position since the only accessible occupation is rubber tapping.

The area is divided into two plantations, one for rubber and one for palm oil, both of which are owned by Syarikat Sri Alam Sdn. Bhd. Following then, Syarikat Mewacres Sdn. Bhd purchased the site and carried out different development projects to maintain the city up to date. The development project began on February 17, 1982, with Mister Woo Whai Yoon in charge of the site. Taman Sri Muda is now located southwest of Shah Alam's town centre in Petaling district, adjacent to Seksyen 13 and Kampung Jawa. Taman Sri Muda is home to a diverse population of races, including Indians, Malay, Chinese, and others. The majority of citizens are employed as manufacturing workers, company owners, construction workers, private sector, government employees, and others. According to Kimilil (2022), the area of Taman Sri Muda is encircled on three sides by the Klang River. According to Google Maps, Taman Sri Muda is hit by both the Klang and Damansara Rivers' flooding. The opposing side is formed by the angle at which the Damansara River enters the Klang River. As a result, Taman Sri Muda is vulnerable to the overflow of rapid water from the Damansara River. Taman Sri Muda floods if any of the rivers overflows.

There are also several parts of the factory lot, one of which is the Axis Industrial Estate. Consisting of 2 and 3 storey terraced houses, residential land, apartments, factory lots and shops, the township suffered from flooding. This situation was rectified in 1995 but flooding has recurred in recent years. It is well known that more mitigation works will be carried out in 2017. The land here is mostly freehold and

there is a large water treatment plant in the North while the Klang River acts as a boundary largely in the North and East of the township.

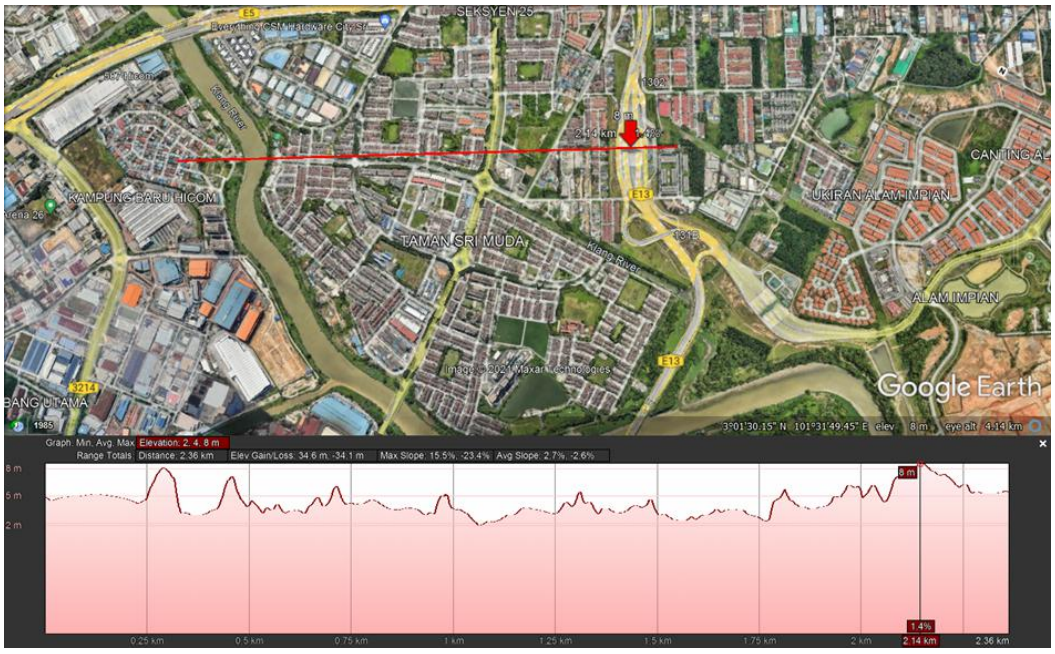



Figure 2.2.1 : A cross section downstream of the highway

Figure 2 shows a cross section downstream of

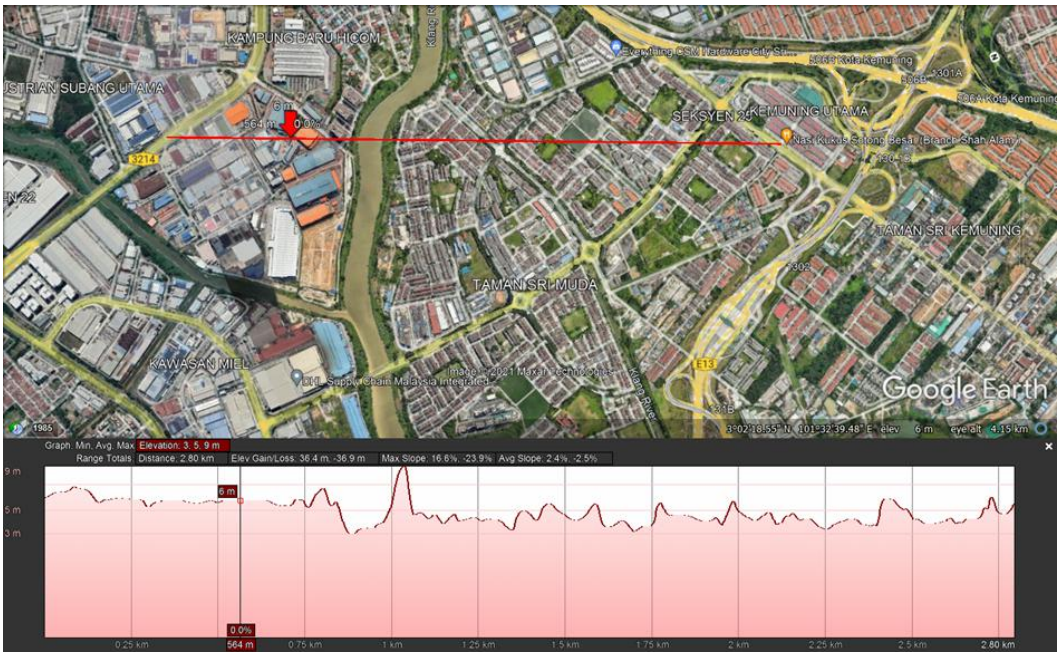



Figure 2.2.2 : Bowl shaped, right elevated, left elevated middle slightly deepened.

Figure 2 depicts a cross section downstream of the roadway; it functions as a funnel, restricting floodwater movement. Again, embankments along the river are to blame. According to Pereira, J. J., and I. Komoo (1999), over 100 different flooding episodes occurred in the Klang Valley between 1990 and 1995. In 1995 alone, at least 7500 persons were impacted. Taman Sri Muda has been hit by flash floods five times the size of the RM200 million destroyed homes since it is positioned 0.5 metre higher above the level of the Klang River. This could be due to a variety of factors, including increased impermeability due to an increase in the built-up component of the urban ecosystem, increased accelerated erosion from exposed surfaces, which results in sedimentation of rivers and streams, causing flash-flooding along flat low-lying river channels, and poor maintenance of drainage facilities in built-up areas, according to the quote. (Jamaluddin,1986)

## 2.3 Floods

### 2.3.1 Definition Floods

Floods are the most common type of natural disaster, occurring when excess water submerges normally dry land. According to Wikipedia "Flood" is "an overflow of water that submerges a normally dry area,". Flooding is often caused in coastal areas by heavy rain, rapid melting snow, or storm surges from tropical cyclones or tsunamis. Floods can be catastrophic, causing loss of life and damage to personal property and vital public health infrastructure. A flood is also an overflow of water that submerges normally dry land. A flood occurs when water overflows or soaks typically dry terrain. There are few areas on the planet where people do not have to worry about flooding. Floods often build over hours or even days, allowing communities time to prepare or flee. Floods can occur fast and without notice at times.

A flood can occur in a variety of ways. The most prevalent is when a river or stream overflows its banks. These are known as riverine floods. A river can be overwhelmed and spread across neighbouring land by heavy rain, a damaged dam or levee, quick glacier melt in the mountains, or even a beaver dam in a susceptible place. A flood plain is the area of land that surrounds a river.

Flooding is a field of study in the discipline of hydrology. It is the most common and widespread natural severe weather event. When floods occur, there is usually a risk of death, public anger, and widespread destruction of property. Floods have the capacity to damage bridges, cars, houses, and even people's lives. Flooding also destroys crops, as well as trees and other land-based structures. Flooding is especially dangerous for those who live in floodplains or in non-resilient structures, or who do not have flood warning and awareness systems.

### 2.3.2 Types of Floods

a) River Flood

River floods occur when regular rain or snow melt causes a river's capacity to be exceeded. A river flood happens when water levels rise above the river's banks. This flooding can occur in any river or stream channel. This contains everything from little streams to the world's major rivers. River flooding is typically caused by four factors: significant rainfall from a tropical storm system making landfall, thunderstorms that persist in the same location for an extended length of time, a combination of rain and melting snow, and ice jams. Ice jam flooding, also known as ice overflow, happens when floating ice becomes stuck, resulting in an overflow of water and debris. These snarls form behind river bends, tributary mouths, dams, and bridges. Ice jams form in cooler places in late winter and early spring.

b) Coastal Flood

Coastal flooding occurs when seawater inundates typically dry land regions near the shore. Tidal surges, high winds, and barometric pressure are common causes of coastal flooding. Storms at sea, such as tropical cyclones, tsunamis, and higher-than-average tides, are commonly responsible for this condition.

c) Storm Surge

A storm surge is an exceptional rise in water levels in coastal areas above typical astronomical tides. Storm surges are always the outcome of meteorological storms that create higher-than-normal tides on the shore. Storm surges are caused by three components: wind, waves, and low air pressure. Storm surge is a particularly hazardous type of flooding. It has the potential to flood enormous coastal regions all at once. It can also rapidly produce floods. Extreme flooding happens when a storm surge coincides with high tide. Storm surges can exceed 20 feet!

d) Inland Flooding

Inland floods are floods that occur inland rather than along the coast. As a result, coastal flooding and storm surges are not inland floods. Rain is virtually often blamed for inland floods. Rain produces inland flooding in two ways. It can happen if there is continuous rain over several days or if there are brief and severe bouts of rain. Inland flooding can also be caused by snowmelt, however rain is the more usual cause. Inland flooding can also occur when streams are clogged by trash, ice, or dams. Inland flooding is sometimes greater in cities since there is nowhere for the water to flow. Paved streets and highways, low-capacity drainage systems, compact structures, and low-lying soil can all contribute to urban flooding or worsen inland floods, and low amounts of green space.

e) Flash Flood

A flash flood is a flood that occurs within 6 hours of heavy rain, and commonly within 3 hours (or other reasons). Flash floods can occur for a variety of causes. The majority of flash floods occur as a result of heavy rain from violent thunderstorms in a short period of time (usually 6 hours or less). The chance of a flash flood is determined by two factors: rainfall rate and length of rainfall. Flash floods can also happen when dams fail, levees fail, or ice jams discharge significant volumes of water. This sort of flood is distinguished by torrents that rip across riverbeds, city streets, or canyons, destroying everything in their path. Flash floods may engulf entire villages, reaching heights of 30 feet. Another reason flash floods are so deadly is that they can occur with little or no notice. This is especially true when a dam or levee fails. Before a flash flood strikes, the National Weather Service suggests that you get familiar with the danger of flooding in your region. They also advise having a family or company catastrophe plan in place in the case of a flash flood.

### 2.3.3 Effect of The Flooding

Flooding of regions used for socioeconomic activity has a number of detrimental consequences. The severity of the detrimental effects is determined by the sensitivity of the activities and people, as well as the frequency, intensity, and extent of floods. Some of these elements are listed below;

a. Loss of livelihoods

As communication networks and infrastructure like as power plants, highways, and bridges are destroyed and disrupted, economic activity comes to a halt, resulting in dislocation and the dysfunction of regular life for a time well beyond the duration of the inundation. Similarly, the direct influence on production assets, whether in agriculture or industry, can stifle regular activity and result in the loss of livelihoods. The impact of lost livelihoods can be seen in economic and commercial operations even in nearby non-flooded areas.

b. Hindering economic growth and development

The enormous cost of relief and recovery may have a negative influence on investment in infrastructure and other development initiatives in the area, and in some situations may cripple the region's fragile economy. Flooding in a region may hinder long-term investments by both the government and the commercial sector. A lack of livelihoods, along with skilled labour movement and inflation, can have a detrimental influence on a region's economic growth. The loss of resources might result in high prices for products and services, delaying development programmes.

c. Loss of lives and property

Flooding has immediate consequences such as loss of life, property damage, crop devastation, animal loss, failure of infrastructural facilities, and worsening of health due to waterborne infections. Flash floods, which occur suddenly and with little or no notice, kill more people than slow-rising riverine floods. Water damage from floods accounts for 90% of all natural catastrophe damage. Homes, companies, automobiles, possessions, and equipment are all examples of personal property. Just a few inches of water may do significant damage to your house or business's contents, not to mention structures and property. Loss of life

is the most catastrophic effect flood damage may have on you or your business. Flash floods are the leading weather-related killer, killing humans, pets, and livestock, and wild animals alike.

### 2.3.4 Flood Incident Updates

Faris Fuad, Berita Harian (March 7, 2022), KUALA LUMPUR: Several areas around the KIang Valley, including the capital here, experienced flash floods following continuous heavy rain for more than two hours this afternoon. The Malaysian Highway Authority (LLM) through a statement on Facebook, informed that several routes including the Besraya Expressway involving the route from the city center to Salak Selatan, from Kuchai to Salak Jaya and Kampung Malaysia to Kuchai were flooded.17 According to the newspaper, as a result of the floods on the Kesas Highway, 4 lanes were blocked and only one lane could be passed at KM48.3 East towards Sukom Junction. Meanwhile, there are also more than 50 houses affected by the floods. The flood occurred due to heavy and continuous rain around Selangor.

## 2.4 Sluice Gate

### 2.4.1 Definition of Sluice Gate

Sluices are used in a number of settings and come in various forms and sizes. The "water gate" refers to the valve that regulates the water gate. These one-way valves are commonly used to manage water levels and flow rates in rivers and canals. It is also used in waste water treatment plants. A sluice is a hydraulic structure used by ancient civilizations to regulate gate openings in rivers, streams, and open irrigation networks to manage upstream water levels. The sluice gates move up and down on a vertical plane above the spillway to moderate flow. Water flows through the gate as it flows up the spillway. As a result, they're often referred to as vertical gates or downflow gates. It is necessary to determine the width of the sluice gate. To reduce water waste, management and monitoring should be implemented in the irrigation network's water control and distribution, and flow control structures such as gates should be carefully selected and fitted to the demands of each region. A sluice is a wooden or metal barrier that slides in a groove at the river's edge and is analogous to a lower aperture in a wall.

## 2.4.2 Design of Sluice Gate

### 1. Flap Gate

Figure 2.4.1 : Example picture of Flap Gate

The flap gate is a simple hydraulic automatic upstream water level control gate. Its simplicity stems from its ease of production and maintenance; unlike other hydraulic automated doors, it requires just flat plate and tube fabrication rather than curved surfaces. This door is operated similarly to a check valve by a pressure head located above it. At the top, there is a hinged gate. When pressure is applied from one side, the gate is always closed; when pressure is applied from the other side, the floodgate opens when the threshold pressure is surpassed.

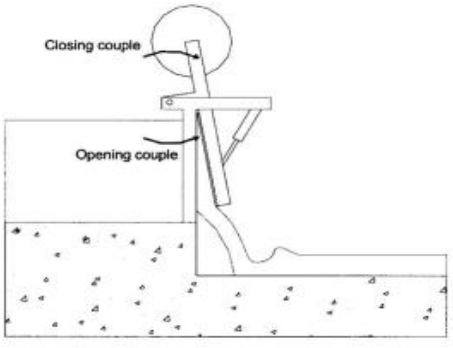



Figure 2.4.2 : Balance of Couples on Flap Gate

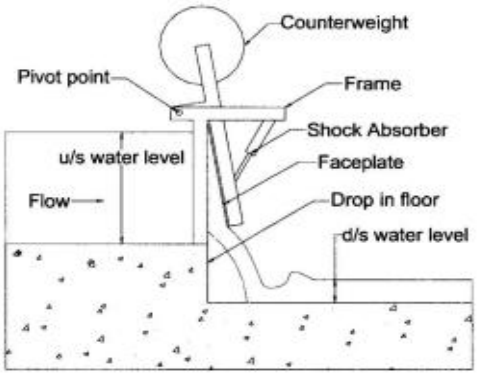



Figure 2.4.3 : Side View of Flap Gate

2. Vertical Rising Sluice Gate

This is a vertical rising sluice gate, which means that the gate's height is adjusted by equipment. The sluice gate may regulate the flow of water by altering its height. Sluice gates are often used to manage the level and flow velocity of water in a river. When the gate is fully lowered, water may pour over the top, producing the same effect as a weir. Engineers use sluice gates to manage the flow of water in a river, which is especially important during times of floods.

Figure 2.4.3 : Example of Vertical Rising Sluice Gate

3. Radial Sluice Gate

The most frequent forms of spill gates in use today are radial gates, sometimes known as tainter gates (after the structural engineer who popularised them). Because water runs beneath the gate, it is categorised as an undershot gate. It is made out of curved skin plates that are held together by a structural steel frame. To raise or lower the gate, a lift system is employed. Water pressure is carried from the curved face to the radial door arm, which distributes the load to a common bearing on both sides of the door opening in a radial door. Load combinations for water control gates can be complicated, and great effort should be made to identify all critical combinations.

Figure 2.4.4 : Example of Radial Sluice Gate

Figure 2.4.5 : Example of Radial Sluice Gate

4. Rising Sector Sluice Gate

Figure 2.4.6 and Figure 2.4.7 show the example of Rising Sector Sluice Gate

These gates are mainly used to regulate the river's flow and level. A portion of the cylindrical surface may also be found on this door. It's at the very bottom of the canal. To enrich, the gate will raise by revolving around its centre, allowing water to pass through. These doors operate quickly because they move in an arc. Because the full water load is carried radially via the arm to the pivot, the lifting capacity is diminished. However, a recess space in the floor is necessary for the entry, which can be an issue in areas with a high silt content.

5. Needle Sluice

Figure 2.4.8 and figure 2.4.9 show of the example of Needle sluice

As in a needle dam, a sluice constructed by a number of tiny needles pressed against a solid frame by water pressure. A needle dam is a weir that uses thin "needles" of wood to maintain a river's level or flow. The needles are supported by a strong frame and are not meant to be watertight. Individual needles can be added or withdrawn by hand to constrain the river's flow and construct a sluice. The first needle dam in the

United States was built on the Big Sandy River downstream from Louisa, Kentucky, in 1896. A similar method, today known as paddle and rymer weirs, was developed. was used since medieval times on the River Thames in England to create flash locks. (19)

6. Fan gate

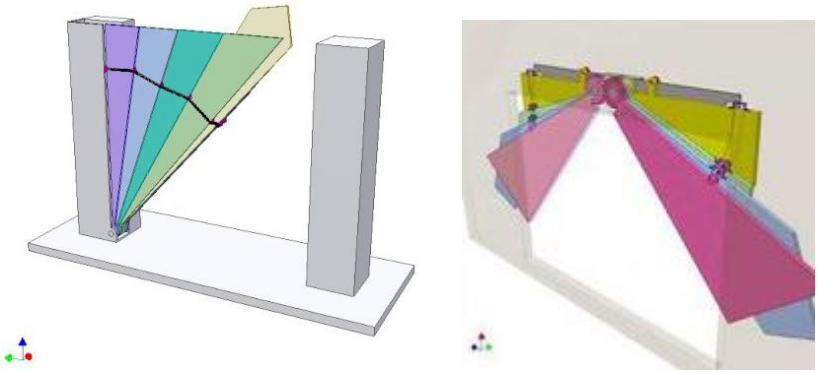


Figure 2.4.10 and figure 2.4.11 show the example of Fan Gate

The Fan door has the unique ability to open in the direction of high water merely by using water pressure. This gate type was mostly used to flood certain areas on purpose, such as the Hollandic Water Line. This sort of gate may still be found in a few places today, such as Gouda. A fan gate has a separate chamber that can be filled with water and is separated from the sluice on the high-water level side by a huge door. When a tube connecting the separate chamber to the sluice's high-water-level side is opened, the water level and therefore the water pressure in this chamber rise to the same level as on the high-water-level side. The bigger gate produces no force since there is no height difference across it. The smaller gate, on the other hand, has a greater level on the upstream side, which applies a force to close the gate. The water level in the chamber will fall when the tube to the low water side is opened. Because the surface areas of the doors differ, there will be a net force shutting the gate.

### 2.4.3 Problem of Sluice Gate

According to Rustiati, N., & Dermawan, V. (2019) during the operation and maintenance time of the sluice gate, the up and down of movement of the gate should be suitable with the design of water flow. However, the operation of sluice gates is not always well-done. Because of the manual movement of operation, sometimes the gates are jammed and even damaged. Thus, the water distribution is not in accordance with the design. When the velocity is high, the bed channel will receive the jet attack velocity which destroys it. When it happens continuously, the bed channel and the material below the bed will be exfoliated.

# 3.0 METHODOLOGY

## 3.1 Introduction

This chapter explains the research method adopted which includes discussion about research design, research location, data acquisition procedures and analysis data procedures. The purpose of this research method is to get a general idea on how river and rain is going to be calculated and how sluice gates work in Taman Sri Muda.

## 3.2 Research design

This research is using a combination of qualitative and quantitative research. For instance, the research of Ideal Design for Sluice Gate in Taman Sri Muda is dealing with human interaction and perspectives hence it is highly encouraged to use qualitative methods. An interview was carried out to get more data and information about the sluice gate, geographical and town planning in Taman Sri Muda. Thus, it will be a more accurate finding as the JPS staff are perceived to give more honest answers and opinions through personal interaction with the interviewer by using telephone calls.

For the most part, this research is also more on quantitative approach which relies on data that are observed or measured to examine questions about the discharge of a river and limitations of a sluice gate that are present in Taman Sri Muda. For example, the method that will be used is by going to the actual location and analyse the specific formula of a discharge and coefficient sluice gate such as depth of a river and velocity flow rate.

Overall, the materials and equipment that will be used for this research are stopwatch and survey levelling staff. Stopwatch is for determining the time taken for 10 liters of water that is flowing in the river. Meanwhile, survey levelling staff is to calculate the depths of the river.

### 3.2.1 Personal Interview

We utilised a personal interview with Encik Saiful, a JPS Klang officer, for this section. This strategy will serve as our primary data because it provides several solutions to our issue statement and research questions. So, primary data are data that are acquired specifically for the study subject at hand. By employing approaches that are most suited to the research topic. When primary data is obtained, new data is often contributed to the existing store of social knowledge. The interview with Encik Saiful was conducted over the phone. This is because of Covid-19 policy, and it also makes it simpler for him to do the responsibilities.As a result, we created a questionnaire just for Encik Saiful. When doing this form of interview, there are benefits and drawbacks. This interview approach is not only typically brief, but it also has certain limits because responses are limited to persons who can be contacted by phone. Aside from that, response rates are often lower than in face-to-face interviews. Furthermore, just a few questions may be answered through telephone interview because it may look inconvenient for responders to answer too many questions.

A personal or face-to-face interview uses a standard structured questionnaire to verify that all respondents are given the same questions in the same order. It is a two-way discussion initiated by an interviewer in order to acquire information from a responder. The format of the interview is defined by the questions, language, and sequencing, and the interview is performed face-to-face. Surveys are studies that collect information by interviewing individuals. Such investigations are known as sample surveys when the participants questioned represent a wider community.

The amount of questions and the specific phrasing of each question included in a questionnaire are defined in advance for all responders. The interviewer just reads each question to the respondent and typically refrains from explaining the questions until the respondent requests clarification.

#### 3.2.1.1 Advantage of Personal Interview

A) Control over the interview environment

An interviewer can standardise the interview by ensuring that it was performed in private, that there was no one to influence the response, and that there was no one to dictate. He can prescreen to guarantee that the proper responder is responding, and he can set up and regulate the interviewing situation. In contrast, in a postal survey, the questionnaire may be completed by persons other than the respondent himself/herself under significantly different settings. Thus, the respondent cannot 'cheat' by obtaining prompts or replies from others.

B) Flexibility

Flexibility is the key advantage of the interview research. When the response suggests that the respondents misunderstood the question, interviewers might explore for more detailed replies and repeat and explain the question. others.

C) Spontaneity

The interviewer has the option of recording spontaneous responses. In contrast to the mail questionnaire, the respondent does not have the option of retracting his or her original response and writing another. Replies given spontaneously are more trustworthy, informative, and less normative than answers given after the responder has had time to think about them.

D) Scope to deal with greater complexity of the questionnaire

An interview study can benefit from a more complicated questionnaire. A good, experienced, and well-trained interviewer can write out a questionnaire so full of skips, arrows, and comprehensive instructions that even a well-educated respondent would feel hopelessly bewildered in a mail questionnaire.

### 3.2.1.2 Types of Interviews used in Research

There are different types of interviews used in the research data collection. An interview is either structured or unstructured, depending upon whether a formal questionnaire has bean formulated and the questions asked in a prearranged order or not. An interview is also either direct or indirect as a result of whether the purposes of the questions asked are plainly stated or intentionally disguised. Cross-classifying these two characteristics provides four different types of interviews.

A) Structured-Direct Interview

The standard sort of interview done during a consumer survey to acquire descriptive information is one employing a formal questionnaire consisting of non-disguised questions, a questionnaire aimed to "get the facts". If the marketing search manager of a television set maker wants to know how many and what types of individuals favour different forms of television cabinets, for example, he may create a series of questions that explicitly ask for these data. If personal interviews are employed, each interviewer will be directed to ask the questions in the sequence listed on the questionnaire and only those questions. The resulting interviews will be structured-direct in character.

B) Unstructured-Direct Interview

The interviewer is just given basic guidelines on the sort of information wanted in the unstructured-direct technique of interviewing. He is left to ask the required direct questions to gather this knowledge, using the warding and order that appears most suitable in each session. In exploratory investigations, unstructured-direct interviews are frequently employed. Many research projects that employ a formal questionnaire for the final interviews have an exploratory phase in which respondents are contacted and unstructured interviews are conducted. These interviews are important for gaining a better grasp of the problem and selecting which areas need to be researched.

C) Structured-indirect interview

In the case of a structured indirect interview, the questions are pre-determined and organised in a systematic manner. The study's objective, however, remains unknown.

D) Unstructured-indirect interview

In the case of an unstructured indirect interview, the questions are neither pre-determined, nor is the objective of the research made plain.

### 3.2.2 Site Visit

3.2.1 : One of the residents of Taman Sri Muda

When we did a site visit. We have done some interviews with the residents of Taman Sri Muda. Based on the interview, we found that there are frequent floods in Taman Sri Muda. The drainage depth is also not deep and easily flooded if it rains heavily. In addition, these residents also admitted that this area is full of garbage on the banks of the river. This causes the drainage to become blocked and flood easily. The resident also stated that the sluice gate was working but the opening operation was a little slow.

“A site visit is an evaluation activity intended to gather first-hand information about a program, usually with the intent to incorporate findings with other data collected. Several types of data collection may occur during a site visit that can strengthen the overall evaluation. The visiting researcher may take the role of non-participant observer by observing without interrupting program activities. (This tends to be the common role for a researcher conducting an external evaluation.) The visitor may also be a participant-observer and take on a role in the program while observing. For example, the researcher may lead an activity or discussion with program participants”[20]

Site visits are an efficient technique to better comprehend quantitative data acquired for other components of the evaluation. A researcher must comprehend the programme or policy being investigated in order for an assessment to be useful. The

researcher can gain a better grasp of the software by witnessing it in operation. leading to fresh information and viewpoints.

Because a site visit can serve several functions, the type of data collected is determined by the purpose of the visit. For example, the researcher may just want a snapshot of the programme in one or more of its places. Site visits may also be utilised to improve understanding of the practicalities behind a programme at a single location, including participant requirements and interests.

Site visits may also provide a chance to detect and recognise unanticipated or unintended consequences of the programme, both positive and bad. Frequently, specific parts of a program's implementation do not match the goal of the program's architects. During a site visit, the researcher can analyse how a programme has been tailored to the specific needs of that location.

### 3.2.3 Secondary Data Collection Activities

We requested data, especially rainfall data for Shah Alam, by email to the official MetMalaysia address. As a result, they offered us station locations in Selangor. Mardi Klang was the only station near to Taman Sri Muda out of the six stations in Selangor. They mentioned RM30 for a summary of rainfall from 2012 to 2022. I successfully purchased the data.

Secondary data is information gathered by someone other than the end user. It implies that the data is already accessible and has been analysed. Magazines, newspapers, books, and journals are all examples of secondary data. It might be either published or unpublished information. Data gathering methods used in secondary research include the internet, libraries, archives, schools, and organisational reports. Secondary research methods are further divided into qualitative and quantitative data collecting techniques. Online questionnaires and

surveys, trend reports, and statistics regarding various aspects of a business or industry are all examples of quantitative data collection tools.

Qualitative research approaches include relying on past interviews and data acquired through focus groups to assist a company understand its consumers' requirements and prepare to meet those needs. It also assists firms in determining the level of employee satisfaction with organisational policies.

A) Online Data

Online data is information obtained via the use of the internet. This strategy has recently gained popularity since the internet provides a big pool of both free and paid research materials that can be conveniently accessed with the press of a button. While this strategy facilitates data collection, the researcher must take care to only acquire information from legitimate websites. In some ways, the internet serves as a virtual aggregator for all other forms of secondary research material.

B) Data from Government and Non-government Archives

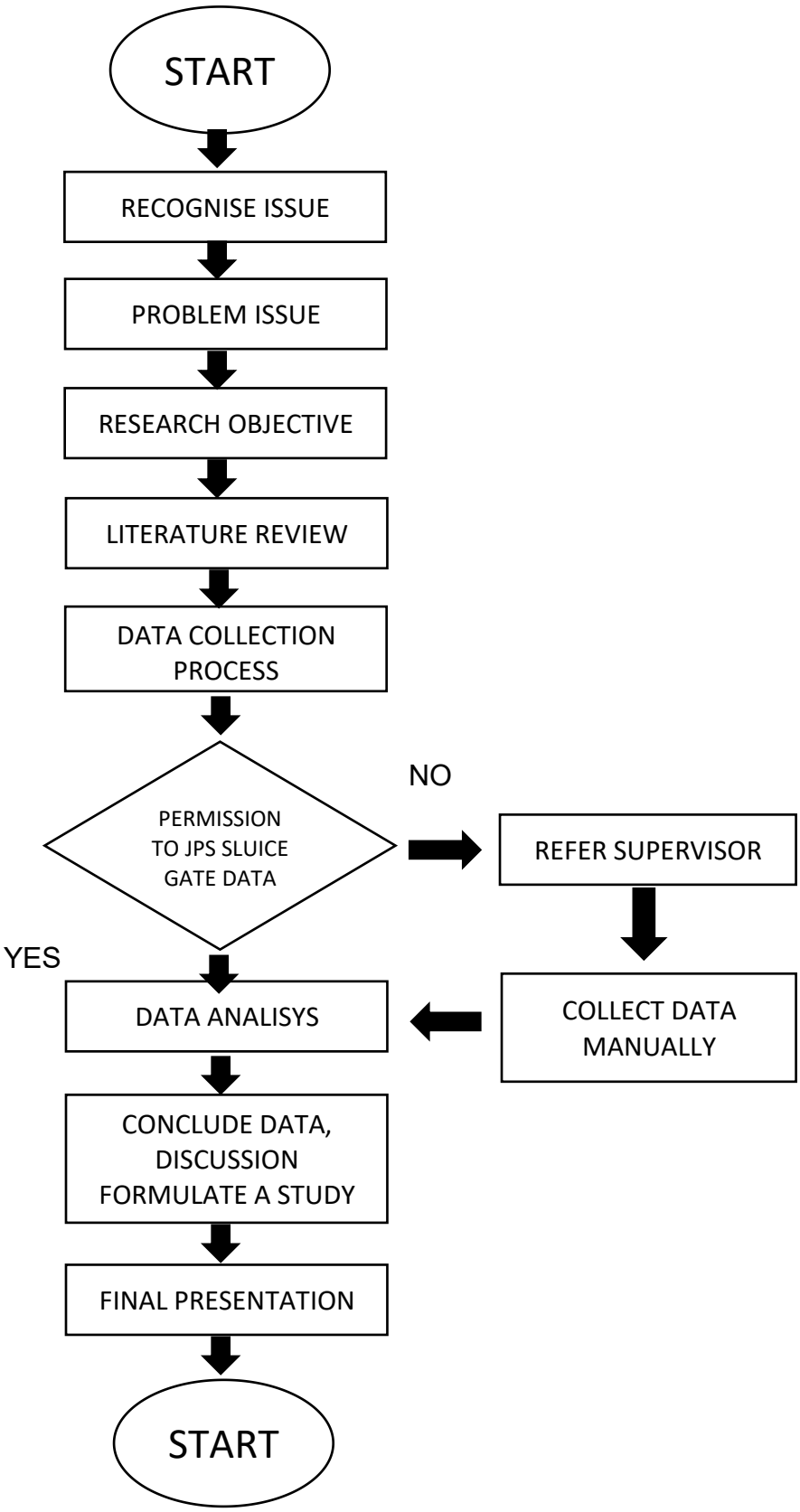
You can also find relevant research materials in official and non-government archives, which generally include reliable information that gives useful insights into various study contexts. In many circumstances, you would have to pay a fee to have access to this information. The problem is that such data is not always easily available owing to a variety of variables. For example, because some of these resources constitute classified information, researchers might have difficulty accessing them.

C) Data from Libraries

Public and private libraries can also provide access to research resources. Consider a library to be an information warehouse containing a collection of relevant material that may be used as legitimate data in many research situations.

Typically, scholars would contribute many copies of their dissertations to public and private libraries, particularly in the case of academic research. Business directories, bulletins, annual reports, and other similar materials that might be used as research data are also collected and maintained in libraries, both in soft and physical versions.

## 3.3 PROJECT FLOWCHART PLANNING AND IMPLEMENTATION OF SLUICE GATE FUNCTION PROJECT IN TAMAN SRI MUDA



## 3.4 Summary

This research is to get the general knowledge of how the river and sluice gate plays an important role in mitigating floods in Taman Sri Muda. geographical and town planning is also mentioned before discussing the research methodology used to conduct this research. Thus, a mix method of research which is qualitative and quantitative will be conducted to get the data and information that is needed in the research procedures. The data that were collected are then analyse and discussed and the results will be displayed.

# 4.0 RESERCH FINDIING AND DISCUSSION

## 4.1 Intoduction

The data analysis and study findings will be described in full in this chapter. This chapter has two sections: deep analysis and broad analysis. This analysis is connected to the collected research findings, which are offered as an interpretation that encompasses the complete scope of the study goals presented in chapter 1.

## 4.2 Research Findings

### 4.2.1 Design Function Of Sluice Gate

Figure 4.2.1 : The Sluice Gate In Taman Sri Muda

Figure 4.2.2 : Sluice Gate in the rainwater catchment pond

Based on the research we have done, we found that there are 2 main sluice gates in Taman Sri Muda. One of them is in the rainwater catchment pond as shown in figure 4.2.2. This sluice gate controls the water level of the rainwater pond. If the pool's water level reaches the set level, this door will be opened to release the water through the drainage found there. While there is another sluice gate near the Kemuning - Shah Alam highway as shown in figure 4.2.1. This sluice gate functions to control the drainage water level found there. In addition, there is also a small sluice gate found in the rainwater catchment pond.

### 4.2.2 Operation of Sluice Gate


Figure 4.2.3 : Some of water control gate components

In this study, we have conducted a questionnaire from the Selangor Irrigation Department. According to JPS, Water gates require routine maintenance due to the presence of major components such as a panel box, shaft coupling, roller, aluminium plate door, and wire rope. Problems with sluice gate components are common, such as the shaft coupling being broken as a result of the sluice gate keeper being late in opening the gate at the appropriate time. The shaft will twist and break, preventing the sluice gate from opening. Furthermore, broken button switch box panels are frequently caused by interference from insects (ants), wild animals (monkeys), and interference from the public, as well as weather variables. Roller components are frequently damaged as a result of a lack of grease oil maintenance. If the roller becomes damaged.

Gate valves are used to stop the flow of liquids rather than to regulate the flow, which is commonly done using a globe valve. The standard gate valve has no blockage in the flow passage when completely open, resulting in very low flow resistance. As the gate is moved, the size of the open flow route fluctuates in a nonlinear fashion. This indicates that the flow rate does not vary uniformly when the stem moves. A partially open gate may shake due to fluid flow, depending on its structure. Gate valves are commonly utilised with bigger pipe diameters (from 2" to the biggest pipelines) because they are less complicated to build than other types of large-size valves.

Friction may be an issue at high pressures. The valve gets more difficult to operate when the medium's pressure pushes the gate against its guide rail. To lower pressure before activating the gate valve, large gate valves are sometimes equipped with a bypass operated by a smaller valve. Gate valves without an additional sealing ring on the gate or the seat are used in situations where small valve leakage is not a problem, such as heating circuits or sewer pipes.

### 4.2.3 Factors That Causes Flooding

| Causes | Types of Factors | Elements |
|---|---|---|
| Direct Factors | Increase in Rainfall | Due to global climatic change |
| | Urbanisation | Increase houses and shop lots |
| | | Decrease in green spaces |
| | Geographical Condition | Surrounded by Klang and Damansara river in 3 sides |
| | | Bowl shaped water catchment area |

Table 4.2.1 : Causes of Taman Sri Muda Floods

Based on table 4.2.1, we can conclude that the causes of floods are caused by direct factors, namely increase in rainfall, conditional geographic urbanization. It is reported that the amount and intensity of rain has increased in Malaysia due to climate change. As Tukimat et al, 2012 quote, that Malaysia is a tropical country where the hydrological systems are very sensitive to changes in rainfall pattern. The term "heavy precipitation" refers to situations in which the amount of rain or snow received in an area significantly surpasses what is typical. The definition of a period of heavy precipitation varies depending on location and season. Climate change has the potential to alter the intensity and frequency of precipitation. Warmer oceans cause more water to evaporate into the atmosphere. More moisture-laden air can create more intense precipitation, such as heavier rain and snow storms, as it flows over land or converges into a storm system. Crop loss, soil erosion, and an increase in flood

danger owing to heavy rainfall are all potential consequences of heavy precipitation, which can lead to injuries, drownings, and other flooding-related health problems.

Many locations have grown more modernised as a result of urbanisation. Land from the hills has been used to recover lowland regions. There are also tiny rivers that have been dammed to use as construction sites. Such activities are a common cause of floods. Creeks and valleys used to flow with water, but today the region is covered with soil. When it rains, the water flows from the hills to the lower region, where it becomes stagnant. The water level will eventually rise, resulting in flash floods.

Consider the geographical context. Taman Sri Muda has height at both ends and a little depth in the centre, as indicated earlier in chapter 1. With aid Google Earth Pro, we can observe a cross section of the land and see which portion elevated and which part is dropped. Therefore, it generates a bowl-like shape where it may simple to become a water collecting region and easy to flood. As a result, it is apparent that Taman Sri Muda's geographical characteristics contribute to the occurrence of floods.

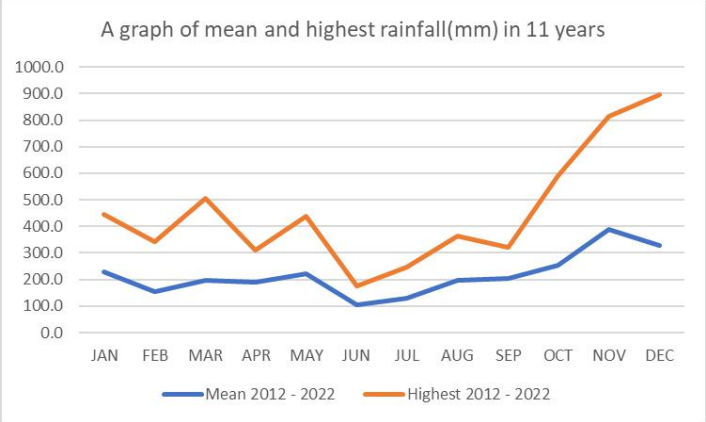
Figure 4.2.4 Garbage alongside the Klang river in Taman Sri Muda.

Demonstrates a lack of solid waste management. A large amount of rubbish was discovered on the drain's side. This is most likely the result of the flood, which left trash on the banks of the Klang River at Taman Sri Muda. This shot was taken on September 28, 2022, only a few days before a minor flood occurred due to two days of rain in a succession. According to one of the locals, the river's water level has reached the same level as the road, thus the situation is not as severe as it appears.

### 4.2.4 Rainfall Patterns

| Period | No. of Years | Rainfall (mm) | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | ANNUAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2012 - 2022 | 11 | **Mean** | 230.1 | 154.3 | 197.8 | 191.1 | 223.0 | 105.4 | 129.2 | 196.3 | 205.2 | 253.1 | 389.0 | 327.9 | 2254.0 |
| | | **Highest** | 446.9 | 341.7 | 505.6 | 310.2 | 439.2 | 177.4 | 246.7 | 365.3 | 322.3 | 591.4 | 815.2 | 897.6 | 3617.7 |
| | | **Year of Highest** | 2017 | 2012 | 2012 | 2014 | 2014 | 2015 | 2016 | 2022 | 2016 | 2012 | 2015 | 2021 | 2012 |

Table 4.2.2 : Rainfall Pattern



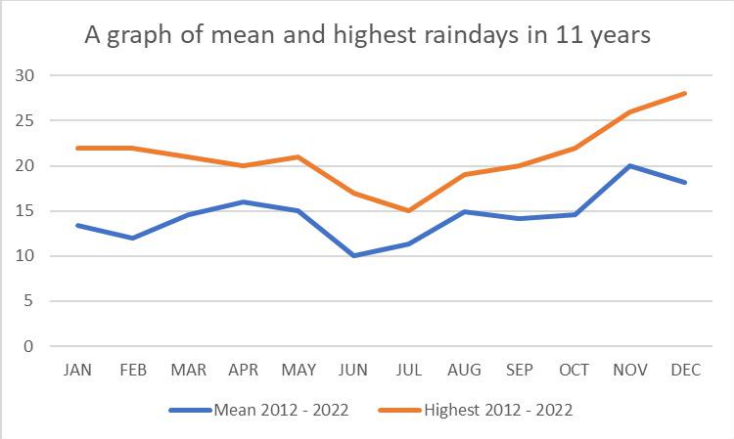

Graph 4.2.1 : A graph of mean and highest rainfall(mm) in 11 years.

Based on the table and graph 4.2.1 as given above it reveals that rainfall intensity is highly unstable as it moves up and down a lot owing to climatic changes that have transpired over the period of 11 years. Starting with January 2017, the amount of rainfall intensity is 446.9 mm, with a mean of 230.1 mm. Second, in February 2012, it fell to 341.7 mm, while the mean fell to 154.3 mm. Third, in March 2012, the value intensity increased to 505.6 mm, as did the mean with a value of 197.8 mm. The data then dropped to 310.2 mm in April 2014, with a mean of 191.1 mm. Then, in May 2014, it climbed by 439.2 mm, while the mean increased by 223.0 mm. Furthermore, in the month of June 2015, it steadily declined to 177.4 mm, and the mean also decreased in value with a value of 105.4 mm, making this month the lowest in the 11-year period.

Following that, the intensity gradually rose in July 2016, with a record of 246.7 mm and a mean of 129.2 mm. Following that, in August of 2022, the value gradually grows with a total of 365.3 mm, while the mean steadily climbs with a total of 196.3 mm. Then it returned to a lower value with notes 322.3 mm with a mean value that climbed to 205.2 mm in September 2016. Soon after, in October of 2012, the rainfall intensity doubled to 591.4 mm, with the highest mean progressively creeping higher with 253.1 mm. The next month is November of 2015, when it quadrupled to 815.2 mm.

| Period | No. of Years | Number of Raindays | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | ANNUAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2012 - 2022 | 11 | **Mean** | 13 | 12 | 15 | 16 | 15 | 10 | 11 | 15 | 14 | 15 | 20 | 18 | 150 |
| | | **Highest** | 22 | 22 | 21 | 20 | 21 | 17 | 15 | 19 | 20 | 22 | 26 | 28 | 214 |
| | | **Year of Highest** | 2016 | 2012 | 2017 | 2019 | 2016 | 2021 | 2022 | 2014 | 2020 | 2013 | 2015 | 2012 | 2012 |
| | | | 2017 | | 2012 | 2020 | | | 2017 | | | | | | |

Table 4.2.3 : Number Of Rain Days




Graph 4.2.2 : A graph of mean and highest rainy days in 11 years.

Referring to table 4.2.3 and graph 4.2.2, a graph of the mean and greatest rainy days in 11 years is shown. To begin, January 2016 set a record with 22 wet days. Following that, in February 2012, the same quantity, 22, is noted. The next month, March 2017, it slightly reduced by one value of 21 days. The number then decreased by one value to 20 days in April 2019. Following that, in May 2016, it increased to one value for 21 days. Meanwhile, in June 2021, the number fell to 17 days. Following that, in July 2022, which likewise dropped two values for 15 days. It quickly grew to 19 days in August 2014.

### 4.2.5 Calculation of Peak Q(Discharge) using MSMA

Calculation peak Q (discharge) by using MSMA sec edition 2012.

Data.

| | |
|---|---|
| Drainage system | Major |
| Land use (developed) | 341.1 ha |
| Land use (undeveloped)<br>Average grass | 27.86 ha |
| Length of overland flow, m | 1486.62m |
| Length of drain, m | 796.08m |
| Land slope | 2.1% |
| Drain slope | 1/114 |
| Drain details | b=14.33m , d=1.28m |

Area of drain = b d

= 14.33 x 1.28

=18.34m2

Perimeter of drain = b+2d

= 14.33 + 2(1.28)

= 16.89m

Step 1 : Select design ARI (refer table 1.1)

Link house/ apartment = 100

Step 2 : Discretise sub-catchment (refer table 2.2 & 2.1)
Overland flow, to :

to = 107 n L1/3S 1/5

= 107 0.045 1486.621/32.11/5

= 47.375 min

Step 3 : Estimate time of concentration (refer table 2.1 & 2.3)

Drain flow, td :

td = n L60 R2/3 S1/2
= 0.015 796.0860 1.092/3 2.11/2
= 0.13m
Time of concentration, tc :
tc = to + td
= 47.375 + 0.13
= 47.505 min

Step 4 : Determine average rainfall intensity (refer table 2.B1)
(Pusat Kawalan T Gong JPS)

i = Tkd + n
=63.493 1000.17047.505 + 0.254 0.872
= 2.906 mm/hr

Step 5 : Estimate runoff coefficient.

| Sub catchment | Land use | ARI | Area developed (ha) | Area undeveloped (ha) | Runoff coefficient (2.5) | |
|---|---|---|---|---|---|---|
| Near retention pond | Link house | 100 | 341.1 | 27.86 | Developed 0.9 | Undeveloped 0.4 |

Step 6 : Calculate average runoff coefficient

C avg = ( 341.1 0.9 ) + (27.86 0.4 )341.1 27.86

= 0.862

Step 7 : Calculate peak flow

Q = C i A360

= 0.862 ( 27.86 + 341.1) 2.906360
= 2.567 m3/s

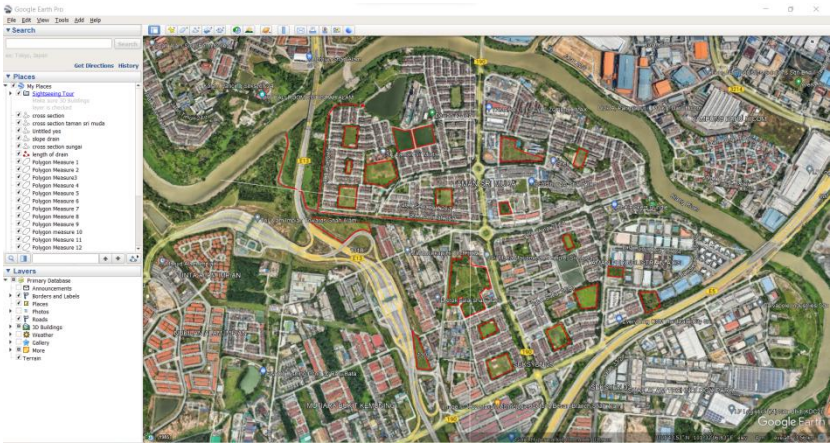


Figure 4.2.5 : Collection Data by Google Earth Pro.

We utilised MSMA 2nd edition to calculate the peak Q(discharge) of the drainage water and followed all of the processes to construct ARI so that we could attain the Q. We also utilised Google Earth Pro to determine the land slope, area developed, area undeveloped, length of drain, height, and elevation loss in Taman Sri Muda by examining a cross section of the region.

## 4.3 Discussion

According to the research findings, TCG sluice gates serve vital functions in acting as a hydraulic system that is efficient in preventing floods and reducing the effects of flooding. When considering the performance of a sluice gate, extensive calculations are required. Identifying circumstances and determining the coefficient of discharge (Cd) and flow rate drain, for example. The sluice gate has existed at Taman Sri Muda for almost 20 years and is still in good working order. However, if they are not effectively maintained and managed, the flooding scenario would increase, especially when high tide and backwater are present.

The following step is to determine the causes that contribute to floods in Taman Sri Muda, which include increased rainfall, urbanisation, and geographical circumstances. Lastly, intensity of rainfall pattern is being recorded to see which year has the most heavy downpour that is in December 2021 where flood happens throughout that time of month. Light rain is defined as less than 2.5 mm by Wikipedia. The range for moderate rain is 2.5 to 7.6 mm. Meanwhile, heavy rain exceeds 7.6 mm. Finally, severe rain is defined as more than 50mm in diameter. We saw that the highest intensity rain was severe rain.

## 4.4 Summary

In this chapter the results and discussion of the study have been explained in detail utilizing primary information gathered through interviews with JPS Klang staff, questionnaires \swith locals who lived in Taman Sri Muda and research results from the research paper and \ssecondary data that based on journals with regard flooding, climate changes and sluice \sgate operation. We completed all three objectives of this investigation.

# 5.0 Conclusion and Recommendation

## 5.1 Introduction

Discussion, conclusions and recommendations will be covered all in this chapter. As a result, I will comment on the results and recommendations, as well as the difficulties we encountered while collecting data for this project. This research project will last approximately one year, with study dates falling in semesters four and five. Each part has its advantages and disadvantages. Nevertheless, I learned a lot in each part of this research, including how to conduct a good interview with superiors and how to uncover the facts of how and why the Taman Sri Muda area was damaged by the flood. The results of this study are from authentic sources. To produce a perfect study requires strong energy, effective support, and the right resources.

## 5.2 Conclusion

In conclusion, from the research that has been done, all objectives can be achieved. sluice gate design can be identified by its type which is the flap gate type. The factors that cause flooding in Taman Sri Muda can also be seen based on interviews with members of the public and JPS staff as well as the terrain that causes flooding. This factor has also been agreed upon by residents and JPS staff. In addition, we can see the difference between the interviews with JPS staff and residents where one of them explained in detail about the sluice gates, possible factors that caused flooding and retention ponds, while one of them explained what was found on the surface level as in at which water level the sluice will be opened. apart from that, we can also see how water locks are managed during floods. The study of Sluice Gates to Reduce Flooding in Taman Sri Muda Shah Alam is shown through interviews, Q peak calculations using the MSMA method and questionnaires with residents and site visits.

As a result, I can infer that research like this one should be replicated so that future generations may learn more about sluice gates, drainage systems, and other forms of floods and assist people in terms of new inventions or tackling new issues

with new approaches. This study will be used as a reference by many parties to better their understanding. This study has concluded with the achievement of the study's purpose, and I hope that this study may be connected by other parties so that we can always surpass it. whatever issues our country faces in the foreseeable future

## 5.3 Recommendation

Natural phenomena are natural phenomena. we can't predict what will happen like the erratic rate of rain that often changes. however, efforts must be made to reduce the occurrence of floods continuously because they cause various negative effects on humans, natural resources and development. Among the suggestions that can be made to control and overcome this flood problem are:

1. Recommendations for residents

According to the results we obtained, the general public has a low awareness of environmental cleanliness. This is because there is a lot of garbage in the drainage area and the sluice gate. It is the responsibility of the residents to keep them clean around because they are the ones close to the river. Rivers and drainage is one of the initiatives to reduce the flood rate because the water will go through the drainage and not through land. In this way, the drains will not be blocked, which can have negative effects such as repeated flooding.

2. Recommendation for JPS

In general, information on popular themes such as floodgates, floods, and the situation's geography should be more accessible to anybody, regardless of age or gender. We urge that JPS be more explicit when giving numerous data sets to minimise misunderstandings between researchers and problems, and maybe to fix certain concerns. For example, raising public awareness and knowledge of sluice functioning. Social media may be one of the sources or platforms used to keep people up to speed on the latest news or trends in the impacted region. People can also make plans for potential outcomes.

## 5.4 Project Limitation

Overall, after obtaining data and information about water gates and floods that have occurred in recent years, even years are a bit of a challenge for us because the project was carried out during the monsoon season, when higher ups like DPS were busy trying their best to mitigate the effects of the impending disaster on nature. However, thanks to current technologies such as Google Earth Pro, the internet, and social media, as well as one of the JPS staff members, Mr. Saiful, who also assisted with our research, we were able to obtain the data we need.

## 5.5 Summary

After nearly a year, this study was completed in accordance with the study's objectives. It may be concluded that, despite the fact that there are many guesses in the process of carrying out this research, if we make an effort, the Almighty will make it simpler because every difficulty must have a solution. I hope that research like these can continue to assist our country achieve academic development and study more deeply so that we can aid our people and become a developed country.

## 6.0 Reference

1. A, Azim Idris. “How poor town planning led to Taman Sri Muda’s deadly floods.” Decades of overdevelopment, profiteering, and possible graft result in at least 16 deaths, hundreds of millions in damage [Shah Alam], January 2022.

2. Rahman, Serina. “Malaysia’s Floods of December 2021: Can Future Disasters be Avoided?” no. flood, 2022, pp. 1-9.

3. Pereira, J. J., & Komoo, I. (1999). Sustainable Management of the Physical Component of the Urban Ecosystems: The Malaysian perspective. Integrating City Planning and Environmental Improvement: Practicable Strategies for Sustainable Urban Development. Miller, D. and Roo, DG, eds. Aldershort: Ashgate.

4. Jamaluddin, M. J. (1986). Human perception and responses to the flash-flood hazards in parts of Kuala Lumpur. A study of the urban ecosystem of the Kelang valley region, Malaysia, 1, 84-104.

5. Rahman, S. Malaysia’s Floods of December 2021: Can Future Disasters be Avoided?

6. Sugan, S. (2013, December 28). Asal-usul Taman Sri Muda http://suganthesanger20.blogspot.com/

7. Google maps, 2018. Taman Sri Muda, (scale).

8. Rustiati, N., & Dermawan, V. (2019). Bed configuration under sluice gate at Sandy–Loam Bed Channel. In MATEC Web of Conferences (Vol. 276, p. 04009). EDP Sciences.

9. Konrad, C.P. (2003). Effects of urban development on floods, https://pubs.usgs.gov/fs/fs07603/

10. Alex Jackson, (May 2014) ; Coastal Flooding - Geography AS Notes, https://geographyas.info/coasts/coastal-flooding/

11. International Labmate Limited, (2014) ; What The Different Types of Floods?, https://www.envirotech-online.com/news/water-wastewater/9/breaking-news/what-are-the-different-types-of-floods/31906

12. Zurich, (2022) ; Three Common Types Of Flood Explained https://www.zurich.com/en/knowledge/topics/flood-and-water-damage/three-common-types-of-flood

13. Eithan Shaw, (November 22, 2019); What Is a River Flood? https://sciencing.com/list-7644820-different-types-landforms.html

14. Geological Survey, Ireland (2022) ; What is Groundwater Flooding ? https://www.gsi.ie/ga-ie/programmes-and-projects/groundwater/projects/gwflood/Pages/What-is-groundwater-flooding.aspx#:~:text=Page%20Content,rise%20above%20the%20ground%20surface.

15. Envirement Agency, (December 23, 2019); What is Groundwater Flooding? https://environmentagency.blog.gov.uk/2019/12/23/what-is-groundwater-flooding/

16. Olivia Lai, Africa Americas Asia Europe, (Aug 31, 2021); What are the Main Causes and Effects of Floods Around the World? https://earth.org/what-are-the-main-causes-and-effects-of-floods/

17. Faris Fuad, Berita Harian (Mac7, 2022); https://www.astroawani.com/berita-malaysia/hujan-terlampau-lebat-punca-banjir-kilat-di-janda-baik-mb-360951

18. Paddle and Rymer Weirs on the Thames, OA Library, retrieved 2011-09-28

19. National Geographic

https://education.nationalgeographic.org/resource/flood

20. Elizabeth Bachrach, Ph.D.,The Value of Site Visits (2004)
https://www.grginc.com/documents/TheValueofSiteVisits.pdf

| WBS NUMBER | TASK TITLE | PCT OF TASK C | SEPTEMBER | | | | | OCTOBER | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | WEEK 1 | WEEK 2 | WEEK 3 | WEEK 4 | WEEK 5 | WEEK 1 | WEEK 2 | WEEK 3 |
| 1 | COLLECTING DA | 70 | | | | | | | | |
| 2 | SITE VISIT | 90 | | | | | | | | |
| 3 | ANALYSE AND D | 70 | | | | | | | | |
| 4 | PREPARATION F | 100 | | | | | | | | |
| 5 | CORRECTION | 100 | | | | | | | | |
| 6 | CONCLUSION A | 100 | | | | | | | | |
| 7 | PREPARATION F | 100 | | | | | | | | |
| 8 | FINAL PRESENT | 100 | | | | | | | | |
| 9 | FINAL REPORT | 100 | | | | | | | | |

| WBS NUMBER | TASK TITLE | PCT OF TASK C | | | NOVEMBER | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | WEEK 4 | WEEK 5 | WEEK 1 | WEEK 2 | WEEK 3 | WEEK 4 | WEEK 5 |
| 1 | COLLECTING DA | 70 | | | | | | | |
| 2 | SITE VISIT | 90 | | | | | | | |
| 3 | ANALYSE AND D | 70 | | | | | | | |
| 4 | PREPARATION F | 100 | | | | | | | |
| 5 | CORRECTION | 100 | | | | | | | |
| 6 | CONCLUSION A | 100 | | | | | | | |
| 7 | PREPARATION F | 100 | | | | | | | |
| 8 | FINAL PRESENT | 100 | | | | | | | |
| 9 | FINAL REPORT | 100 | | | | | | | |