

**WASTEWATER MANAGEMENT IN MALAYSIA:
A STUDY OF WASTEWATER POLICIES AND
IMPLEMENTATION IN KAJANG DISTRICT,
SELANGOR**

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**MASTER OF PHILOSOPHY
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SELANGOR**

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DECLARATION



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Wastewater Management in Malaysia: A Study of Wastewater Policies and
Implementation in Kajang District

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of the degree Master of Philosophy

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I hereby declare that this thesis is all my own work, except as indicated in the
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Date : 18 September 2019

I hereby declare that I have all necessary rights and consents to publicly
distribute this thesis via University of Nottingham.

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ABSTRACT

WASTEWATER MANAGEMENT IN MALAYSIA: A STUDY OF WASTEWATER POLICIES AND IMPLEMENTATION IN KAJANG DISTRICT, SELANGOR.

Rapid and increasing urbanisation and economic growth has affected the landuse and urban density changes in the district of Kajang, Selangor as in most parts of Malaysia. While development highlights the progress in spatial infrastructure planning and growth of the Malaysia economy, the challenges of urban infrastructure waste management such as wastewater planning and management are poorly researched and reported. This study investigates wastewater governance in Kajang district as a reflection of the policy implementation, short comings and management practices in Malaysia. It involves secondary and primary study of literatures on wastewater management in Malaysia. A questionnaire survey and face to face interviews were conducted to collect relevant data for evaluation and analysis. The survey covered the Kajang district of Selangor area, where sampled respondents included managers and workers that are involved in policy, management and operations in wastewater management. From the sample size of 100 questionnaire respondents, six interview sessions were conducted. The data were analysed using SPSS program for descriptive interpretations and thematic analysis. The results of the questionnaire survey and interviews showed that generally fairly efficient operation in wastewater management in Malaysia in general and in the Kajang District in particular however, some shortcomings in wastewater management due to lack of funds, manpower, equipments and skills. The analysis also found that there is also the matter of public awareness and the lack of understanding regarding wastewater generated and its implications in terms of pollution and management.

Conclusion, although wastewater management practices in Malaysia are good in terms of policies, its implementation are poor due to lack of finance, training and joint coordination between the Federal Government, Local Authorities and other related agencies.

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LIST OF ABBREVIATION/ ACRONYMS

MPKj	-	Majlis Perbandaran Kajang
PPP	-	Public Private Partnership
DOE	-	Department of Environment, Malaysia
SPAN	-	National Water Service Commission
EQA	-	Environmental Quality Act
EIA	-	Environmental Impact Assessment
GBI	-	Green Building Index
IWK	-	Indah Water Konsortium
WHO	-	World Health Organisation
UN	-	United Nation
STP	-	Sewage Treatment Plant

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CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Water is a colourless, transparent, and odourless, liquid. It fills the seas, lakes, rivers, and is the source of rain and, most importantly, an essential fluid of living organisms (Linton, 2010). According to Steven (2020), water is a molecule that are formed of two hydrogen atoms and one oxygen atom which can be formed as gases, liquid and solid. Water for daily household use should be clearly free from colour, taste and odour as much as it must be without any trace of poisonous substances, pathogens and high levels of mineral and organic content (Elvina et al., 2017). Approximately 70.9% of the earth is covered by water and 29.1% by land (Central Intelligence Agency, 2017); while the human body is made up of about 60% water (Mayo Clinic, 2014). Thus, retaining a sustainable and clean water resource is necessary for the environment and human health (Malik et al., 2015). It is estimated that about 60% of the consumption of treated water per capita will be transformed eventually into wastewater (Metcalf et al., 2004).

Water quality monitoring serves a number of purposes including monitoring for assessment against commitment national and international standards which serve to detect temporal and spatial differences, trends and changes in quality of surface water due to water usage (Milburn and Richards, 1994). Monitoring data generated are essential for meaningful interpretation and management decisions thus development of resources allocation, location, standards of enforcement, trend analysis, public information and scientific research is needed to progress forward in managing water quality (Norhayati, 1981).

Globally, there is increasing pollution and depletion of available freshwater resources, and this poses a threat to sustainable development alongside human and ecosystem health. It is estimated that freshwater will likely be the first natural resource to run short (Furumai, 2008). Urban water consumption has a huge impact on the natural water cycle and causes many significant changes in the aquatic environment (Furumai, 2008). Therefore, treating wastewater is essential as failing to do so could do harm to humans and the environment. Unfortunately, in Malaysia; clean water from streams, rivers, ponds or lakes is threatened by water pollution (Afroz et al., 2014).

The amount of wastewater production is related to human behaviour, lifestyle and standard of living as well as the technical and judicial systems under which the amount and type of waste generated in households and industry vary (Henze et al., 2020). Regardless of the amount of wastewater and its treatment, polluted water from residential or industrial areas may threaten the availability of a clean and sustainable water source if not properly managed. Untreated wastewater should not be disposed of into the environment as the biological degradation of organic materials in wastewater uses up oxygen and thus reduces its availability in the receiving waters for the survival of aquatic life.

Many countries in the world have difficulties treating wastewater as it is not only expensive, but also because the process needs to be enforced (Jeremy and Anna, 1998). Failure to manage wastewater treatment properly could attract adverse media and public attention that could lead to severe public health risk. To produce affordable, sustainable and safe approaches to wastewater management, which is publicly acceptable is a challenge to wastewater authorities (Jeremy and Anna, 1998). Only 55 (30.4%) of 181 countries have made data available on wastewater production, treatment and usage, which is an indication that understanding and researching wastewater management is difficult with outdated or inadequate data and poor documentation (Sato et al., 2013).

In the case of a sewer-based system, drainage must be continuous either to a sewer network or to some receptor, for example, a septic tank. In the case of dry (separating) toilets, it is required to have a sample if collection of faeces and urine are at the specified frequency. Latrines must be emptied to ensure a sustainable and acceptable service. Therefore, even though there is no direct equivalent to the downward-spiral situation of irregular piped-water supplies, maintenance is crucial to be able to sustain sanitation systems; without this the service quality will deteriorate. Similarly, to clean and maintain sanitation facilities, must be financial resources, which could be made available by charging for the service. Regardless of the locality, the level of affordability to pay for such services would be almost similar, it is both practicable and acceptable to incorporate the sanitation charge in the 'water' bill, on the basis of reasonable and affordable rates (Rouse, 2014).

1.2 Problem Statement

Water pollution and wastewater treatment came in attention in Malaysia in the early 70's where agriculture in palm oil and rubber industry was in a rapid growth. Since then, wastewater management in Malaysia has become more challenging to manage since the 90's. Managing water quality is done by monitoring the level of water quality or water effluent released to the environment with a systematic and functional managing system (Davis, Donald and June, 2005). Thus, policies created should consider the increasing growth of residential developments and industrial centres in urban-expansions that will increase water pollution in Malaysia (Muyibi, 2007 and Suleyman, Ambali and Eissa, 2008).

Before 1993, wastewater management in Malaysia had been handled by the local authorities in designated areas. However, this was changed when Malaysia, through the Federal Government, awarded Indah Water Konsortium (IWK) a concession, to manage the wastewater and sewerage services from local authorities nationwide (with the exception of the states of Kelantan, Sabah, Sarawak and the Johor Bahru Town Council (Zuzilawati, 2014). This action was

taken by the Government to ensure a centralised system managing wastewater and minimised water production efficiently in the future.

Even as Malaysia moves forward towards achieving developed nation status by 2020, demand for clean water continues to increase and so was the challenges to implement water policies addressing heavy industrialisation, infrastructural developments, and urban expansions (Malaysia, 2016). According to Munusami, Ismail and Chamhuri (2016), the production of wastewater will increase because it is estimated that Malaysia's population will rise to 32 million by 2020 from 30.7 million in 2014 which is not far off as in 2019 the current population of Malaysia has reach 32 million. As the Malaysian government is serious to improve the quality of wastewater treatment services and networks it is important to manage wastewater properly (Mamun et al., 2009). In analysing the management of water, the focus is typically on the supply, demand and distribution of the water. There are limited number of studies on sanitation and wastewater management (Flores, Ozerol and Bressers, 2017), and most studies on wastewater are from science and engineering viewpoints, while relatively few studies have discussed issues from social science perspective (Flores, Ozerol and Bressers 2017).

As Malaysia adopts the Sustainable Development Goals number 6 to ensure access to water and sanitation for all (United Nation, 2020), this study focuses on identifying gaps in wastewater treatment policies and their implementation, investigates approaches to wastewater management and identifies major concerns from the management relating to wastewater management in Malaysia.

In Malaysia, the state of Selangor is the highest populated state with Kajang as a high density area. As the population in the Kajang area had increased from 808,786 in 2010 to 884,980 in 2014 (Majlis Perbandaran Kajang, 2015), the pace and capacity of wastewater produced by population must to be managed properly through good management. As the domestic sewage discharge may increase due its high residential population, the study on wastewater management in the area

could prove beneficial for understanding and adopting better ways to improve the wastewater system in Malaysia.

1.3 Research Questions

The research questions for this research are as follows:

- I. What is the nature of the wastewater management policy in Kajang, Selangor, Malaysia and how is it implemented?
- II. How are the wastewater operations implemented in the Kajang, Selangor, Malaysia?
- III. What are the major management and implementation issues faced by the managers and workers in the total operation (management and implementation) of wastewater in Selangor, Malaysia?

1.4 Aims and Objectives

The overall aim of this research is to conduct an investigation of wastewater governance in Malaysia in general and study the issues involved in the management and implementation of wastewater operations in the Kajang Municipal Council (KMC) area of Selangor, Malaysia.

The specific objectives of this research are as follows:

- I. To investigate the current state and nature of wastewater management in Kajang district of Selangor, Malaysia;
- II. To investigate the organisation perception on policies and guidelines related to wastewater management in Kajang district of Selangor, Malaysia; and

- III. To investigate the major issues or concerns of managers and workers involved in the implementation and practices of wastewater operations in the Kajang district of Selangor state, Malaysia.

1.5 Scope and Limitations of the Study

The study was conducted only in wastewater management involving residential areas in Kajang. The study was conducted mainly in the Kajang area in Selangor and any attempt to generalize to other district area in Selangor many required further study.

CHAPTER 2

LITERATURE REVIEW

2.1 Wastewater Definition

Wastewater is the by-product of many uses of water uses such as showering, dishwashing, laundry and, of course, flushing the toilet (Environmental, 2020). According to Tilley et al. (2014) wastewater can be the result of domestic, industrial, commercial or agricultural activities, surface runoff or storm water, and from sewer inflow or infiltration. Liptak and Liu (2000) defined wastewater can be separated in two categories: industrial wastewater and domestic wastewater. The industrial wastewater results from various industrial operational and processes which generally undergoes a series of pre-treatment and reuse, and is then discharge into public water or natural received bodies where it re-enters the hydrologic cycle. The domestic wastewater consists of human waste, ablution water, kitchen wastewater and other household activities. In urban areas, the domestic wastewater is generally conveyed away through a buried pipeline into a sewage system. In rural or suburban areas, the wastewater may be collected and disposed through the use of septic tanks.

This combination of wastewater may contain certain undesirable components, namely organic, inorganic and toxic content, and also pathogens or other disease-carrying microorganisms (McGhee, 1991). According to Grady and Lim (2011), wastewater contain organic compounds, ammonia, iron and other oxidizable compounds are significant sources of biological oxygen demand. The major categories of organic solids in wastewater include proteins, carbohydrates, fats and oils. Protein comprises around 16% nitrogen, and along with urea is a primary source of nitrogen in wastewater (McGhee, 1991). Henze et al. (2020) pointed out

that the production of waste from human activity is un-avoided and managing wastewater properly is crucial. Apart from that, most wastewater is contaminated water, which is rich in nitrate and phosphate. Biologically this is a primary contributory factor to eutrophication downstream which substantially alters the properties of the aquatic ecosystems of some river systems (Suleyman, Ambali and Eissa, 2008).

Table 2.1 Types of Wastewater produced from urban activities and wastewater treatment plants.

Wastewater from society	Wastewater generated internally in treatment plants
Domestic wastewater	Thickener supernatant
Wastewater from institutions	Digester supernatant
Industrial wastewater	Reject water from sludge dewatering
Infiltration into sewers	Drainage water from sludge drying beds
Storm water	Filter wash water
Leachate	Equipment cleaning water
Septic tank wastewater	

(*Source:* Biological Wastewater Treatment Table 3.1: Principles Modelling and Design from Henze et al., 2020)

2.2 History of Wastewater Treatment and Management

According to Andreas and Shane (2015), the first modern sewage systems were built in the mid-19th century as a result of industrialisation reforms and increasing urbanisation, production of human waste increase in which contaminate water supply and caused the cholera outbreaks in 1832, 1849, and 1855 in London, which killed thousands of people. Although the history of wastewater management could be traced back to as early as 3500 BC (Lafrano and Brown, 2010) it was John Snow who in 1854 highlighted the importance of managing wastewater through an investigation of the cholera outbreak in Soho, United Kingdom (Kari, 2000). Figure 2.1 shows a mapping of John Snows cholera cases in London in the year 1854.

Figure 2.1 John Snow Map on Cholera Cases in London Epidemic of 1854



(Source: Robin's Blog, Retrieved 10th February 2017, from <https://www.blog.rtwilson.com>)

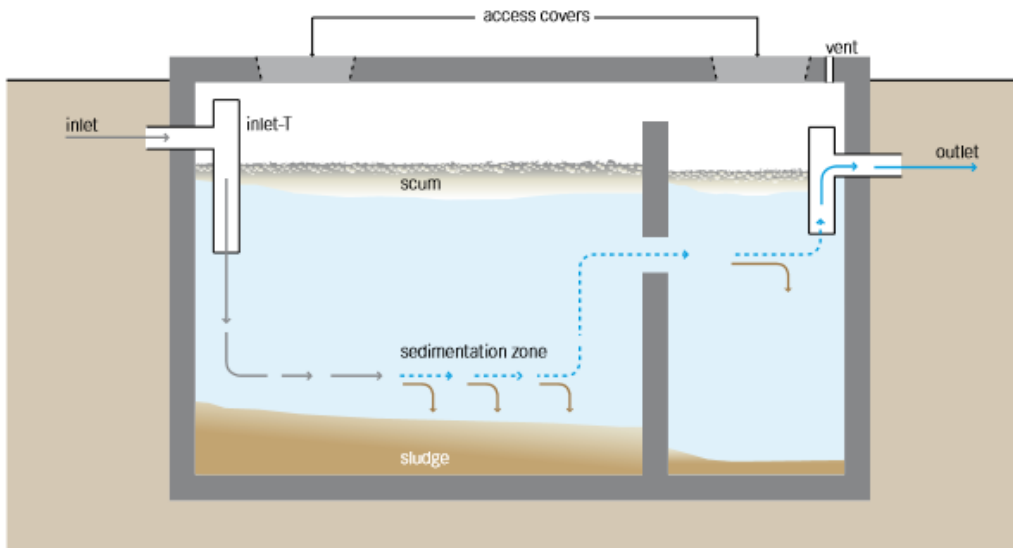
Snow's finding, led to significant changes in the management of wastewater so that by 1860 a modern primary treatment system either two compartments for waste storage and a gas outlet pipe was established using Fosses Mouras (an early version of the septic tank) as shown in Figure 2.2 that was developed by Jean-Louis Mouras in France (Steinbeck, 2005).

For hundreds of years, not much attention has been paid to the management of wastewater, which, in many cultures was characteristically disposed of in the streets and in the vicinity of population centres, thus giving rise to negative impacts on public health as well as the environment. The consequences have been the many epidemics that broke out several parts of Europe until the 19th century (Lafrano and Brown, 2010).

Historically, managing wastewater has always been a daunting technical and political challenge to people and governments. The story of waste and wastewater management is a paradox of both human resourcefulness and weakness (Lafrano and Brown, 2010). Figure 2.3 shows the sanitation timeline history of wastewater from a global view.

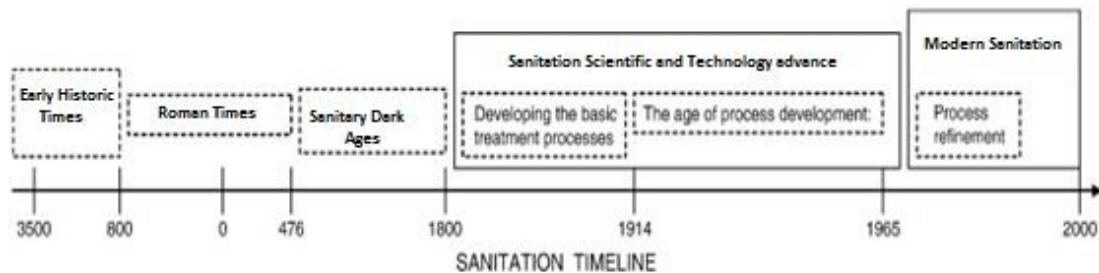
Despite the fact that a host of historians and economists have detailed how wastewater management has evolved over time (Serner, 2007), their work has focused on the engineering perspective. There has been much evidence uncovered of ancient dams, aqueducts and pipes (Serner, 2007) which enabled the supply of fresh water for human use. However, as there are limited information and studies available, archaeologists have not been able to provide accurate information of how wastewater was managed in ancient times (Serner, 2007).

Figure 2.2 Standard Layout of a Septic Tank



(Source: Compendium of Sanitation Systems and Technologies (2nd ed.) from Tilley et al., 2014)

As the wastewater system involved through the years, the 20th century saw a revolution in wastewater management, environmental science and public view involving greater awareness of pollution and its impact on the environment. More scientific debates between society and government began to surface and increased interest in pollution control (Lafrano and Brown, 2010).



(Source: Wastewater Management Through the Ages: A History of Mankind from Lafrano and Brown, 2010)

Figure 2.3 Sanitation Timeline History

2.3 Factors contributing to the occurrence of wastewater

As the development of urbanisation and technologies was revolutionised in the 90's, more chemicals and other waste compounds were increased and became a potential threat to the environment (Bolong et al., 2009). In a case study in Zhienjeng China, sections of major rivers and cities showed levels of extreme pollution despite monitoring by their environmental control agencies between 2001 and 2005, which created a 'pollution haven' attributed to industries in city areas and which also affected rural areas (Taguchi, 2010). However, in Malaysia, the main sources of pollution comprised indiscriminate discharge from sewage treatment plants, land clearing activities for development and domestic sewage (Malaysia, 2016) and a need to be managed properly.

The Malaysian Department of Environment (David, 2012), reported that the major sources of water pollution from industry in the country are from the food and beverage, chemical-based, textiles, paper, palm oil and rubber processing industry. Household wastes such as carwash wastewater, on the other hand, has the highest polluted wastes with high impurities. Mandac and Zagar (2014) found that household waste also contains traces of elements of soil and particles, oil and grease, surfactants, detergent, phosphates and hydrofluoric acid from various lifestyle activities. The reason for different types of household wastes generated may differ from household or domestic establishments due to the daily water usage (Tang, Tan and Ho, 2007).

As Brooks (2006) pointed out, the lack of clarity on management or good governance in wastewater may occur from lack of education to lack of implementing regulation. The discharge of industrial and domestic wastewater untreated will create an anaerobic condition that reflects on unbalanced ecosystem, fish mortality, odours, diseases and other nuisances to the community. In some cases, heavy metals product such as mercury, cadmium, lead and organic chemicals such as polychlorinated biphenyl which are bio accumulated in the

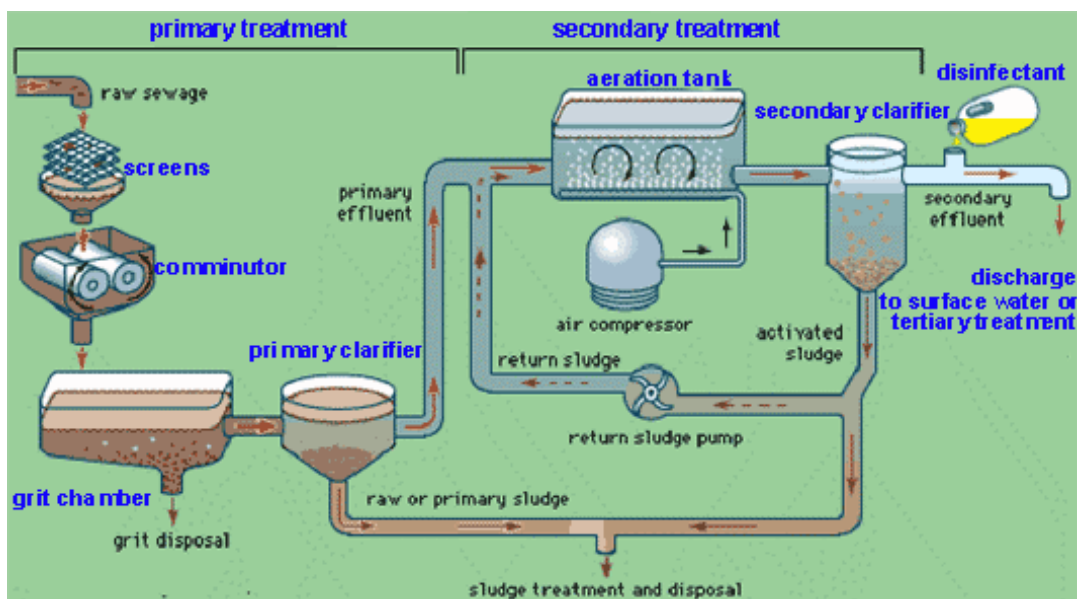
aqueous food chain may cause severe toxic effects on human being (Liptak and Liu, 2000).

2.4 The wastewater treatment process

The purpose of treating wastewater is to allow any contaminated or polluted effluent that may be harmful to the environment to be processed properly and effectively (McDonald, 2015). One key advantage of proper wastewater disposal is the prevention of spreading of disease as human waste product can contain bacteria and other micro-organisms that can harbour human pathogens and increased the risk of spreading excreta-related diseases through the water-borne route (Raouf, Homaidan and Ibraheem, 2012). If contaminated water finds its way and discharge into lakes, rivers or water bodies which is used for drinking or recreational purposes, it could spread throughout the community rapidly. For that, a sewage treatment plant (STP) is a facility which is designed to treat wastewater and remove any particles before the wastewater is released into the environment must be built in nearby population area (Lingyun, Guangming and Huifang, 2014) where the process treatment is shown in Figure 2.4. Wastewater treatment in general involves primary, secondary, and sometimes an advanced treatment process, with various biological, physical, and chemical technologies. The primary process of treating wastewater is to screen and remove some of the suspended solids and organic matter (e.g. clay, sediments, microorganisms) and add medium such as active carbon and coagulants or biological techniques (biodegradation) to treat and separate most pathogens and contaminants from the wastewater. The original sewage, consisting of municipal and industrial wastewaters, passes first through the mechanical screen and aerated grit chamber. In certain treatment processes, primary and secondary stages could be amalgamated into a single operation. After the wastewater has been through the first treatment process, it will move to the secondary treatment process where biological treatment processes

are carried out and nearly 90% of organic matter is removed (United States Environmental Protection Agency, 2004). Most wastewater treatment plants (WWTPs) or STP use biological treatment like activated sludge trickling filters, aerated lagoons and rotating biological contactors (Nada et al., 2015). Then, the sewage is channelled to the final sedimentation tanks before release to the environment (Nada et al., 2015).

Figure 2.4 Standard Wastewater Treatment Process



(Source: Wyong Shire Council, Retrieved 3 Mac 2017, from <https://www.wyong.nsw.gov.au>)

Biological wastewater treatment is generic term applied to processes that use microorganism to decomposed organic matter in wastewater and is roughly classified into two categories: aerobic treatment and anaerobic treatment (Metcalf et al., 2004) which are as follows:

i) Aerobic treatment

A method for decomposing organic matter into water, carbon dioxide and simple inorganic substance by using aerobic microorganisms. Additionally, the microorganism may be used for deodorization, denitrification and dephosphorization.

ii) Anaerobic treatment

A method for decomposing organic matter by using anaerobic microorganisms in closed system under the absence of air. In treating wastewater, there are several types of treatment plants that are been used. The types of treatment plants are as follows:

i) Extended Aeration System

Conventional treatment of wastewater in an Active Sludge Plant (ASP) includes primary settlement an aeration of the wastewater, followed by final settlement of the biomass before discharge of the treated effluent;

ii) Oxidation Ditch

A basic single stage design oxidation process with no primary sedimentation which the plant usually a central island with agitated by aeration rotor to provides dual function and flow velocity;

iii) Aeration Lagoon

Commonly used in small community, the system uses aerators to mix the contents of the ponds and add oxygen to wastewater which may be upgraded in the future to receive more wastewater volume; and

iv) Oxidation Ditch

A pond that usually is shallow earthen basin of controlled shape, which is designed for treating wastewater from small communities or industrial plants.

2.5 Wastewater Management and Practices Worldwide

Multilevel government system is problematic due to lack of communication and understanding unless the problems are solved; any plans pertaining to urban dispersion will fail. Despite the fact that most government in the world is strongly committed to the development of an urban policy, the actions of the various national ministries that are responsible for implementing this policy lack proper coordination (Dirk, Henning and Claudia, 2009). For instance, in Malaysia water management system, the absence of horizontal coordination nationally is made worse by the poor vertical coordination as well between the central, regional and local government level which the unequal authority and influence between the various levels of government controlled mainly by national-level government policies, whereas regional-level institutions rely on these ministries while they themselves possess merely weak power (Dirk, Henning and Claudia, 2009) leading to a lot of debate in parliament on poor water management to the public.

According to Robins et al. (2017), many government systems have the essentials of a system-wide water policy already there, so it does not mean starting from scratch. There is a host of plans, legislation, structures, processes and measures that are relatively unconnected and that should be joined (and, in certain cases, in-filling) to create a clear and comprehensible whole thus, the necessity to revisit monitoring and enforcement systems, and enhance the degree of effectiveness and efficiency is made more urgent and crucial.

With the practice of regional governance and policy making being scaled on a regional basis, there appears to be feasible regionally-based water governance system throughout (Furst, 2007). Regional governance involves collaboration in problem-solving actions among various parties who work together to address common issues (e.g., wastewater management and issues) based on a concept of functional interdependencies instead of political boundaries (Furst, 2007).

In Western Europe for instance, individual municipal bodies are heavily burdened with new responsibilities such as, renovating facilities and addressing the issue of micro-pollutants and conventional strategies can no longer suffice or be capable of accomplishing tasks with the required efficiency and effectiveness (Furst, 2007). According to Benz (2007) there are several researches done in Europe that find that most systems on management focus on giving full autonomy to municipalities and forming system that communicates and synergized the municipality with the federal government system. There are management strategies that combine regionalisation with professionalisation, to form an enlarged organisational entity regionally, whereby resources are pooled and enlarged, thus making available more funding than would be normally available under regionalization. In such a situation, traditional legal practices and public laws cease to be the controlling factor. Instead, greater reliance on self-monitoring and the state plays the role of guide rather than that of actor and participant in the process (Furst, 2007).

However, it must be remembered that that this lateral management structure such horizontal government structures still maintain an interdependent relationship with the vertical structures of governmental oversight. This is because there is always a need for supervision of regional activities to provide the stamp of legitimacy (Benz, 2007). On the other hand, there are others who maintain that to be a proper regional model, a region needs its own organization and its own fiscal sovereignty (Lieberherr, 2011), whereas the participating local governments transfer political authority to the new arrangement (Lieberherr, 2011).

Although the fundamental logic of regional government system is that it will lead to greater efficiency and effectiveness in implementing the desired goals and thus achieve the long-term acceptance of policy (Benz, 2007), the regional institutional framework falls behind the strong local and national levels (Benz, 2007). As automation processes enable more strategic decision-making at the operational level through higher competencies, they could be steps towards the achievement of regionalisation with an enhanced institutional framework. On the other hand, since such processes require decision-making to be separated from political influence (e.g., direct voter input) compared to traditional local governance (Peters and Pierre, 2006), they are perceived as threatening the democratic framework by weakening the need for democratic legitimacy such as accountability, responsiveness, integrity, transparency and governability (Warner, 2011).

A government system either from federal or local government, to improve the wastewater management system, the people that are involved or employed in managing wastewater in a certain area must view itself as being accountable to the citizens in managing public utility sectors (Gilmour and Laura, 1998). Management system also should always reform and improve management system frequently to ensure a more economical and output-effectiveness as the primary performance indicators (Benz and Papadopoulos, 2006).

Apart from that, managing wastewater efficiently must come from individuals that work to guarantee adequate sanitation, which the government has an obligation to provide the services. Furthermore, management organisation has to facilitate such by helping users to practice safe and hygienic sanitation. By enabling wastewater management that is well regulated, it will help users to access adequate sanitation, and also in the interest of public health, protect others from unsafe environments. According to Graham (2011), improving wastewater management does require a lot of strengthening, as local authorities in Malaysia are unsuitable to manage the system thus giving the private companies opportunity to fill this void (Graham, 2011).

To further improved wastewater management and its governance, combination with Public Private partnership (PPP) which is the decentralization of public-sector organizations was another strategy and policies for public sector and administrative reforms in many sectors of administration (Pollitt, 1990). PPPs have developed into a popular governmental strategy to provide better public services and improved efficiency to the public (Chou et al., 2015)

Moving away from public law, public organizations operate under a private law, which in theory would improve their managerial and operational flexibility (Talbot, 2010) Employee management practices, organizational structure improvements, and the introduction of private business methods into public organizations were the primary concerns (Dunleavy and Hood, 1994). In addition, increased competition between public and private operators regarding services delivery was expected (Talbot, 2010).

In this way, public–public partnerships seem to be associated with efficiency, equity and effectiveness gains compared with other types of arrangements (Bovaird, 2014). For inter-municipal corporations alone (i.e. those that involve cooperation between the same governmental levels), financial gains are possible due to the existing scale economies, which lead to costs savings (Warner, 2011). There has been an increasing number of countries incorporating PPPs in infrastructure investment plans to reduce deficits and drive the economy (Chou et al., 2015). For that, public–public partnerships and inter-municipal corporations are becoming an alternative to public services delivery (Hugo, Marques and Ricardo, 2017). The associated with value for money was the main attractive factors why PPPs was adopted in Malaysia (Sanni and Hashim, 2014). In Malaysia, the PPPs was having difficulty as reported that poor management system was to be blame which resulted in the federal government taking control on Indah water Konsortium in 2013 (Sanni and Hashim, 2014).

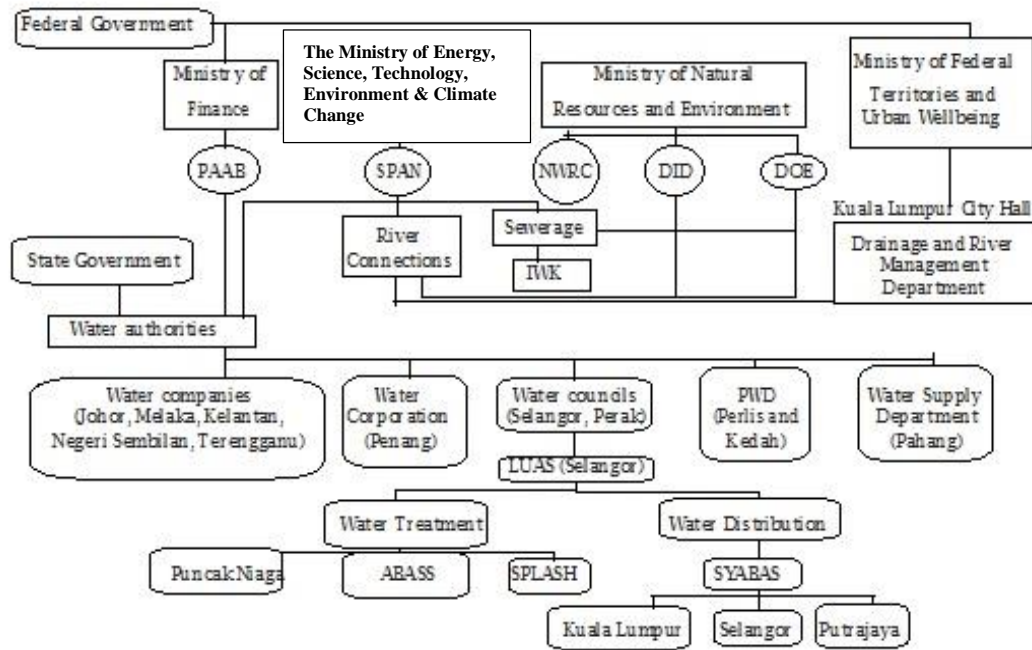
2.6 Wastewater in Malaysia

2.6.1 Wastewater Management

In Malaysia, an extensive monitoring programmes started in 1985, aiming at protection of the nation's water resources in the long term. The programme main emphasis is the application of water quality indices in classification on river system based on Interim National Water Quality Standards (Department of Environment Malaysia, 2018). According to Hutchinson (2014), in Malaysia, there is a multi-level governing system including federal government and three federal territories, the state government comprising 13 states and about 150 local or municipal authorities that have a separate list of responsibilities and shared responsibilities. Figure 2.5 shows the Malaysia hierarchy in water management in the country multi-level government system.

As about 95% of water sources in Malaysia derive from inland river systems, and as a county that is moving forward towards the National Vision 2020 (i.e., becoming a fully developed nation), it is imperative that policies for improving water quality and preserving water sources should be implemented. Malaysia has been recognised as among the few countries that are taking serious measures to create policies to transform its water services industry as part of moving towards becoming a sustainable and fully-developed nation (Teo, 2014). With a population of 32.3 million based on the Report of Census 2017 by the Department of Statistics, Malaysia, it was estimated that 3.19 billion cubic meters or waste per year would be generated.

Figure 2.5 Malaysia-Institutional Hierarchy in Water Management



(Source: Adapted from Water Service Industry Reforms in Malaysia, International journal of Water Resources Development from Teo, 2014)

One of the key players in wastewater management in Malaysia is the Indah Water Konsortium (IWK). According to Muyibi (2007), IWK was established in 1994 to facilitate compliance with the Sewerage Services Act (1993). IWK is fully-owned by the Malaysian government which covers most parts of Malaysia to provide services in sewage system, operating and maintaining public sewage treatment plants and sewage pipelines, and desludging or septic management for one million individual septic tanks throughout Malaysia (Chan, 2012). As part of the wastewater managing system IWK was created and awarded a 28-year concession for the operation, maintenance and management of sewerage systems in 143 local authorities or municipalities which, by the end of the concession period will be surrendered to the Federal Government (Hutchinson, 2014).

To further improve the wastewater system, guidelines on Sludge Disposal Sites Selection Criteria were adopted and used by the State Department of Environment (DOE) and Sewerage Services Department, which required applying for written approval for disposal of sludge. The Federal Constitution was amended in 2006 empower the Federal Government to manage water facilities throughout the country as Malaysia made major changes in water service industry law and regulations (Mohammad, 2011). Amendments to the Federal Constitution were made that introduced the Water Services Industry Act (WSIA) (2006) and the National Water Services Industry Act (SPAN Act) (2006). This were made to ensure certain powers and jurisdiction to the Federal Government to manage the water services in the county (e.g. sewage and wastewater treatment) while still maintaining some function and authority for State Governments on water sources (e.g. river) (Teo, 2014) as water resources are a part of the land and governance by State Law.

Malaysia's Federal Government in the 8th Malaysia Plan introduced a policy to upgrade public sewer systems and construct additional centralising sewage treatment plants to prevent waste and contamination from being released into rivers (Chan, 2012). About 5.3 million m³ per year of sewage sludge were produced at wastewater treatment plants managed by IWK generated from increasing growth in urban activities in the country (Salmiati et al., 2012). Malaysia has a 5-year plan to increase the connected sewerage services by grid and septic tanks from 36.2 million population equivalent (PE) in 2010 to 40.7 million PE by the end of 10th Malaysia Plan in 2015.

In a policy forum that was backed by the 9th Malaysia Plan, Malaysia's Water Vision 2025 was created with the objective of establishing a national policy for overall development of the water resources in Malaysia that involved better living conditions for people, clean water for food and rural development and to promote economic growth (Mokhtar, 2010). In Malaysia, the government is very conscious

of the development and importance of environmental laws and policies in terms of compliance and regulation towards the environment (Mohammad, 2011).

Public policy scholars and practitioners know very well that the issues in management failure are as a result of lack in training, attitude and communication (Meier and McFarlane, 1995). Even with a well-designed management system it's not guaranteed that the desired outcome will be well-delivered (Birkland, 2011).

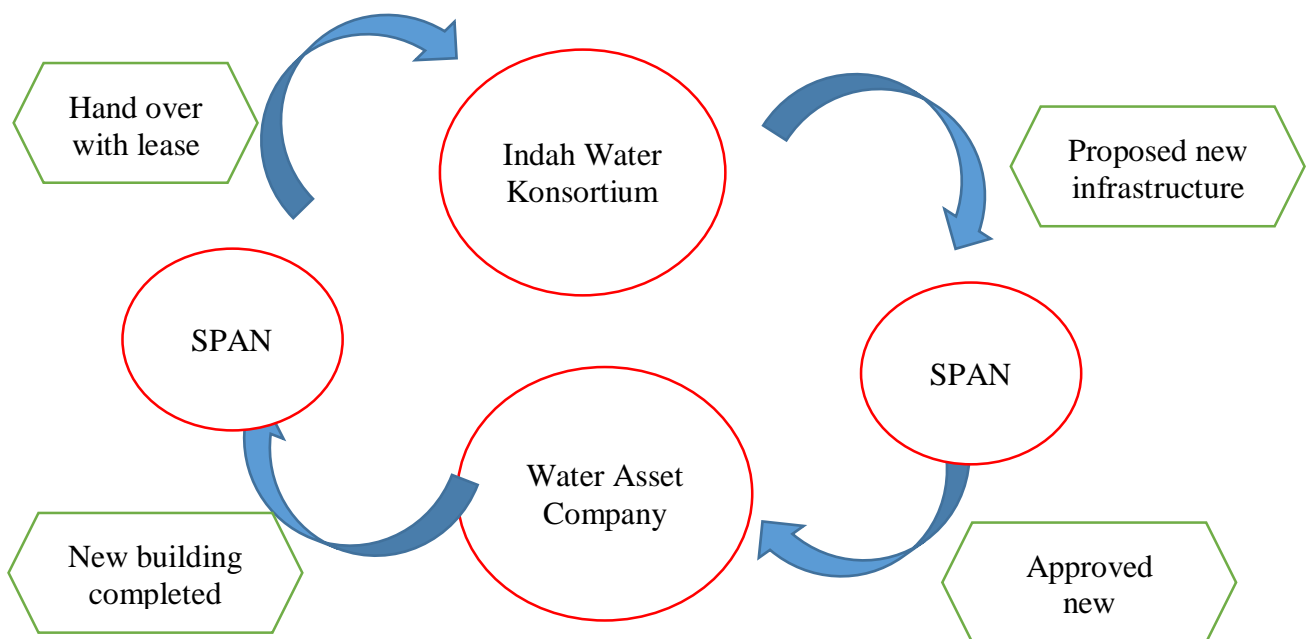
In Malaysia, infrastructure proposals are reviewed as part of a periodic planning and tariff-setting process, with regulatory approval required for funding. The funding approach has been designed to provide long-term (typically 40-year) low-interest loans through a government organization called in English "Water Asset Co.". With the Malaysian government's credit rating, Water Asset Co. is able to obtain low-interest loans on the international money market. The process is as follows (Teo, 2014):

- As part of the planning process, a water company submits proposals to the National Water Services Commission (Suruhanjaya Perkhidmatan Air Negara, or SPAN). SPAN approves the infrastructure development for funding, which is financed by Water Asset Co.
- Water Asset Co. owns the new infrastructure; it is leased to the water company at a rate approved by SPAN. The cost to the water company is included in the allowable tariffs which SPAN judges affordable to the water customers. The leasing charge includes a sum for recovery of the capital cost.
- At the end of the 40-year lease, the capital cost is paid off and the assets transferred to the water company. Water Asset Co. has recovered the capital, which can then be used for other water and wastewater infrastructure developments.

- This process should provide more sustainability, because the capital funding is part of full cost recovery. It becomes affordable thanks to the ability to spread the infrastructure cost over a long period of time, avoiding the whole cost falling on the 'current' generation.

This is an excellent example of as shown in Figure 2.6 shows innovation in a governance structure involving all aspects of water and sanitation in management adapted from Teo (2014).

Figure 2.6 Process of building new wastewater facility in Malaysia



(Source: Adapted from Water Service Industry Reforms in Malaysia, International journal of Water Resources Development from Teo, 2014)

2.6.2 Wastewater Management Agency

In assuring better governance in environmental planning, several institutions or agencies have been established by the Malaysian government to coordinate environmental issues including the Economic Planning Unit (EPU), the Public Services Department (PSD), the Manpower Planning, the Department of Irrigation and Drainage (DID) and Modernisation Unit (MAMPU) and the Department of Environment (DOE) as shown in Table 2.2. Their duties are to assist the National Development Planning Committee to formulate, oversee, implement and review all development plans, as well as make recommendations on financial allocations to the National Planning Council headed by the Prime Minister of Malaysia. (Mohammad, 2011).

Table 2.2 Agencies under the Federal Government of Malaysia and jurisdiction in wastewater management

Departments	Task/ Responsibility
The Department of Irrigation and Drainage (DID)	Hydrology, river management, flood mitigation, Coastal management and storm water management
The Public Works Department (PWD)	Domestic and industrial water supply
Department of Environment (DOE)	Quality of rivers, reservoirs or any water catchment areas
The Ministry of Health (MOH)	Quality of raw water supply especially for drinking water purposes
The Ministry of Energy, Science, Technology, Environment and Climate Change	Setting water supply and sanitation policies
The Economic Planning Unit (EPU)	Planning and distribution of physical/ infra funding

(Source: Environmental Law and Policy Practices in Malaysia: An Empirical Study from Mohammad, 2011)

As part of that, the National Water Services Commission (or Suruhanjaya Perkhidmatan Air Negara, SPAN) was formed in April 2007 by the Malaysian government to reform the Malaysian water services industry with the objective of creating and promoting more comprehensive and efficient water services including sewerage services (Ujang, Rakmi and Noranuar, 2008).

2.6.3 Laws, Regulations and Policies

Malaysia has established pollution legislation since the early 1920s (Waters Act, 1920) with the objective of controlling river pollution in the country. In Malaysia, standards are based on the effluent discharge. As the legislation was limited in scope and became irrelevant to modern environmental problems, a new and improved Environmental Quality Act (1974) (EQA) was introduced forming new legislation and strengthening the agency for controlling water pollution in Malaysia (Wichelman, 1976; Afroz., et al., 2014 and Muyibi, 2007).

The Environmental Quality Act (1974) was targeted at controlling and regulating industrial pollution, wastewater, air pollution from factories and solid waste management problems and has subsequently been amended three times. The EQA (1974) introduced several regulations to control effluent discharge:

- i) Environmental Quality (Prescribed Premises) (Crude Palm Oil) Regulation 1977 and Amended in 1982);
- ii) Environmental Quality (Prescribed Premises) (Raw Natural Rubber) Regulation 1978 and Amended in 1981); and
- iii) Environmental Quality (Sewage and Industrial Effluents) Regulation 1979.

The EQA (1974) was again amended in 1985 when environmental impact assessment (EIA) was added to ensure a better regulation of environmental issues

(Mohammad, 2011). To control wastewater pollution from municipal and industrial areas, the environmental quality standards related to sewage and industrial effluent regulations was enacted in 1979. However, an improved act, the 'Environmental Control of Toxic and Hazardous Waste Management' was introduced in 1981 to include regulation on industrial emissions. In 1989 the Environmental Quality Orders and Regulations (Prescribed Premises) related to Scheduled Wastes Treatment and Disposal Facilities was passed to ensure that all scopes and problems on pollution were facilitated by the Malaysia Government (Muyibi, 2007).

To curb the public nuisance of water pollution, the Street, Drainage and Building Act (1974) was regulated and carried out by local authorities to protect inland waters and prevent water pollution. This 1974 Act included the basic requirements to protect water resources from pollution related to earthworks stated in Section 70A. This federal law was passed to ensure that buildings are provided with proper facilities such as modern sanitation and drainage systems that could control water pollution from residential and industrial areas (Muyibi, 2007). The Sewerage Services Act (1993) through Act 508 states that municipality sewage in Malaysia must be treated in a wastewater treatment plant or sewage works (Commissioner, 2006). This shows Malaysian law on wastewater that covers municipality area. To highlight the seriousness of water pollution from wastewater and drainage systems, in 2006 the Malaysian government revamped the sewerage sector and placed it under the National Water Service Commission (Water Services Industry Act, 2006) in which sewerage services remain the responsibility of local authorities (Hutchinson, 2014).

As water efficiency is a main concern in Malaysia, the Green Building Index (GBI) was introduced to evaluate six management criteria including matters on Energy Efficiency, Indoor Environmental Quality, Sustainable Site Planning, and Management, Material and Resource, Water Efficiency and Innovation towards a better and environmental friendly building system (Rashidi, et al., 2015). To ensure

that all regulations that are passed by the government for protecting the environment will be implemented smoothly, Malaysian law should be enforced strictly (Mohammad, 2011). The improvement of sitting policies not only improved principals and guidelines, but also improved leadership skills for translating those guidelines through dynamic decision processes into mutually acceptable outcomes (Lesbirel, 2005)

2.6.4 Enforcement in Wastewater Regulation

According to Zimmer, Stafford and Stafford (1994), steps must be taken by the government to introduce effective deterrents for polluters including the introduction of nuanced payment structures relative to the types of pollution and the costs of treatment. 'Big polluters' must be penalised and made to bear the full share of wastewater management. For large companies, requirements must be imposed to treat wastewater at source as this would be a useful tool to ensure that treatment costs are internalized.

Enforcement of laws in Malaysia is important and must be done with better coordination plans (Mohammad, 2011). To uphold enforcement in Malaysia, relevant agencies such as the Ministry of Health must be included in this program where they must be properly and adequately informed on the environmental situation. With regard to enforcing regulation in standards of wastewater to be released into the environment, Malaysia has two standards which were incorporated in the Malaysia Environmental Quality Act (1974) Environment Quality (Sewage) Regulations (2009) that are enforced as shown in Table 2.3:

Table 2.3 Malaysia Standards on Clean Effluent Parameters

PARAMETER	UNIT	STANDARD	
		A	B
Temperature	°C	40	40
pH		6.0-9.0	5.5-9.0
BOD5 at 20 °C	mg/l	20	50
COD	mg/l	120	200
Suspended Solids	mg/l	50	100
Oil and Grease	mg/l	5	10
Ammoniacal Nitrogen (enclosed water body)	mg/l	5	5
Ammoniacal Nitrogen (river)	mg/l	10	20
Nitrate Nitrogen (river)	mg/l	20	50
Nitrate Nitrogen (enclosed water body)	mg/l	10	10
Phosphorus(enclosed water body)	mg/l	5	5

(Source: Malaysia Environmental Quality Act (1974) Environment Quality (Sewage) Regulations (2009), Retrieved 14 April 2017 from www.doe.gov.my)

Trained personnel should be in charge of inspection and in the context of Malaysia; it will be the responsibility of the Department of Environment (DOE). Onsite

regulator inspections are for the purpose of ensuring the accuracy of these self-reports).

2.6.5 Wastewater Management Funding

Implementing wastewater treatment projects is expensive, but due to poor planning and lack of budget by the government, wastewater tariff was introduced by billing the users (Simachaya, 2009). According to Hezri and Hasan (2006), billing tariffs for wastewater treatment were transferred from states to the Federal Government for better regulation of the newly privatised water sector that was introduced by the Malaysian Federal Government. The limited ability of state governments to manage capital-intensive privatisation projects such as IWK resulted in the need for constitutional amendments, whereby jurisdiction over the distribution of wastewater and setting of tariffs were transferred from states to the Federal Government in 1994. This action was unprecedented and was carried out to better regulate and manage waste by privatising the waste water sector (Hezri and Hasan, 2006) that could lower the burden of monitoring and implementation of resources. As tariffs for wastewater treatment services are very low in Malaysia at RM2.00 to RM 8.00 per month per premises the government of Malaysia funds the STP's facilities (Muyibi, 2007).

Based on the scale of the challenge, the most important task is to attain basic levels of service for everyone before moving to higher standards, particularly by focusing the most disadvantaged (Mecca, Davis and Davis, 2011). Current expenditure patterns do not always correctly address those most in need, and often benefit the relatively well-off (Mecca, Davis and Davis, 2011). According to United Nation (2020) funding in Malaysia disproportionately favours large urban systems (e.g. wastewater treatment facilities and sewerage networks, etc.) compared with basic services in rural areas and deprived urban areas (e.g. latrines, boreholes, and hand pumps). At present, 62% of all sectorial aid is

allocated to the development of large systems while only 16% is spent on basic systems (United Nation, 2020).

As funding is concern, the estimation is that about RM 28 billion would be required to fund modernised wastewater treatment plants throughout Malaysia that are modern, efficient and use less energy (Muyibi, 2008). It is estimated that the Malaysian Government has allocated nearly RM 12 billion for upgrading and managing water and wastewater facilities throughout the country for a 5-year period from 2016-2020 (Malaysia, 2016). Beside focus on the continuing non-profitable water reduction programme and investing new network and treatment plants, a well manage financial system will continue to ensure a sustainable and clean water resource (Malaysia, 2016).

2.6.6 Technology and Infrastructure of Wastewater

Following the restructuring and amendments to water policy in Malaysia and the establishment of the National Water Services Commission (SPAN) in 2007, ownership of all water facilities assets are governed by Pengurusan Aset Air Berhad (PAAB) (a national water asset holding company) to provide services to the state water companies (Saimy and Yusof, 2013) and to ensure the success of developing water facilities for long-term sustainability of water quality and sewerage services in Malaysia (Ujang, Rakmi and Noranuar, 2008). Afroz et al., (2014) reported that PAAB could obtain low-interest loans on the international money market through the Malaysian government's credit rating that could save government spending. This company (PAAB) owns new water infrastructure that is approved by SPAN on a 40-year lease, which will be transferred to the water company at the end of the lease while recovered capital will be used for future development of water and wastewater facilities.

Existing wastewater systems comprise centralised wastewater treatment plants, including mechanical, biological and chemical treatment. (Tillman, Svingby and

Lundstorm, 1998). However, with recent technological advances in wastewater treatment and better research and development facilities, there are many choices for using and building wastewater treatment facilities that range from state-of-the-art technologies to more conventional treatment options. It is not easy to decide on the most suitable technology from the wider range available as there are several factors to be considered, such as capital costs, operation and maintenance costs and land requirement, all of which affect the decision making (Kalbar and Karmaker, 2012).

The studies of behaviour in setting conflicts is considerably influence by social pressure in which a project on building wastewater facilities could imposed sizable negative externalities on the residents of the community (Oberholzer, 1999). While commitment by the Government is necessary and the backbone in any wastewater management is the importance of observing waste patterns and in future to generate more awareness among the public of the importance of treating wastewater for sustainable living. Traditionally, domestic sewage and industrial wastewaters, in Malaysia and in most developing countries, are employed by two different strategies which is the technical (structural) and institutional (non-structural) strategies (Mamun et al., 2009). Removing sewage from urban areas remains a problem for water resources if effective treatment and disposal of waste cannot be done properly. However, Hezri and Hassan (2006) pointed out that the government of Malaysia focused on addressing the poor public service management in general and the lack of building water infrastructure is the problem faced by wastewater management system in Malaysia.

2.7 Organisation Management in Wastewater

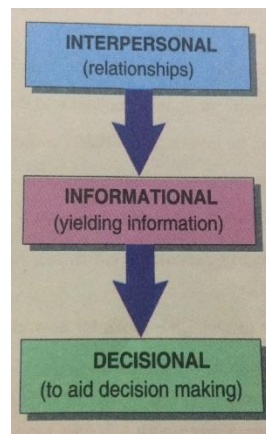
According to Brooks (2008), organisation management is a study of human behaviour in an organisation context that focus on individual and group on its actions and activities towards a dynamic organisational or management from certain disciplines such as psychology, personality and character that's improve

the outcome of a certain organisation that have many variables from short to long-standing factors which impacts employee morale, productivity and engagement both positively and negatively.

2.7.1 Management and leadership

According to Brooks (2008) Managers in modern times was always understood to spend most of their time planning, organising, coordinating, commanding and controlling on how they manage the organisation, however from his findings it is suggested that managers fulfilled their jobs from sequence of roles as shown in Table 2.4.

Table 2.4 Sequence of roles in communication



(Source: Organisational Behaviour-Individuals, Group and Organisation (4th ed.) from Brooks, 2008)

From Brooks (2008) the finding made by Mitzberg was agreed by Kotter in 1982, where managers were found to spend little time in isolation on solitary task towards managing and less on building relationship with employees and network internally with other departments thus creating a silo working environment. Towards transforming towards a better management system, it is suggested that managers adopt a less emotional attitude and show more leadership qualities on particular

occasion (Brooks, 2008). Although leadership is more concern on human behaviour, visionary, inspiration, motivation and dynamic aspects, an organisation would not be in total management/ leadership role if planning, organising and controlling together with problem solving and maintaining a degree of predictable and stable solution is meet (Brooks, 2008).

2.7.2 Organisational Structure

An organisation structure is a key variable concerning performance and attitude as also behaviour of people that are working in the environment which by creating a sustainable and flexible organisation, the individual or group would be able to achieve the role and functions in the organisation (Brooks, 2008). In an organisation, some sort of hierarchy which concerned with the lines of authority used to ensure people know who they take information and guidance from and who they are accountable.

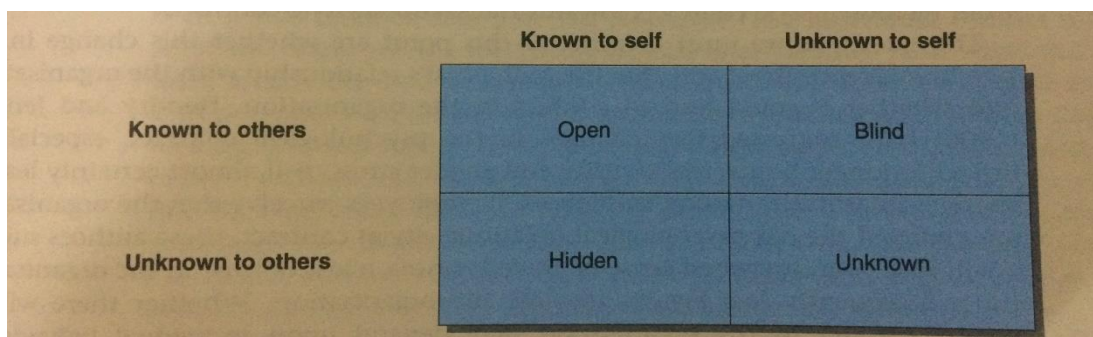
There are several structures towards building a reliable organisation, however most organisation based their structure on centralised and decentralised structure. Centralised gives the organisation control to a few people and has the advantages that decision is more likely to be consistent and jobs at lower levels should be more simplify as important decision are removed (Brooks, 2008). Decentralisation however provides greater potential for motivating employees as decision are taken near place of work and organisation can react faster in a given situation. However according to Hales (1999), decentralisation is far from clear and cautions that it does not bring great change in the organisation as human resources still plays a great role in selection, training and rewords in the organisation created. As such, managers should not change the structure only in response to a performance downturn but should keep a watchful eye on stature relation to strategy and push through changes in action when needed (Brooks, 2008).

2.7.3 Organisation Training and Communication

In an organisation, communication can influence individual behaviour through change in individual perception a perceptual bias. As such by adopting the Johari Windows concept, it would be better understood how changes affects the psychological contract and the potential conflict inside the organisation (Brooks, 2008). According to Brooks (2008), the Johari Windows is one of the techniques used upon training either new or seniors' people in the organisation which are different part of an organisation to seek and improve communication and tackle problems in the organisation together in which highlighted the important on training in a given organisation.

As such, by polishing the communication skill, it will not only create a better leadership in the organisation but created sensitivity towards the power and recognising how people perceived words and action in the organisation (Brooks, 2008). Continues training and learning communication skills is a process which is based on experience encounter and depends on how interpretation is meet and received (Kolb, 1976). According to Brooks (2008), issues on communication in an organisation is vital as personality and perception could change the attitude in the organisation as shown in Johari Windows at Figure 2.7.

Figure 2.7 Johari Windows



(Source: Organisational Behaviour-Individuals, Group and Organisation (4th ed.) from Brooks, 2008)

CHAPTER 3

METHODOLOGY

3.1 Research methodology

The study explores the wastewater management on policy, practice and challenges in Malaysia by drawing on the multiple perspectives of government and industry players' experiences in managing wastewater. Description and details of each method and procedure and how it will be applied for analysis are provided in this chapter. The methods used will also provide justifications for the choice of population and sampling strategy. In addition, the data analysis and data integration carried out in the research are also explained.

3.2 Research design

This research is a study, which is aimed at finding out the issues and gaps and future direction in wastewater management. In the context of the current research, the mixed methods approach is adopted by the researcher to conduct the research and explained below.

3.2.1 Rationale for Mixed Methods

Creswell (2014) pointed out that in the use of mixed methods there are bound to be differences, with a tendency to be either more qualitative than quantitative or vice versa in the design. Nonetheless, fundamental to the terms using words or numbers is the combination approach or integrating diverse methods (Creswell,

2014). However, the term 'mixed methods' is perhaps most appropriate in involving collection of both qualitative and quantitative data as to integrate both of those data (Creswell, 2014). According to Creswell and Plano (2017), although there are challenges working with the design that emerges, this technique is widely used by many researchers to answer research questions specifically.

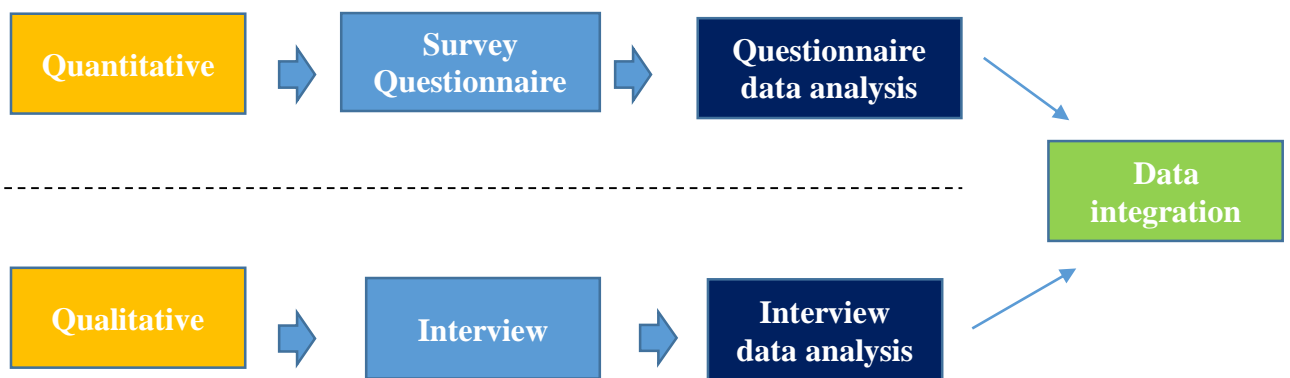
Mixed methods will use both quantitative and qualitative approaches at an exact point in a research (Tashakkori, John and Teddlie, 2010) which will be beneficial for data collection. Gilham (2005) also pointed out that the mixed methods approach is suitable for researcher as it combines the strengths of both quantitative and qualitative and provide increasing appreciation of the limitations of single methods. The justification for using this mixed methods approach in this study includes, firstly, in the context of the current study, wastewater management are a complex subject, which involves various hierarchy from managers to its operators which could be captured from quantitative or qualitative data.

Secondly, in addition, there is general agreement that combining different types of methods can strengthen the research (Greene and Caracelli, 1997) as the specifics of qualitative data like interviews can afford insights which are unobtainable through common quantitative surveys (Jick, 1979). In the context of the current study, the quantitative aspect of the research via the questionnaire would enable the researcher to capture general information as well as unearth the potential salient points of the issue of wastewater management. Meanwhile, the qualitative method would be most suited to the task of obtaining a better understanding of the issues of wastewater management in a more detailed and in-depth manner. This is because it offers the researcher the opportunity to pursue the finer details of the accumulated quantitative data, focusing on its salient issues which are significant to the research that was not captured or not fully captured by the initial questionnaire. It is also designed to complement the researcher's full understanding of the research problem (Sharlene and Hesse,

2010). Hence, mixed methods approach offers the best opportunities for answering the research questions (Johnson and Onwuegbuzie, 2004).

3.2.2 Types of mixed methods

Figure 3.1 Mixed Methods design for the study



As the Figure 3.1 above shows, the current study is a sequential explanatory mixed methods design, which comprises two separate parts which are the quantitative and qualitative approaches (Creswell, 2014). In the first part, the quantitative data are collected in a broad survey through a questionnaire to generalise results to a group of population (Creswell, 2014). This is followed by the second part focused on qualitative data to collect detailed views from respondents (Creswell, 2014). Such data were gathered using individual semi-structured interviews.

In the context of this study, priority is given to the quantitative data using questionnaire as it is done first, and the qualitative survey is done in two parts of the second phase of the study (Creswell, 2014). The justification for this approach is that the numerical information paints an overall picture of the research problem, whereas the textual information and its analysis will enhance and clarify those

statistical results by investigating participants' views in more detail (Creswell, 2014).

3.3 Sample

The target sample in this study comprises the individuals directly connected with wastewater management. As Noraini (2010) pointed out, a target sample is a group of people that is selected from various background such as job description, work institution or location for the purpose of the study. Essentially, all participants in the current study represented the various stakeholders involved in policies, enforcement, maintenance and operation of the wastewater system in the country. Using sample size in a research study would save time as the time to extract data would be shorter than using population as its target group (Fraenkel and Wallen, 2019).

Each different stakeholder will bring into the study their own perspectives on the issue of wastewater management, thus enabling a more enriched and holistic view of the subject under study.

3.3.1 Administrators

This group of people comprise the main personnel involved in or responsible for the wastewater management in the area of study. These administrators in the current study are represented by officers, technicians and enforcement agents as explained in the following sub-sections:

3.3.1.1 Managers and Officers

This first subgroup of administrators comprises personnel at mid or higher level of the management structure, namely the federal, local authorities or agencies from the Ministry of Energy, Green Technology and Water of Malaysia, Kajang

Municipality, Indah Water Konsortium (IWK) and contractors appointed by IWK to manage wastewater facilities in a certain area. Their inclusion as participants in the study is based on several criteria. Firstly, the study related to their roles and responsibilities in the management of wastewater in the study area, which makes them experts either in management or operation.

3.3.1.2 Technicians and enforcement agents

This second subgroup of administrators comprises primarily the technicians, who are the persons of authority responsible for operating, monitoring and enforcing the wastewater system in the Kajang area. Being technicians and enforcement agents, they are able to appreciate the potential effect of the wastewater management on managing and enforcing of policies. These technicians are mostly employed by Indah Water Konsortium and oversee the work that is done to maintain and run the wastewater facility. These enforcement agents are employed by IWK or the Department of Environment, Malaysia to ensure proper compliance with regulations and wastewater standards before being discharged into the environment.

3.4 Sampling strategy and participants

For this study, stratified random sampling is adopted in the effort to understand management of wastewater in the study area. This is to ensure unbiased sampling in which each target group is represented.

3.5 Study Area

The general study area is Peninsular or West Malaysia in South East Asia and extends from 1° 15'N to 6° 45'N latitude and 99° 40'E to 104° 35'E longitude. It is bordered by the South China Sea on the east and on the west by the Straits of Malacca. Its northern boundary is with Thailand and Singapore is in the South.

Peninsular Malaysia covers an area of 127,560 km². Its maximum length is 736 km, while its maximum width is 322 km. Its coastline stretches some 1930 km. In total, Malaysia has more than 100 river systems, with the largest river in Peninsular Malaysia being the Pahang River, which is about 434 km long. There are 12 states in Peninsular Malaysia, nine of which have state monarchies (Sultans). East Malaysia comprises two states in the island of Borneo, Sabah and Sarawak, and the federal territory of Labuan.

3.5.1 The Study Location

The specific study location is the Kajang Municipality in the Hulu Langat District of the state of Selangor in Peninsular Malaysia as in Figure 3.2. Kajang is located in the south east of Selangor state, and is within the 2° 59'N longitude north and 101° 47'E longitude east, with an area coverage of about 539km². It is also located approximately 27 km south from the Federal capital of Kuala Lumpur. This area has an estimated population of 343,000.

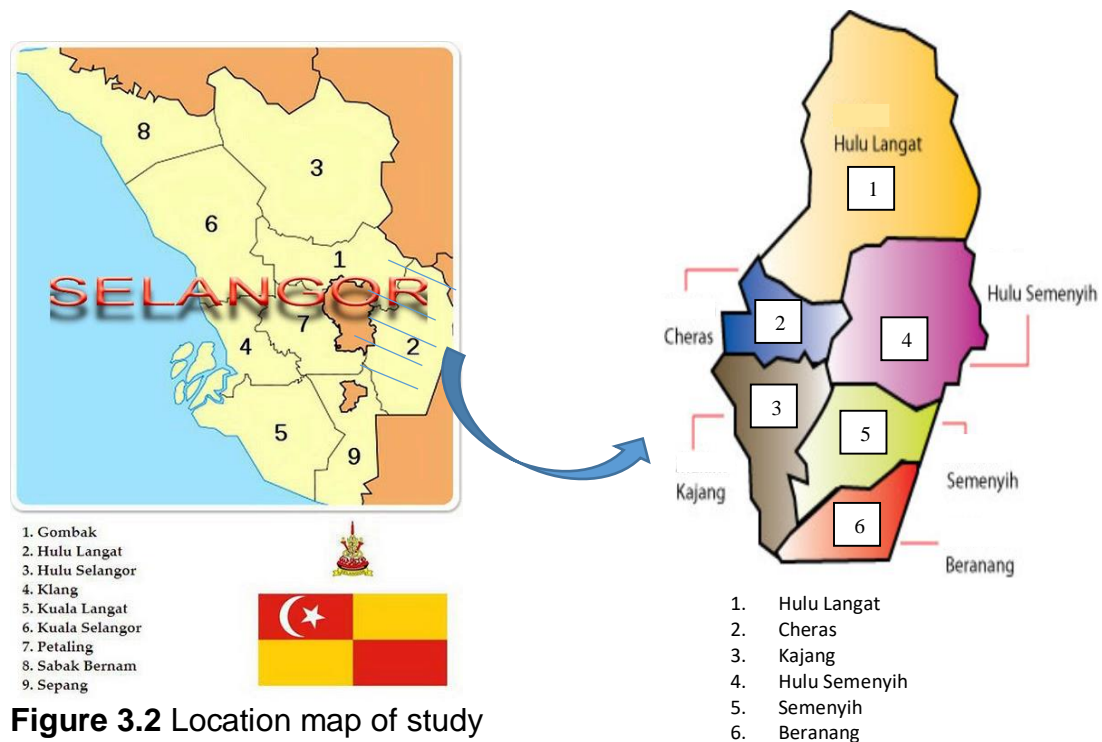


Figure 3.2 Location map of study

The Kajang area has several main rivers, among them the Langat River, Semenyih River and Beranang River. Kajang is also situated near three other Local Authorities in Selangor, two Local Authorities in Negeri Sembilan and a Local Authority in the Federal Territory of Kuala Lumpur.

3.5.2 Stratified Random Samples

To get the best outcome of the study, respondent was selected from various background and working department such as Kajang Municipality and Indah Water Konsortium by using stratified random sampling that involves dividing the respondent of interest into smaller groups, called strata. A number of 100 respondents was selected during this study a 10 percent of the total estimation of the study group.

3.6 Selection of Respondents

The selection of the study sample was drawn from government officers and industry players primarily based on their occupational position which is to manage wastewater in the Kajang area as well as on their knowledge and expertise in relation to wastewater management such as in the policies, implementation or enforcement in their current official capacities within their respective agencies.

In sum, the stratified random sampling selection was deemed appropriate for the purpose in relation to the aims of the study and research questions. This is because a selection of the random sample from different groups provides information needed to cover the target group. In addition, they are experts in their respective areas of wastewater management and its facilities due to their experience and knowledge. Besides this, the combination of such a mix of respondent types of different stakeholders, with different perspectives and experiences regarding wastewater management could prove to be an invaluable

source of insights into multiple perspectives that could be gathered using semi-structured interviews and a survey questionnaire.

3.7 Data Collection

As the current study utilises the mixed-methods approach, the primary data collected will be from the combination of the following: a) survey questionnaire and b) semi-structured interview. However, before these are explained in detail, the data collection phases that will be adopted for the whole fieldwork of this study need to be clarified.

3.7.1 Data collection phases

Before the fieldwork can be undertaken, the research ethical approvals and official letter acknowledging the study carried out were obtaining from the University of Nottingham, Malaysia.

The period for the field study was in April 2018 for the purpose of data collection. Phases of data collection were adopted as shown in Figure 3.3:



Figure 3.3: Data Collection Phases

Before conducting data collection, a formal written request was sent to each affected Government and industry player's office via email. Letter informing them of the purpose of the study and tentative dates of the proposed actual

fieldwork visits. These were undertaken on ethical grounds that require an official notice to be given prior to the actual visit as a formal communication and as professional courtesy to all the selected offices.

On the actual visit to the selected office, introduction to desk officers who would be the persons in charge on ensuring the researcher would be able to collect data in the office(s) selected. During this visit, all the details and briefing on the study was explained. Besides that, the research documents like The School of Geography Consent Forms and Participant Information Sheets were also given, to the selected office personnel that are taking part in the study would be furthered explain thus ensuring a smoother and successful data collection process.

3.8 Justification of Methods used

To ensure that the research and data collected for the study are appropriate to be used, below are the justifications of the said methods:

3.8.1 Survey Questionnaire

Questionnaire is defined as '*a written list of questions, the answers to which are provided by respondents*' (Kumar, 2014). In terms of collection for the quantitative data in this first phase of the research, a survey questionnaire was used as the most suitable instrument based by questionnaire for data collection saves time and cost and it offers greater privacy for the respondents (Kumar, 2014).

3.8.2 Semi-structured Interview

The semi-structured interview is one of the most common methods used in gathering qualitative data (Gillham, 2005). In the context of this study, apart from quantitative data in the form of a survey questionnaire, a follow-up personal face-to-face interview was conducted with selected representatives of the selected offices to examine the issues, gaps or challenges related to wastewater management. Semi-structured interviews rely on the interactions between the interviewer and the interviewee (Clifford, French and Valentine, 2016).

The researcher would need to assure that the data collected remains confidential and anonymous (Clifford, French and Valentine, 2016). This is important as ethical responsibility by the researcher is trusted by the respondents. According to Krueger and Casey (2000), the researcher should listen, pay attention and be non-judgemental in an interview even if some interviewees have or provide offensive views.

3.8.3 Justification of interview

As interview is a face-to-face scenario and enables more interaction between the interviewer and the interviewee (Gooch and Vavreck, 2019). According to Awang (2010) respondents will not turn down the request for an interview, with a proper plan and approach. In the Malaysian context, the local culture of entertaining interviews when someone comes to the door with a polite and pleasant manner was practised (Awang, 2010) and expected by the researcher. According to Connaway and Powell (2010), in conducting an interview the interviewer should attempt to create a friendly non-threatening atmosphere. The interviewer should give a brief, casual introduction to the study; stress the importance of the interviewee's participation; and assure anonymity, or at least confidentiality, when possible. The researcher used these technics to gain positive respond to questions

in good faith and provide honest, accurate responses when engaging with respondents.

With regard to the language, the interviews were conducted in either Malay or English, depending on the interviewee's preference. The interviewer was the researcher himself and during the interview, besides note taking, audio-recording and photo recording were also done with the knowledge and consent of the interviewee to complement the data collection.

3.9 Data analysis

The collected data from the different collection methods were analysed by the researcher to obtain a better understanding of the state of wastewater management in the study location in three analyses to cover the data from the questionnaire and interviews.

The analysis of the quantitative Questionnaire data was done as suggested by Pallant (2013) using the Statistical Package for Social Sciences for Window Version 21.0 (SPSS). Firstly, a data theme or title was prepared to provide information about the variables in a dataset, such as the type, variable labels, value labels, as well as the number of cases in each level of categorical variables and means and standard deviations of continuous variables. Secondly, the structure of the data file was set up. Thirdly, the survey data from all the questionnaires were entered into the data file systematically. Fourthly, the data were then screened for any errors or missing data and subsequently cleaned. Next, the survey data were analysed using relevant statistical and descriptive functions and graphs which will be discussed in Chapter 4.

As Dunn and Andrew (2015) explained, there are three types of interviews: structured, unstructured and semi-structured which can be placed along the sequence. However, semi-structured interviews are more flexible although prearranged questions are used. The analysis of the interview data commenced

with the transcription process undertaken by the researcher to familiarise and immerse himself with the data. According to Clifford, French and Valentine (2016) it is important that a researcher is equipped with themes and questions to ask the respondents. Each of the interviews was transcribed into the English language individually to ensure that there was no dilution or confusion of meaning by the writer by using dictionary and goggle translator. This transcription process was carried out individually and systematically according to the respondents' type. This approach was taken to ensure that each interview was transcribed, and no interview was missed, using a checklist of interviewees as reference. As such, this method would be able to collect data in -depth from wide range of people which include leaders of the organisation, professionals or operators who has first-hand knowledge about managing wastewater in the study area.

As described, above the statistical methods used in the analysis were as follows:

- a) The percentages, arithmetic means, and the standard deviation used to describe the characteristics of the subjects such as personal information (age, education level, working position) were analysed using statistics which included the frequency, the arithmetic mean and the Standard Deviation;
- b) Chi-square test was used to determine a correlation between independent variables and a dependent variable; and
- c) The t-test was used to measure the differences between independent variables in the study area.

3.9.1 Descriptive Data Analysis

Descriptive analysis was also used to describe the basic features of the data in the study. They provide simple summaries about the sample and the measures. Together with simple graphical analysis, they form the basic virtual of any

quantitative analysis of data. With descriptive analysis, one simply describes what is or what the data shows. Description of data is needed to determine the normality of the distribution; description of the data is necessary as the nature of the techniques to be applied for inferential analysis of the data depends on the characteristics of the data.

Once the data are grouped, different statistical measures are used to analyse data and draw conclusions. For the present study, the following statistical measures of descriptive analysis were used to compute further statistical testing.

1. Measures of Central tendency.
2. Measures of Variability.
3. Measures of Divergence from Normality.
4. Measures of Probability. Graphical methods have been adopted for translating numerical facts into more concrete and understandable form.

3.9.1.1 Mean

The Mean or average is probably the most commonly used methods of describing a central tendency. Mean is the average of all values in a distribution (Krishnaswami and Ranganatham, 2016).

The Mean can also be calculated using the formula: -

$$x = \frac{\sum x}{N}$$

Where, \bar{x} = sample mean

$\sum fx$ = sum of scores in a distribution

N = number of items

Median

The median is the positional average that divides a distribution into two equal parts so that one half of items falls above it and the other half below it. In other words, the midpoint of a distribution of values is called the median. It is the point, below and above which 50% of the population lies

If there is an even number of numbers in the set, then the median calculates the average of the two numbers in the middle.

3.9.1.2 Median

$$\text{Median} = l + \left[\frac{\frac{N-F}{2}}{fm} \right] \times i$$

Where, l = lower limit of median class.

N = number of scores in a series.

fm = frequency of median class

c = length of class interval

F= no, of cases below the median.

The standard deviation is used when expressing dispersion in the same unit as the original measurement. It is designated as (σ)

The standard deviation can be calculated using the following formula:

$$\sigma = \frac{i \sqrt{\sum fx^2 - c^2}}{N}$$

3.9.1.3 Mode

The mode is the most frequently occurring value in the set of scores. The mode is indirectly calculated mean and median. It is a quick and appropriate measure of central tendency. The mode can be calculated as the largest frequency in the distribution, using the following formula:

$$\text{Mode} = 3 (\text{median}) - 2 (\text{mean})$$

3.9.1.4 Standard Deviation

The standard deviation shows the relation that set of scores has with the mean of the sample. Standard deviation is expressed as the positive square root of the sum of the squared deviations from the mean divided by the number of scores minus one. It is the average difference between observed values and the mean.

Where, σ = Standard Deviation (S.D.)

i = length of class interval

Σ = sum of

x^2 = squares of the deviations of scores from the assumed mean 198

f = frequency of class interval

c^2 = square of correction

N = total number of scores

3.9.2 Thematic Data Analysis

Thematic analysis is the process of identifying patterns or themes within qualitative data. There are many different ways to approach thematic analysis (Javadi and Zarea, 2016). However, this variety means there is also some confusion about the nature of thematic analysis, including how it is distinct from a qualitative content analysis (Turunen and Bondas, 2013). By adopting Braun and Clarke (2006) 6-step framework is probably the best method in social studies as it offers such a clear and usable framework for doing thematic analysis as shown in Table 3.1. The goal of a thematic analysis is to identify themes, i.e. patterns in the data that are important or interesting, and use these themes to address the research or say something about an issue. This is much more than simply summarising the data; a good thematic analysis interprets and makes sense of it. A common pitfall is to use the main interview questions as the themes (Braun and Clarke, 2006).

Table 3.1 Six-Phase Framework of doing a thematic analysis

Step 1: Become familiar with the data, Step 2: Generate initial codes, Step 3: Search for themes,	Step 4: Review themes, Step 5: Define themes, Step 6: Write-up.
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(Source: Doing a thematic analysis: A practical, step-by-step guide for learning and teaching scholars from Maguire and Delahunt, 2017)

3.10 Instruments

In general, a process to prepare research data collection are called instrument in which, selecting a correct instrument should be done carefully (Noraini, 2010). In this study, three set of questionnaires for the survey was developed based on the research questions and objectives. The first set would be answered by the managers, the second set are answered by the technical and enforcement officers and the third would be answered by the contractors.

The questionnaire was divided into five sections with mainly a close-ended questions section that mainly focused on different aspects of wastewater management and implementation such as below:

- i. General background Information
Personal data of respondents (gender, occupation, including position, age, education and income)
- ii. Communication organisation
Respondents' knowledge on wastewater organisation.
- iii. Training

Respondents' knowledge and awareness of the existing training system.

iv. Wastewater Infrastructure

Assessment of organisation budget, tariffs and facilities in wastewater management.

v. Monitoring

Assessment of factors important on job monitoring from the respondents' point of view.

The first section of the is concerned with personal information of the sample group, such as age, gender, level of income, level of education, work experience and work position. The answers required were chosen from the list of choices. This section has six items. It's a vital source of data as the researcher needs to assess who to survey and how-to break down the overall survey response data into meaningful groups of respondents. An assessment based on demographic considerations was done.

Second section. This part of the questionnaire is concerned with the respondent's general knowledge of wastewater management with regard to the approaches, policies and transformation. There are 9 questions in this section, where questions are answered using a simple 'yes' or 'no' answer. An open comment is left on selected questions to give respondents opportunity to express their thoughts or ideas.

The third section of the questionnaire issued to gauge the understanding of respondents regarding the importance of providing training to personnel for better management. There are 7 questions to be answered using a simple 'yes' or 'no' answer. An open comment is left on selected questioned to give respondent's opportunity to express their thoughts or ideas.

The fourth section of the questionnaire is used to gauge the understanding of the respondents' opinion on the importance of good wastewater facilities and its obstacles faced in maintaining or creating a better wastewater management system. There are 8 questions to be answered using a simple 'yes' or 'no' answer. An open comment is left on selected questioned to give respondent's opportunity to express their thoughts or ideas.

Finally, the fifth section is used to gauge the respondent's opinions on the importance of monitoring in wastewater management. There are 8 questions to be answered using a simple 'yes' or 'no' answer. An open comment is left on selected questioned to give respondent's opportunity to express their thoughts or ideas.

The researcher has code the answer by 1 for 'yes' and 2 for 'no' as it is easier to decode, proses and analysis to base on the respondent's answer. In this study, the researcher will distribute the questionnaire to the respondents on the visit day.

3.11 Data integration

After the above-mentioned different data collection methods have been separately analysed accordingly, the next step will be the data integration. The integration through narrative method will be employed for this study using the 'weaving approach' whereby the quantitative and qualitative findings will be joined on a theme-by-theme basis, guided by the research objectives and overarching themes of the study.

In the initial data integration process, the survey results are given priority, in providing the initial skeleton basis for the study findings by offering initial data themes, in the form of numerical representation from the survey in addition, interesting and unique findings that emerge from the qualitative data analysis left uncaptured by the survey questionnaire will also be utilised where deemed

relevant to form additional themes to the findings. In such a case, additional themes that emerge are added.

CHAPTER 4

RESULTS AND DISCUSSION

This Chapter discusses the results of the study. The presentation of the findings closely follows the sequence of the three research objectives of the study. The Chapter begins with the description analysis of the questionnaire of the respondents' background information, as well as their position in wastewater governance, followed by descriptive analysis of the levels and patterns of organisational communication practice, perception concerning general knowledge and opinion on personal training in wastewater management, wastewater infrastructure and monitoring. The subsequent section describes the thematic analysis from six in - depth interviews conducted to conclude research objectives.

4.1 CURRENT STATE AND NATURE OF WASTEWATER MANAGEMENT IN KAJANG DISTRICT, SELANGOR, MALAYSIA

This section reveals information obtained from the questionnaire given to the respondents who are involved directly to the wastewater management and policies in Kajang District. As described in the section on sampling in Chapter Three, the respondents of the study consisted of 100 practising personnel involved in wastewater management and policies in the Kajang District. However, only a total of 87 from 100 respondents completed the questionnaire while 13 did not.

It should be noted that, of the 87 questionnaires returned, there were very few that contained errors such as circling more than one response to a question; or not answering some questions. These particular sections were discarded but the responses in the other sections which were correctly completed were retained and analysed. According to Ary, Jacobs and Razavich (2018), reporting results for

different values of N (number of respondents) for different sections of an instrument is accepted since N did not vary greatly across instruments, or across different sections of an instrument, it is assumed that the variation would have very little effect on the patterns of data obtained. The actual number of respondents' responses that were considered usable data for each variable studied is specified in the report of the results in each section.

4.1.1 GENERAL BACKGROUND INFORMATION

This section presents data on the demographic background of the respondents, including their academic and professional qualifications. These items were described by number and per cent of personnel reporting each choice as shown in Table 4.1 below.

Usable data on the of the counsellors or respondents in the study came from 87 responded questionnaires, who fell into five position categories. A majority of them (42.53%) were operators and technicians (39.08%). Only 11.49% were enforcement officers, 4.6% were management personnels and 2.3% engineers were participated in this study. This distribution of respondents according to position held in organisation is illustrated in Table 4.1.

The distribution of respondents according to highest education is also shown in Table 4.1 below. A large majority of 50.57 % respondents involved in this study possessed a diploma, followed by 42.53% respondents with SPM qualification. Only 6.90% respondents had a bachelor's degree or master's degree.

Table 4.1 Distribution of Respondents by General Background Information

Variable	Respondents (N=87)	
	<i>f</i>	Per cent
<u><i>Position in wastewater Governance</i></u>		
Management	4	4.60
Engineer	2	2.30
Technician	34	39.08
Operator	37	42.53
Enforcement Officer	10	11.49
Others	-	-
<u><i>Gender</i></u>		
Male	63	72.41
Female	24	27.59
<u><i>Age Range in years</i></u>		
22 – 41	71	81.61
42 – 61	16	18.39
<u><i>Highest Education</i></u>		
High School	37	42.53
Diploma	44	50.57
Bachelor's Degree	3	3.45
Master's Degree	3	3.45
<u><i>Income Level</i></u>		
Less Than USD 1,000	74	85.05
USD 1,001 – 4,000	13	14.95
<u><i>Working Experience</i></u>		
Less than 1 year	18	20.69
1-5 years	25	28.74
6-10 years	28	32.18
11-15 years	12	13.79
16-20 years	4	4.60
Total in each sub-sectors	87	100.0

(Fieldwork survey, April 2018)

In terms of working experience, analysis found that the majority of respondents (60.92%) had between 1 – 10 years of experience in which 32.18% of them had 1 - 5 years of experience and 28.18% of them had 6 - 10 years of working experience, followed by 20.69% with less than 1 year of experience and another 13.79% with 11 - 15 years of experience. Only 4.6% had more than 16 years of working experience as shown in Table 4.1 above.

4.1.2 COMMUNICATION ORGANISATION

Nine questions related to the organisation communication practice among respondents in wastewater management in Kajang were asked.

As shown in Table 4.2 below, the study reveals that 66.67% respondents agreed that their department had considered their proposal recommendation to improve wastewater management.

Table 4.2 below also shows that only 54.0% of the respondent felt that they were given more flexibility and responsibility towards improving the role of moderate skill employees in improving wastewater management. Where else, 46.0% of respondents felt that by giving flexibility to the operators it would give negative impact on the system as there are already guidelines and standards of operating that needs to be followed by them.

Table 4.2 Distribution of Respondents by Communication Organisation

No.	Variables	Frequency		Percentage	
		N = 87		% = 100	
		Yes	No	Yes	No
1.	<i>Does your head of department/ director consider your recommendation on ways to improve wastewater management?</i>	58	29	66.67	33.33
2.	<i>How do you feel about giving flexibility to operators on managing the wastewater facility?</i> A good step to give responsibility to personnel (Yes). Not a good idea since standards of operation need to be followed strictly (No).	47	40	54.02	45.98
3.	<i>The Malaysian wastewater management is centralised by the Federal Government. Do you agree this is the best system?</i>	80	7	91.95	8.05
4.	<i>Do you think political figures play a role in improving wastewater management?</i>	12	75	13.79	86.21
4.	<i>Do you often attend management meetings with the head of department/ directors?</i>	70	17	80.46	19.54

6.	<i>In your opinion, is there enough manpower in your organisation to execute wastewater management?</i>	59	28	67.82	32.18
7.	<i>Do you think you are overworked by your organisation?</i>	23	64	26.44	73.56
8.	<i>Do you often feel threatened by commands given from your head of department/ directors?</i>	3	84	3.45	96.55
9.	<i>Are you given the opportunity to report any misconduct by head of department/ directors?</i>	63	24	72.41	27.59

(Fieldwork survey, April 2018)

In Table 4.2 above, respondents shows high level of agreeance (91.9%) on Malaysia wastewater management system which the Federal Government of Malaysia has centralised control in making policies, enforcement and main stream decision towards improving the wastewater industry. About 86.2% of responders feels that politician should not interfere so much on wastewater management in the district as shown in Table 4.2.

However, Table 4.2 also shows that managers often carried out meetings to coordinates team activities on organising the management system. 80.5% of the respondents agrees that they had attended the coordinated meeting often as to evaluate the level of effectiveness of the existing management which comply with current guidelines or procedures.

About 67.8% of the respondents as in Table 4.2 felt that manpower should be increased with the increasing demanding of wastewater treatment in development

areas. However, about 32.2% of respondents felt that the amount of manpower is sufficient and should be fully utilised.

The important of fully utilised work force in a given organisation is important to ensure a more successful management team. Table 4.2 also shows that, 26.4% of respondents felt that they were overworked. However, the majority of respondents (73.6%) agreed that their workload is at a normal range.

On the other hand, Table 4.2 shows that 94.2% of respondents felt they were not threatened by command or directives given by their managers or supervisors, at work place.

In response to report misconduct in the organisation, 72.4% of respondents in this study were given opportunity and channels to report on any misconduct done by their higher ranking officers to the immediate or higher management officers.

4.1.3 TRAINING

Seven questions were asked regarding the purpose of describing respondent's perception towards their training programme undergone by all wastewater management personnel in Kajang.

As shown in Table 4.3, 91.9% of respondents agreed that their organisation have sponsored various type of trainings as to improve their working skills which are needed to manage better wastewater programmes.

Table 4.3 Distribution of Respondents by Training

No.	Variables	Frequency		Percentage	
		N = 87		% = 100	
		Yes	No	Yes	No
1.	<i>Have you had any training sponsored by your organisation?</i>	80	7	91.95	8.05
2.	<i>How many times yearly does management send you for training?</i> less than twice (Yes) More than twice (No)	74	13	85.06	14.94
3.	<i>Would you be willing to attend additional classes after work to improve your knowledge or managing skill?</i>	28	59	32.18	67.82
4.	<i>Does your organisation have comfortable training facilities for wastewater training?</i>	80	7	91.95	8.05
4.	<i>Are the training facilities well equipped for wastewater training?</i>	80	7	91.95	8.05

6.	<i>Does your organisation give you the flexibility to choose your desired training?</i>	36	51	41.38	58.62
7.	<i>How does your organisation select lecturers/ facilitators for training? Personnel inside the organisation?</i>	30	57	34.48	65.52

(Fieldwork survey, April 2018)

Table 4.3 above also shows that 85.1% of respondents had received less than twice training programmes in accordance with the skill that are needed in workplace yearly. Only 15.9% of respondents had received training programme of more than 3 times, yearly.

On improving the workforce skill and training, question was ask if respondents are ready to attend training after work. Table 4.3 shows that 67.8% of respondents reveals that they were unwillingly to participate any training programmes if conducted after working or office hours.

In facilitating a well manage and comfortable training activities, respondents were ask on how they feel on training facilities and equipments provided for their training. The responses received was overwhelming with 91.9% of respondents agreed on facilities and equipments for training was comfortable and well equipped, as shown in Table 4.3.

On giving flexibility to workers on choosing their desire training programmes, Table 4.3 also shows that 59.7% felt that they were not given enough opportunity to

choose the training programmes that they were interested. Only 41.3% felt they were given the training as they have applied.

Table 7.16 also shows that 65.5% of trainers that was selected by the organisation were experts from outside the organisation. Where only 34.5% comprised of selected personnel's from the organisation.

4.1.4 WASTEWATER INFRASTRUCTURE AND FUNDING

Eight questions were asked for the purpose of describing respondent's perception towards wastewater infrastructure in Kajang.

Table 4.4 Distribution of Respondents by Wastewater Infrastructure and Funding

No.	Variables	Frequency		Percentage	
		N = 87		% = 100	
		Yes	No	Yes	No
1.	<i>Do you think wastewater facilities should be funded by Government?</i>	18	69	20.69	79.31
2.	<i>Do you think adopting new technology can lower the operational cost of a wastewater facility?</i>	79	8	90.80	9.20

3.	<i>Do you think that the tariff on wastewater should be increased to improve the wastewater infrastructure?</i>	68	19	78.16	21.84
4.	<i>Do you think joint-bill system (wastewater bill combined with electricity or water bill) by the government is an effective method of collecting payment of wastewater bill from the public?</i>	85	2	97.70	2.30
5.	<i>Do you think wastewater management in Malaysia can be improved for better wastewater treatment by adopting new technology?</i>	63	24	72.41	27.59
6.	<i>Do you feel that operators are safe working at the wastewater treatment plant?</i>	81	6	93.10	6.90

7.	<i>Do you think the wastewater facilities are being properly maintained?</i>	57	30	65.52	34.48
8.	<i>Does your organisation regularly conduct inspection of wastewater facilities condition?</i>	60	27	68.97	31.03

(Fieldwork survey, April 2018)

As shown in Table 4.4 above, 66.7% of the respondents felt that both government and public should be responsible in funding the wastewater facilities in Kajang. The public involvement is to ensure that they really understand the financial difficulty in managing wastewater facilities in the district.

In Table 4.4 above, the majority of respondents (90.8%) agreed that new technologies in wastewater treatment would lower the cost of operation. Funding is important to maintain an efficient wastewater treatment process. The study found that 78.2% of respondents agreed that wastewater tariff should be increased to accommodate the rising cost of wastewater treatment every year.

Table 4.4 also shows the response received towards a joint-billing system to ensure payment for wastewater treatment service from consumers. Response from the study reveals that 97.7% agreed on the method be used to encourage and increase payment of services from the public.

Technology plays vital role in wastewater treatment. Table 4.4 also shows that 72.4% of respondents agreed that a new technology need to be adopted or developed to improve wastewater management that sufficiently address the

wastewater treatment scenario in Kajang and Malaysia as a whole. Also in Table 4.4 shows 93.1% of the respondents agreed that the facilities for wastewater treatment plant in Kajang is a safe place for the operators and workers to work.

Maintaining a good and working facilities is something that's need to be given high priority as it would provide positive impact on the wastewater treated in the facilities. Table 4.4 also shows that 65.5% of respondents agreed that the facilities were regularly checked and well maintained. Also Table 7.24 shows that 68.9% of the respondents felt that the management or managers had regularly inspected the wastewater facilities in Kajang district.

4.1.5 MONITORING

Eight questions were asked to monitor respondent's perception towards wastewater management in Kajang.

As shown in Table 4.5 below, 72.4% of respondents felt that urbanisation expansion is to be blamed for the increase of wastewater sources, plus 18.4% on illegal dumping by public and another 9.2% on farming dumping activities.

Table 4.5 Distribution of Respondents by Wastewater Monitoring

No.	Variables	Frequency		Percentage	
		N = 87		% = 100	
		Yes	No	Yes	No
1.	<i>In your opinion, the main source of wastewater is from Urbanisation expansion?</i>	63	24	72.41	27.59
2.	<i>Do you feel that wastewater after treatment is safe to be released into the environment?</i>	81	6	93.10	6.90
3.	<i>Do you think wastewater released from public without proper treatment is unavoidable?</i>	74	13	85.06	14.94
4.	<i>Do you think urbanisation is the main factor for the increased wastewater production?</i>	63	24	72.41	27.59

5.	<i>Do you know how often water quality from a wastewater treatment plan is tested?</i>	80	7	91.95	8.05
6.	<i>Do you feel the acts/ regulations in Malaysia are adequate for enforcement of the law?</i>	30	57	34.48	65.52

(Fieldwork survey, April 2018)

As from Table 4.5, 93.1% of the respondents agreed that water released from wastewater treatment facilities are safe for the environment. Table 4.5 above reveals that the level of perception among respondents on wastewater released by public. The study found that 85.06% of the respondents felt that water released by public without treatment are unavoidable as their premises have no mini treatment plant at their housing area.

Table 4.5 also shows that urbanisation is the main factor in wastewater production in Kajang. 72.4% of the respondents agreed with this statement. Regulating the guidelines and policies is a key factor on maintaining the quality and standards in wastewater treatment plant. Table 4.5 reveals that 91.9% of respondents agree that wastewater is often being tested at the treatment facilities as to monitor the quality of water released from the Plant.

Table 4.5 also shows that 65.5% of respondents felt that Malaysia Act or regulation needs further improvement to ensure a stricter enforcement on wastewater treatment activities not only in Kajang but also in other parts of Malaysia.

Table 4.6 below shows that 83.9% of respondents felt that lack of personnel knowledge about the law as well as lack of professionalism and commitment from the authority personnels are to be blamed on the failure of enforcement the law on wastewater regulation in Kajang. Only 16.1% blamed the interference of politicians in enforcing and implanting the law.

Table 4.6 Distribution of Respondent’s Perception towards Reason for Lack of Enforcement Wastewater Regulation in Kajang

Variable	Respondents (N=87)	
	<i>f</i>	Per cent
<i>Why is regulation of law difficult to be implemented?</i>		
Lack of professionalism and commitment of personnel	31	35.63
Political interference in law	14	16.09
Personnel’s lack of knowledge about the law	42	48.28
I don’t know	0	0.00

(Fieldwork survey, April 2018)

Table 4.7 below shows that respondents felt that, in order to monitor the effectiveness of personnel involvement in ensuring the related Policies and Act. 67.8% agreed that Supervisors Annual Reports plays a vital role in determining the quality of personnel involved in their work. 16.0% felt that using CCTV would also help in monitoring the personnel’s while another 8.1% felt that, the logged book would be sufficient.

Table 4.7 Distribution of Respondent’s Perception towards Effectiveness Way of Monitoring Subordinates in Kajang

Variable	Respondents (N=87)	
	<i>f</i>	Per cent
<i>Which is an effective way for an organisation to monitor subordinates?</i>		
Supervisor’s annual reports	59	67.82
Close-circuit television (CCTV)	14	16.09
Log in book	7	8.05
I don’t know	7	8.05

(Fieldwork survey, April 2018)

4.1.6 CONCLUSION FROM QUESTIONNAIRE SURVEY

The Survey conducted in the study reveals there are some good findings related to the three objectives of the study. However, overall findings of the study would be discussed in the following Chapter 5.

4.2 THEMATIC INTERVIEWS

To support the quantitative findings of the survey conducted, as well as to address the outlined research questions, in depth interviews were conducted to obtain direct views of wastewater management personnels in Kajang. The findings from these interviews were analysed using themed analysis techniques to identify the key themes of wastewater management issues. This finding is needed to answer the all three research question related to research objectives, i.e, the policy and guidelines related to wastewater; or objective regarding the major issues that are the concern of managers involved in wastewater operations in Kajang. At the end

of the analysis, there are a few outcome that are produce based on the openness of respondents to elaborate more on management of wastewater in the area.

The interview conducted is approximately 5-15 minutes, with 6 keys personal was identify to give the interview which is from various background in operation, technical and managers. Below are the sample of interview and theme that were produce.

4.3 THEMATIC ON COMMUNICATION ORGANISATION

Based on the interview conducted with a personnel that is working a Vacuum Truck Driver in the wastewater industry, below are what the responses received from the interviewee was:

Interviewer: Are bosses who supervise the workers are normally giving advice and are subordinates views is acceptable?

Respondent: The relationship between the subordinate staff with the bosses are in good terms. Boss a lot of them contribute to ensure subordinates work well. Not a problem from my experience as they always teach me.

Interviewer: As part of your work does include slugging, is it supposed to do be done regular, such as annually or it is just by users complain?

Respondent: I cannot comment because I believe it should be thought of by the managers and not works like me.

From this part of the interview, we could see that although the driver is stating a positive remark towards the management team, it seems that he is reluctant to address matters referring on matters pertaining to work complains.

Based on the interview conducted with two personnel that is working as technician in the wastewater industry, below are what the responses received from the interviewee was:

Interviewer: Does your organization give an opportunity for the employees to give their view in managing wastewater?

Respondent1: So far it depend on supervisors. In meetings that was held, view was given and discussed. There is a chance on employees to channel their view I guess.

Respondent2: Yes, we can give views, I mean constructive views that may improve the organisation furthered.

From this part of the interview, we could see these technician stating a positive remark towards the management team, and it seems that communication in there organisation are well conducted.

Based on the interview conducted with a personnel that is working as a manager in the wastewater industry, below are what the responses received from the interviewee:

Interviewer: Do you as a manager in the organization give opportunities for the employees to give their view in managing wastewater?

Respondent: Yes, I do. We always open the idea of giving feedback in meetings. There are also other forums that are open such as emails, notes and conferences were all groups of employees could give feedbacks on this matter.

From this part of the interview, we could see managers are well inform on this subject and a good establishment in communication is a priority in order to run a well organise organisation.

4.4 THEMATIC ON TRAINING

Based on the interview conducted with a personnel that is working a Vacuum Truck Driver in the wastewater industry, below are what the responses received from the interviewee:

Interviewer: Based on training, does management give adequate training?

Respondent: The management does occasionally give is training for a period of time.

Interviewer: Is that enough? The average number of times?

Respondent: It is a continuously training.

Interviewer: In terms of equipment for training, do you think it is adequate or need to be improved?

Respondent: Well equip, but lack of ample parking near the training facilities that can be increased.

From this part of the interview, we could see that the response received was promising with an acknowledgment on improving training facilities in the future.

Based on the interview conducted with two personnel that is working as technician in the wastewater industry, below are what the responses received from the interviewee:

Interviewer: Are training provided in your organisation?

Respondent1: Each year training are conducted and must be attended at least once a year, there are Key Performance Indicator (KPI) that are made mandatory.

Respondent2: We depend on your budget, there are in-house and out-sourced training provided.

Interviewer: For training purposes, is the equipment for training well equip?

Respondent1: Basics equipment is there provided, but it was not in 'tip top' condition can get the training done.

Respondent2: Equipment need to be updated. Now, the pace of technology is changing rapidly. There is not much change in technology equipment.

From this part of the interview, we could see these technician stating a positive remark on training that are conducted in their organisation but lack of updated equipment is a problem.

Based on the interview conducted with a personnel that is working as a manager in the wastewater industry, below are what the responses received from the interviewee:

Interviewer: Do you give training for your employers?

Respondent: Yes, we do. As employees are backbone in any organisation, the key to stronger organisation is through training. Normally that are a specific target for each individual to complete yearly training that are provided.

From this part of the interview, we could see managers were giving acknowledgment on how training was done to improve the organisation.

4.5 THEMATIC ON WASTEWATER INFRASTRUCTURE AND FUNDING

Based on the interview conducted with a personnel that is working as Vacuum Truck Driver in the wastewater industry, below are what the responses received from the interviewee:

Interviewer: Do you think the equipment that are supply is for field work is in good working safety?

Respondent: I cannot comment on this, I believe our equipment for field work is supervised by safety offices so I believe in them.

Interviewer: Overall do you think there is a need to add more wastewater treatment plants and more vehicle to the field, examples Kajang area as population is increasing yearly?

Respondent: I think it does smooth the job, if the company can add a lot nicer vehicle and increase development of plants. What I can say it is difficult to get workers that need to involve a lot of impurities (waste) and smell.

From this part of the interview, we could see that the response received was promising with an acknowledgment on improving facilities in the future. Based on the interview conducted with two personnel that is working as technician in the wastewater industry, below are what the responses received from the interviewee:

Interviewer: How is your opinion on wastewater infrastructure?

Respondent1: Basics infrastructure is improving, but not all in good condition as a lot of money is needed to maintain these facilities. But we are trying our best to insure that the quality of treated water is at par with the standards enforce.

Respondent2: Equipment need to be updated with new technology and more green technology to reduce electric consumption.

From this part of the interview, we could see that these technicians stating a positive remark on facilities and maintenance however improvement in technology and maintenance was still needed to ensure a better service provided.

Based on the interview conducted with a personnel that is working as a manager in the wastewater industry, below are what the responses received from the interviewee:

Interviewer: Do you think that wastewater facilities is improving?

Respondent: Yes. In Kajang area we are in the merge of reforming and building a new plant with a capacity to treat approximately 920,000 inhabitants. Many small plants will be closed and there wastewater will be distributed to this plant. It is still in construction but we are hoping it will improve treated wastewater in the area.

From this part of the interview, we could see that managers acknowledged that planning of good facilities with newer equipment could increase performance in wastewater treatment.

4.6 THEMATIC ON MONITORING

Based on the interview conducted with a personnel that is working a Vacuum Truck Driver in the wastewater industry, below are what the responses received from the interviewee:

Interviewer: Does your supervisor monitor your work?

Respondent: Off Course they do. Monitoring is done from the job is assign to me and until the report is completed. I will need to follows standard including checklist, reports submission and sometime photos to support the work completion.

From this part of the interview, we could see that although the response is simple it showed that a well establish management system provide SOP and checklist to ensure a good monitoring review is done professionally.

Based on the interview conducted with two personnel that is working as technician in the wastewater industry, below are what the responses received from the interviewee:

Interviewer: How is the monitoring of works been done in the organisation? For example, the Government will value them based on performance indicators such as KPI, Standard Operation Manual (SOP) or yearly assessment?

Respondent1: I believed we adopt the same system as the Government.

Respondent2: Agreed

From this part of the interview, we could see these technicians agreed that monitoring system in there organisation were following standards assessment mainly from Government of Malaysia ways of monitoring employees as from yearly assessment to quarterly reviews on work performance. Based on the interview conducted with a personnel that is working as a manager in the wastewater industry, below are what the responses received from the interviewee:

Interviewer: How do you monitor your employees?

Respondent: We monitor them very closely through designated supervisors. There supervisors must have expertise and knowledge on the field and must follow strict standards, checklist and also a yearly assortment of their subordinate

From this part of the interview, we could see that managers acknowledge on monitoring success through a good standard operating from the organisation.

4.7 OTHER OUTCOME BASED ON MANAGEMENT

Based on the selection of the interview conducted, there are also results of this themed analysis that are developed based on the openness of the respondents as follows:

1. According to the respondents that are working as technician in wastewater industry, treating wastewater meets the standard water treatment planning set from the international standard, namely:
 - a. Secure standards under one implementation.
 - b. The standards currently used in the Department of Environment of Malaysia.
2. According to the respondents that are working as technician in wastewater industry there are some places still in colonial times where tariffs collected are still low and difficult to upgrade to new plants as the facilities are old and need more budget to improve the sewage system.
3. According to the respondents that are working as technician in wastewater industry older water treatment plants in some areas should be reviewed as closer as it is a better option to establishing a new water treatment area than upgrading the old one.
4. According to the respondents that are working as technician and managers in wastewater industry Knowledge of wastewater is also important to ensure that people are not confused over wastewater treatment and the public also need to be aware the importance of the tariff for wastewater treatment services.

5. According to the respondents that are working as technician and managers the use of new technologies can facilitate surveillance of sewage. Cost is also very important but it is an issue to be addressed by the management.
6. According to the respondents that are working as technician and managers the tariff is very low and cannot be increased because it would affect the public.
7. According to the respondents that are working as technician and managers "Joint-Bills" is not required but it is a good as to ensure consumers made regular payment towards wastewater treatment process. Joint billing was suggested, as if no treated water supply could be established, than there's no wastewater will be produced to ensure that consumers maintain their supplies of treated water, they will need to pay the amount of wastewater billed to them.
8. According to the respondents that are working as managers Management has no problem to increase the terms of tariff however political interference alone which makes it difficult as tariff increase is not a favourable move as it will impacts the voter's sentiments.
9. According to the respondents that are working as technician and managers Lack of knowledge of sewage water, the public needs to know about the importance of sewage and sewage treatment. They do not see why they need to pay the bill.
10. According to the respondents that are working as managers the value of the tariff are insufficient, and needs to be raised according to the situation as it requires cost for maintenance, equipment and services cost increasing every year.
11. According to the respondents that are working as technician and managers There are a handful of people who do not pay the tariff, and they have a

negative effect in generating stable income to the wastewater treatment company.

12. According to the respondents that are working as technician and operations officers given the opportunity to provide opinions and views to further enhance the importance of Indah Water to the public, and provide adequate facilities. However, not all opinions from the experts are well received by the management.
13. According to the respondents that are working as managers SPAN produces "National Sewerage Catchment Strategy and Policy", a guide to improving the area that will be ready soon.
14. According to the respondents that are working as technician and operators officers the management also needs to have a new system to close this system. Monitoring system in Indah Water itself is also a problem, as some use it for their own benefit. Therefore, the efficiency of audit checks should be regularly be made to monitor the quality of wastewater plant management.

4.8 CONCLUSION FROM THEMATIC INTERVIEWS

The Survey conducted in the study reveals there are some good findings related to the three objectives of the study. However, overall findings of the study would be discussed in the following Chapter 5.

CHAPTER 5

RESERCH SUMMARIES

5.1 INTRODUCTION

Discussion on the overall findings of the study on the wastewater management in Kajang District was discussed in the last two Chapters. In the previous Chapter, it was revealed that the wastewater management in Kajang currently experiencing the problem in dealing with waste water management due to lack of financial support from the publics as well as less budget allocation by the Ministry and Local Authority. This Chapter, thus, set out to summarize the main points already discussed in the previous two Chapters with regards to wastewater management in Kajang.

This Chapter will be divided into four sections. Section one restate the research objectives of this study before summarizing the main research findings in the following Section two of the Chapter. The third Section discusses the recommendations for improving future waste water management in Kajang District. Section 4 outlines some proposal for future research related to waste water management in Kajang in an effort to provide further insight into the problems that might encounter by Kajang District as well as any other relevant Local Authority in Malaysia. The Chapter will conclude with the summary of the study.

5.2 RESTATEMENT OF RESEARCH OBJECTIVES

The overall aim of this research is to conduct an investigation of wastewater governance in Malaysia in general as well as studying the issues involved in the management and implementation of wastewater operations in the Kajang Municipal Council area in Selangor, Malaysia. The study was conducted only in

wastewater treatment involving residential areas in Kajang area. The main purpose of the research has been to study the status of waste water management in Kajang District and to analyse the factors that have contributed to waste water management weaknesses in Kajang.

The specific objectives of this research are as follows:

- i. To investigate the current state and nature of wastewater management in Kajang district Selangor, Malaysia;
- ii. To investigate the organisation perception on policies and guidelines related to wastewater management in Kajang district Selangor, Malaysia; and
- iii. To investigate the major issues or concerns of managers involved in the implementation and practices of wastewater operations in the Kajang District, Selangor, Malaysia.

5.3 SUMMARY OF RESEARCH FINDINGS

5.3.1 CURRENT STATE AND NATURE OF WASTEWATER MANAGEMENT

5.3.1.1 COMMUNICATION WITHIN ORGANISATION

As stated in subsection 4.1.2 in relation to workers communication with wastewater management, the study found majority of the workers (66.67 per cent) agreed that the management always willing to accept any good recommendation put forward by the workers in order to improve the management of wastewater within the organisation. Furthermore, about 54.0 per cent realised that the wastewater

management always provide opportunity, flexibility and responsibility towards improving the role of moderate skill employees within the organisation as to ensure job success.

The study also revealed there was a good relation between workers and management staffs. In term of job burden it was found that 73.56 per cent of the workers agreed that the daily job given to them by the management did not burden them and most of them really happy with current assignment allocated to them. This could be reflected with the nature of manpower within the organisation as about 67.82 per cent of the workers in the opinion of enough manpower in the organisation to execute wastewater jobs management.

The study also revealed that the good relation within the organisation was also reflected with the positive attitude among the workers in which majority of them (94.25 per cent) felt that they were seldom threatened by their respective Heads of Department particularly in relation to job commands or assignments given to them. This could be due to job transparent within the organisation in which workers were given the opportunity to report any misconduct by heads of department or Directors. If an organisation has a lot of misconduct in there management system, it would give a negative impact from the public on maintaining sustainable and efficient wastewater management and treatment.

As such, 72.4% of respondents in this study revealed that they were given opportunities and channels to report on any misconduct done by their higher ranking officers to the immediate or higher management officers. On the similar issue, the study also revealed that managers often carried out meetings to coordinates team activities on organising the management system. 80.5% of the respondents agreed that they had attended the coordinated meeting often as to evaluate the level of effectiveness of the existing management which comply with current guidelines or procedures.

The study reveals that the wastewater management in Kajang had experienced a bad relationship with some political parties within the areas. It was revealed that 86.2% of respondents realised that politician should not interfere so much on wastewater management in the district.

5.3.1.2 TRAINING PROGRAMMES

On studying the respondents or workers perception towards any training programmes conducted by the wastewater management in Kajang for them, the study reveals that the management have had conducted regular training programmes for their staffs either during or after office hours. Based on data analysis in subsection 4.1.3, 91.9 per cent of the workers also agreed that their organisation have sponsored various type of trainings as to improve their working skills which are needed to manage better wastewater programmes within the organisation. However, 15.9 per cent have had received training programme of more than three times, yearly. Majority of them (85.1 per cent) had only undergone the training programme once a year. 67.8 per cent of the workers revealed that they were unwillingly to participate in any training programmes if conducted after office hours.

The study also revealed that Kajang wastewater have better facilities and equipment provided for its staff training programmes. 91.95 per cent of workers agreed on facilities and equipment for training were comfortable and well equipped. However, the flexibility to workers on choosing their desire training programmes was not given freely as the management have the right to determine the type of training that the staff should undergo based on the relevancy of the programme to their daily job assignment. Furthermore, majority of the trainers at the training programmes involving external trainers specially selected by the management.

5.3.1.3 WASTEWATER INFRASTRUCTURE

On the status of wastewater infrastructure in Kajang District data analysis in Subsection 4.1.4 are referred. The study reveals that 93.1% of the workers agreed that the facilities for wastewater treatment plant in Kajang is a safe place for the operators and workers to work. However, 72.4% of them also agreed that a new technology need to be adopted or developed to improve wastewater management that sufficiently address the wastewater treatment scenario in Kajang and Malaysia as a whole. At the same time, 90.8 per cent of workers also agreed that new technology in wastewater treatment would lower the cost of operationa and as in the case of wastewater management in Kajang, 68.9 per cent of workers agreed that the management or managers had regularly inspected the wastewater infrastructures or facilities.

On the wastewater infrastructure funding many respondent workers perceived that both the government and public should be responsible to finance the cost of managing the treatment plant. The public involvement is to ensure that they really understand the financial difficulty in managing wastewater facilities in the district. Funding is important to maintain an efficient wastewater treatment process. The study found that 78.2% of respondents agreed that wastewater tariff should be increased as to accommodate the rising cost of wastewater treatment process every year. The study also revealed 97.7 per cent agreed on the method of a joint-billing system to ensure payment for wastewater treatment service from consumers as to encourage and increase payment of services from the public.

5.3.2 PUBLIC PERCEPTION ON POLICIES AND GUIDELINES OF WASTEWATER MANAGEMENT

Regulating the guidelines and policies is a key factor on maintaining the quality and standards in wastewater treatment plant. The study found that the majority of respondents (91.9 per cent) realised that wastewater is often being properly tested at to monitor the quality of water released from the Plant.

The lack of awareness and personal knowledge on law particularly related to wastewater as well as lack of professionalism and commitment from the authority were also to be blamed on the failure of enforcement the law on wastewater regulation in Kajang. Only 16.1% blamed the interference of politicians in enforcing and implanting the law.

As such the minority of respondent-workers (65.5 per cent) felt that Malaysia Act or Regulation needs further improvement to ensure a more strict enforcement on wastewater releasement and wastewater treatment activities not only in Kajang but also in other Local Authorities in Malaysia.

As to ensure the quality of works at work place as well as to monitor the effectiveness of personnel involvement in enforcing the related Policies and Act on wastewater treatment activities in Plant the majority of respondent-workers (67.8 per cent) agreed that Supervisors Annual Reports plays a vital role in determining the quality of personnel involved in their work, beside, CCTV application (16.0 per cent) and Logged Book (8.1 per cent).

Public perception towards wastewater management in Kajang revealed that 72.4% of respondents felt that urbanisation processes in Kajang is to be blamed for the increase of wastewater sources. Other factors are the illegal dumping by public (18.4 per cent) agriculture waste dumping activities (9.2 per cent).

On the issue of wastewater released by the public in Kajang the study found that 85.06 per cent of the respondent-workers felt that water released by public without treatment cannot be avoided as most of their premises have no mini treatment pond located at their housing area.

5.4 MAJOR ISSUES OR CONCERNS IN THE IMPLEMENTATION AND PRACTICES OF WASTEWATER OPERATIONS

This subsection discusses the research findings related to the third objective of this study that is, looking at the major issues or concerns among the managers or administrators involved in the implementation and practices of wastewater operation in Kajang. The findings are based on the outputs delivered by these senior staffs during the personal interviews with the researcher. Some of the interesting findings from the interviews are as follows:

1. Wastewater treatment plan under Indah Water Management always meets the standard water treatment planning set from the international standard.
2. The new plant is scheduled to be built in according to the plan as required by DOE. There are also a handful of non-scheduled areas and plans from the DOE and they are just waiting for external feedback to inspect the plant. Slow action to commission of the new plant resulted to occurrence of pollution in the plant area and could increase the chances to close.
3. The use of new technologies can facilitate surveillance of sewage. Cost is also very important but it is an issue to be addressed by the management and the government. Currently, the tariff is very low and cannot be increased because it will affect the public. Knowledge of wastewater is also important to ensure that people are not confused over wastewater treatment and the public also need to be aware the importance of tariff for wastewater treatment services.

4. The value of the tariff is insufficient, and needs to be raised according to the situation as it requires cost for maintenance, equipment and services cost increasing every year. Management has no problem to increase the terms of tariff however political interference alone which makes it difficult as tariff increase is not a favourable move as it will impact the voter's sentiments.
5. Currently "Joint-Bills" is not mandatory but it is a good to implement as to ensure consumers made regular payment towards wastewater treatment process. Joint billing was suggested, as if no treated water supply could be established, then there is no wastewater will be produced hence to ensure that consumers maintain their supplies of treated water, they will need to pay the amount of wastewater billed to them.
6. There are a handful of people who do not pay the tariff, and they have a negative effect in generating stable income to the wastewater treatment company. Lack of knowledge of sewage water, the public needs to know about the importance of sewage and sewage treatment. They do not see why they need to pay the bill. This small group of people also tends to approach politician to interfere with company action such as lawsuit and late penalties.
7. The management plan is controlled by Indah Water itself. Monitoring will also be made by Indah Water, except for machine damage; it depends on the type of problem encountered. Often the problem will be resolved by outside contractors such as JPAM and others. KPI targets are also available to ensure staffs are always in compliance with the set KPIs.
8. The SPAN produces "National Sewerage Catchment Strategy and Policy", a guide to improving the area that will be ready soon. The Guidelines to the operator has also been given to increase the Catchment Sewerage Strategy development plan. The area has also been assigned to several sections according to SPAN's instructions. This composition will be investigated to see

which compositions are often used, either the STP composition, the majority IST or the non-system majority.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

The conclusions that can be drawn from this study offer a mix of outcomes. While there are positive conclusions like a generally fairly efficient operation in wastewater management in Malaysia in general and in the Kajang District in particular, there are also issues that should still be resolved.

These issues concern some shortcomings in management, personnel training, management-staff interaction and the question of how billing for wastewater management services should be implemented as well as certain aspects of the relationship between the government and the private sector partner Indah Water Konsortium.

There is also the matter of public awareness and the lack of understanding regarding wastewater generation and its implications in terms of pollution and management. In light of the above-mentioned findings, the next section presents some recommendations for future related research.

6.2 RESEARCH RECOMMENDATIONS

6.2.1 Although the organisation applies several monitoring systems to monitor the performance of the workers, improvement in this monitoring system such as audit checks should be regularly being made to monitor the quality of wastewater plant management.

6.2.2 The management provides periodic training for staffs to be more efficient and reliable. The relationship between management and staff is also very good.

6.2.3 Given the opportunity to provide opinions and views to further enhance the importance of Indah Water to the public, and provide adequate facilities. However, not all opinions from the experts are well received by the management.

6.3 FUTURE RESEARCH SUGGESTIONS

6.3.1 This study has investigated wastewater and its management, particularly in the Kajang District in the state of Selangor, Peninsula Malaysia and based on the findings, the following recommendations are offered for those interested in conducting further research to add to the field of knowledge on wastewater management, particularly in Malaysia.

6.3.2 Review the government policies pertaining to wastewater management and pollution in Malaysia and recommend amendments to ensure higher consistency with regard to the proper management of wastewater towards a sustainable environment;

6.3.3 Review the current equipment and methods of treatment currently in place at the Kajang plant and recommend changes or improvements for better treatment outcomes;

6.3.4 Review staff training programmes currently in place and introduce improvements in terms of fair sharing of training for all affected personnel; and

6.3.5 Review on a nationwide scale the management-personnel interactions to ensure more efficient and more interactive liaison between management and staff at plants where the situation can be improved and.

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APPENDIX

THESIS SURVEY QUESTIONNAIRE

**School of Geography
University of Nottingham**

WASTEWATER MANAGEMENT IN MALAYSIA: A STUDY OF WASTEWATER POLICIES AND IMPLEMENTATION IN KAJANG DISTRICT

The purpose of this study is to understand wastewater treatment policies and practises in Malaysia. The information provided will be used for research and publication purposes and will be treated confidentiality. The aim of the study is to find best approaches that could be adopt for wastewater management in Malaysia.

Questionnaire No.: _____

Survey Date: _____

In signing this consent form, I confirm that:

I have read the Participant Information Sheet and the nature and purpose of the research project has been explained to me.

Yes No

I have had the opportunity to ask questions.

Yes No

I understand the purpose of the research project and my involvement in it. Yes No

I understand that my participation is voluntary, and I may withdraw from the research project at any stage, without having to give any reason and withdrawing will not penalise or disadvantage me in any way. Yes No

I understand that while information gained during the study may be published, any information I provide is confidential (with one exception – see below), and that no information that could lead to the identification of any individual will be disclosed in any reports on the project, or to any other party. No identifiable personal data will be published. Yes No

I understand that the researcher may be required to report to the authorities any significant harm to a child/young person (up to the age of 18 years) that he/she becomes aware of during the research. I agree that such harm may violate the principle of confidentiality. Yes No

I agree that extracts from the interview may be anonymously quoted in any report or publication arising from the research. Yes No

I understand that the interview will be recorded using audiotape/electronic voice recorder/video recorder. Yes No

I understand that data will be securely stored Yes No

I understand that I may contact the researcher, if I require further information about the research, and that I may contact the Research Ethics Officer of the School of Geography, University of Nottingham, if I wish to make a complaint relating to my involvement in the research.

Yes No

I agree to take part in the above research project.

Yes No

_____ Participant's name (BLOCK CAPITAL)	_____ Participant's signature	_____ Date
_____ YASIR MUDA AZIZI	_____ Researcher's signature	_____ Date

PART 1: GENERAL BACKGROUND INFORMATION

Instructions: (1) Please fill in the blanks with your answer according to the numbers given:

- a) Your position in wastewater governance:
1. Management
 2. Engineer
 3. Technician
 4. Operators
 5. Enforcement officer
 6. Others (please specify)
- b) Your gender:
1. Male
 2. Female
 3. Prefer not to say
- c) Your age:
1. Under 21 years
 2. 22-41 years
 3. 42-61 years
 4. Above 61 years
 5. Prefer not to say
- d) Your highest education:
1. High school
 2. Diploma
 3. Bachelor's degree
 4. Master's degree
 5. Ph.D.
 6. Others (specify).....
 7. Prefer not to say
- e) Your income:
1. Less than USD 1,000
 2. USD 1,001-4,000
 3. USD 4,001-7,000
 4. USD 7,001-10,000
 5. More than USD 10,000 (please specify)
 6. Prefer not to say
- f) Your working experience in wastewater management:
1. Less than 1 year
 2. 1-5 years
 3. 6-10 years
 4. 11-15 years
 5. 16-20 years
 6. More than 20 years (please specify)

PART 2: COMMUNICATION ORGANISATION

Instructions: Please tick (x) in the check box below:

The set of questions is concerning general knowledge and opinion on how wastewater management in Malaysia coordinated.

a) Do you consider your subordinates recommendation on ways to improve wastewater management?

1. Yes

2. No

b) How do you feel on giving flexibility to your subordinates on managing wastewater?

1. A good step to give responsibility on experience in management

2. Not a good idea since standards of operation needs to be followed strictly

Comments: _____

c) Malaysia wastewater system is managed centralised by the Federal Government, do you agree this is the best system?

1. Yes

2. No, State controlled under the Local Authorities/ Municipality is a better managing system

Comments: _____

d) Do you think politic figures play a role in improving wastewater management?

1. Yes

2. No, they are an interference to the management system

e) Do you often chair management meeting with your subordinates?

1. Yes

2. No

If yes, please state how many times monthly: _____

f) In your opinion, is there enough manpower in your organisation to execute managing wastewater?

1. Yes

2. No

g) Do you think your subordinates are overworked by your organisation?

1. Yes

2. No

Comments: _____

h) Do you feel your subordinates are threaten by commands given?

1. Yes

2. No

3. Sometimes

Comments: _____

i) Do you give opportunity from your subordinates to allege any misconduct or problems in the organisation?

1. Yes

2. No

Comments: _____

PART 3: TRAINNING

The set of questions is concerning general knowledge and opinion on personnel training on wastewater management in Malaysia.

Instructions: Please tick (x) in the check box below:

a) Do you think the organisation are sponsoring enough training to your subordinates?

1. Yes

2. No

b) How many time yearly does management sends your subordinates for training?

1. less than twice

2. 3-6

More then 7

c) Does the organisation provide additional classes after work to improve your subordinates knowledge or managing skill?

1. Yes

2. No

Comments: _____

d) Does your organisation have comfortable training facilities for wastewater training?

1. Yes

2. No

e) Are the training facilities well equipped for wastewater training?

1. Yes

2. No

Comments: _____

f) Does your organisation give your subordinates the flexibility to choose their desire training?

1. Yes

2. No

Comments: _____

g) How does your organisation select lecturers/ facilitators for training?

1. personnel inside the organisation

2. outside trainers

PART 4: WASTEWATER INFRASTRUCTURE

Instructions: Please tick (x) in the check box below:

The set of questions is concerned with infrastructure on wastewater management in Malaysia.

a) How do you think wastewater facilities should be funded?

1. Government

2. Public

3. Government and public

Comments: _____

b) Do you think by adopting new technology can lower the running cost of wastewater facility?

1. Yes

2. No

3. I don't know

c) Do you think that tariff on wastewater should be increased to improve the wastewater infrastructure?

1. Yes

2. No

Comments: _____

d) Do you think join-bill system (wastewater bill combine in electricity or water bill) by the government is the effective method in collecting payment on wastewater bill from the public?

1. Yes

2. No

Comments: _____

e) How do you think wastewater management in Malaysia could be improved to better treat waterwater?

1. Develop or adopt new technology

2. Build more treatment facility using current technology

Comments: _____

f) Do you feel operators are safe working at the wastewater treatment plant?

1. Yes

2. No

Comments: _____

g) Do you think the wastewater facilities are maintain properly?

1. Yes, well maintained

2. No

Comments: _____

h) Does your organisation often conduct inspection on wastewater facilities condition?

1. Yes

2. No

Comments: _____

PART 5: MONITORING

Instructions: Please tick (x) in the check box below:

The set of questions is concerned with monitoring on wastewater management in Malaysia.

a) From your opinion, the main source of wastewater is from?

1. Urbanisation expansion
2. Farming activities
3. Illegal dumping from public

<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

Comments: _____

b) Do you feel that wastewater treated are safe to be release to the environment?

1. Yes
2. No
3. I don't know

<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

Comments: _____

c) Do you think wastewater release from public without proper treatment is un-avoided?

1. Yes
2. No

<input type="checkbox"/>
<input type="checkbox"/>

d) Do you think urbanisation is the main factor wastewater in increased in production?

- 1. Yes
- 2. No
- 3. I don't know

Comments: _____

e) Do you know how often does water quality from wastewater treatment plan being tested?

- 1. Yes
- 2. No

f) Do you feel the act/ regulation in Malaysia covers enforcement action on executing the law?

- 1. Yes
- 2. No

g) Why is regulation of law being difficult to be implemented?

- 1. Lack of professionalism and commitment of personnel
- 2. Politic interference in law
- 3. Lack of knowledge about law by personnel
- 4. I don't know

Comments: _____

h) Which is the effective way organisation monitors subordinates?

1. Supervisor yearly reports
2. Close-circuit television (CCTV)
3. Log in book
4. I don't know