CHAPTER 3: DATA ACQUISITION AND ANALYSIS

3.1 Introduction

The research methodology is an important aspect of research to make a study results are good and reliable. Research methodology also provides guidance and step-by-step method of bringing out a more systematic research. Research is a logical and systematic search for new and useful information on a particular topic. It is an investigation of seeking solutions to scientific and social problems through objective and systematic analysis. It is a search for knowledge, to discover the hidden truths. Research knowledge means information about matters. The information might be collected from different sources like experience, human beings, books, journals, nature, etc. A research can lead to additional contributions to the existing knowledge. Only through research is impossible to make progress in a field. Research is done with the help of study, experiments, observation, analysis, comparison and reasoning, (Rajasekar et al., 2006).

This study also carried out the methods that were undertaken by previous studies such as site visit visits, interviews, other relevant official document and management effectiveness evaluation tool across the world by World Conservation Union (IUCN). In addition to the larger scope, the difference in the method of this study with the previous study was spatial analysis. This study has mapped activities within the dam area and analyzed data on land use and land ownership within the dam catchment area.

This chapter will describe the research methodology used in order to complete this study. The method are used in this study are described according to the research objectives of the division to four and nine sub- chapter review questions through the literature review.
First sub chapter is The Characteristic of Dams in Selangor. Under this sub chapter the identify research technique that will be used to obtain information on the type, function, size and disaster class of the dams in Selangor.

2nd sub chapter is The Issues in The Selangor Dam Basins. This sub-chapter will explain the detail technique to get the information about the type of activities, land use, type of development and the type of land ownership in Selangor dam basins.

On 3rd sub-chapter, will be discuss about the technique to get the information about The Existing Dam Management Systems in Selangor. The technique will divide in to three techniques which is the information about the generic and specific components of The Selangor Dam Management Systems and the generic, specific issues and challenges in Selangor Dam Management Systems and the effectiveness tracking tool to evaluate the existing dam management systems in Selangor.

4th sub-chapter is a sustainable dam management systems model for Selangor. This sub-chapter will explain detail about the SWOC analysis technique to develop a sustainable dam management system model for Selangor. An overview of the research methods used in this study is described in the figure 3.1.
3.2  The Characteristic of Dams in Selangor

Research design will be identified and decided through the research question. Each research question will have deference research design and sometime have a multiple of technic in the way to answer the research question. Research design will be discussed by the research question.

3.2.1  The Type, Function, Size and Disaster Class of Existing Dams in Selangor

Base on figure 3.2, has several research designs to get the information about type, function and disaster class of an existing dam in Selangor. Overall type of research design is qualitative research. To gather the data, this study need a, site visit or study field in the dam area to identify the type function, and the view of the dams. Second technic is being use is document review the official report of the dam in Selangor especially about the technical part such as a capacity, height, disaster class, structure, stability and others. So this research question will utilize two technic of research. 1) Is primary data from the study field in year 2012 and 2) from the secondary data from the official report of the dam in Selangor of Drainage and Irrigation Department and Selangor Water Management Authority. The Analysis will be use is, context and summarize the analysis on a term of type, function, size categories and disaster class of the dam in Selangor to be discussed with theoretical frameworks for dam definition and Characteristic in chapter 6 - discussion.
Figure 3.2: Data Acquisition Process - The Type, Function, Size and Disaster Class of Existing Dam in Selangor
3.3 The Issues In Selangor Dam Basins

3.3.1 The Type Of Activities In Selangor Dam Basins

To know the activities in the dam basin in Selangor, this study are used the quantitative research to identify the activities in dam area in Selangor. Field study has been use to look and find what the problems happened such as illegal dumping problem in dam area or interference are happened at dam area, the field study data are digitized in the map form, to look and analyze the location of interference at the dam area see Figure 3.3. Second technic are used is the interview session with officers from related agencies in dam management and development surrounding the dams. The related agencies as, Selangor State Water Management Authority, State Land Department, Drainage and Irrigation Department, Town and Country Planning Department, all local government are involved, and operator such as SYABAS, ABBAS, SPLASH, National Security Council and others are related. All the data from the interview session and the mapping analysis and field study has been analyze with qualitative data analysis technic. Results presentation and interpretation are form of Interference issues at dam water catchment area map, listing of issues and problems from the interview session and comparison analysis result about which dam is facing the issues of interference.

3.3.1.1 Comparative Analysis

In the main of assessments, from 9 type of activities from mapping analysis, each with a three-point scale. The intention is that the scale shows whether the situation is acceptable or not. Generally 1 is low; 2 are medium and 3 are high of activities. A series of three alternative answers are provided against each activity in dam basin to help make a judgment as to level of score given. The score is totaled and the percentage of the possible score calculated. The maximum score of 8 is 384. (8) type, of activity multiply with the highest total location (16) and multiply with (3) point-scale. A final total of scores from completing the assessment form can be calculated as percentage of
384 or of the total score from all types of interference issues were relevant to the particular dam water catchment area. Percentage earned by each dam water catchment area will be classified into several ranking of interference issues.

The four point scoring system are used is generally 0 is equivalent to not significant of interference issues; 0.1 - 25 is low; 25.1 - 50 is medium and 50.1 - 100 are a high level of interference issues. Dam basin or dam water catchment area is a level 1 sensitive environmental area in a Malaysia National Physical Plan 3, there is no activity are allowed in the dam basin area excluded the research activity. Water quality is must maintained between class 1 and 2 in accordance with interim water quality standards. Any timber activity should be 100 meters wide form the dam water catchment buffer zone. Because of the high level of sensitivity, this area should not be exposed to activities that could threaten the water quality and dam area security. With that, this research makes an assumption, that the score is over 50% it is a high level of interference to the dam area. 50% of score can harm and exposed the dam basin area to the water pollution, sedimentation, rubbish and others. In addition, any activity within the dam basin area such as oil spill, leachate for rubbish, landslide and any pollution will affect the reservoir water quality. Medium level is half of 50%, which mean it is a within 26% to 50%. Low level of interference is between 1% to 25% and 0% is not significant of interference.
Figure 3.3: Data Acquisition Process - The Type Of Activities In Selangor Dam Basins
3.3.2 The Type of Development Within 3 kilometer Radius from Selangor Dam Basins Border

To get the type of physical landscape within a 3 kilometers radius from dam basin border in Selangor, this study will use the quantitative research, to identify the dam water catchment surrounding development within 3 kilometers from the dam's structure, with study field as a primary data. Second technic is secondary data from the mapping data from satellite image map from Town And Country Planning Department (Sungai Tinggi Dam, Batu Dam, Klang Gate Dam, Langat Dam and Semenyih Dam) and Google image from Google Maps (Tasek Subang Dam and Sungai Selangor Dam area). The analysis that will use is observation analysis and mapping analysis. This map will be overlaid with dam water catchment border maps from SWMA and buffer within 3 kilometers from the dam water catchment border by generated from buffer tool in MapInfo software. Comparative analysis will be made between the seven main dam to look which dam are surrounded by the urban area, new development or located far from the urban area, see figure 3.4. The trend of development in Selangor are tent to approaches and surrounds the dam water catchment boundaries especially the old dam structure such as Tasek Subang Dam, Batu Dam and Klang Gate Dam. Dam basin or dam water catchment area is a level 1 sensitive environmental area in a Malaysia National Physical Plan 3, there is no activity are allowed in the dam basin area excluded the research activity. This data analysis, also to look either the dam near to the urban area are facing the interference and land use conflict at the end of the research (discussion chapter 6).
Figure 3.4: Data Acquisition Process - The Type of Development Within 3 Kilometer Radius From Selangor Dam Basins Border
3.3.3 **The Type of Land Use in Selangor Dam Basins.**

Type of land use in the dam basin in Selangor will involve two analytical techniques as figure 3.5.

3.3.3.1 **Mapping Analysis**

Mapping analysis technique used to identify the land use conflict in dam water catchment area. Data acquisition technique is done by secondary data from Planning Approval information are digitized as a map. Planning approval and Land Use information can be got from Selangor State Town and Country Department. Second map data is water catchment border maps from LUAS. Two types of maps come from deference agencies will be overlaid and analyzed. Conducted mapping analysis to know the existing land use in the dam's water area.

3.3.3.2 **Comparative Analysis**

Comparative analysis between seven main dams has been made to identify which dam are facing the land use conflict and which dam are not having a land use conflict in dam water catchment area. In the main of assessment, from 6 type of land use, each type with a sixt-point scale. The intention is that the scale shows the level of impact brings by each contradict land use. Generally 0 is equivalent to forest and water body; 1 is agriculture; 2 is residential; 3 is business; 4 is road / ways and 5 is industries. A series of five alternative answers are provided against each land use type to help make a judgment as to level of scale given. The total of scale will be multiplied with the total of land use area percentage. The score is totaled and the percentage of the possible score calculated. The maximum score of 6 types of land use is 25 multiply 100% (percentage area from total of dam water catchment area) become 2500. A final total of scores from completing the assessment form can be calculated as percentage of 2500 or with the total score from those type of land use was relevant to the particular dam water
catchment area. Percentage earned by each dam water catchment area will be categorized into the ranking of land use conflicts. Generally 0 is equivalent to not significant of land use conflict; 1 - 25 is low; 26 - 50 is medium and 51 - 100 are a high level of land use conflict. Dam basin or dam water catchment area is a level 1 sensitive environmental area in a Malaysia National Physical Plan 3, there is no contradict land use with the forest and water body are allowed. Water quality is must maintained between class 1 and 2 in accordance with interim water quality standards. Others land use will lead to the a lot of activities in the dam basin area. Because of the high level of sensitivity, this area should not be exposed to others land use that could threaten the water quality and dam area security. An assumption, makes the score is over 50% it is a high level of land use conflict to the dam basin area. 50% of score can harm and exposed the dam basin area to the water pollution, sedimentation, rubbish and others. In addition, any activity within the dam basin area such as oil spill, leachate for rubbish, landslide and any pollution from others land use will affect the reservoir water quality. Medium level is half of 50%, which mean it is a within 26% to 50%. Low level of land use conflict is between 1% to 25% and 0% is not significant of land use conflict.
Figure 3.5: Data Acquisition Process - The Type Of Land Use In Selangor Dam Basins

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3.3.4 The Type of Land Ownership in Selangor Dam Basins

To get the information about the type of land ownership in the dam basin in Selangor, analysis technique involved is mapping and comparative analysis.

3.3.4.1 Mapping Analysis

Mapping analysis will be implemented, to identify the land lot in dam basin area. Land title lot is meant by ownership of the land by private. The data acquisition technique is by secondary data of Land Title Lot Maps year 2009 from JUPEM. Second map data are water catchment border maps from LUAS. Two types of maps come from deference agencies will be overlaid and analyzed in mapping analysis to know the existing land title lot or the ownership land in the dam's water catchment area. Comparative analysis between seven main dams will be made to know which dam have a lot of private land lot and which dam have a less private land lot in the dam water catchment, see Figure 3.6.

3.3.4.2 Comparative Analysis

This technique will make a comparison with a percentage of private land in dam water catchment area. Percentage earned by each dam water catchment area will be categorized into the ranking of private land ownership in dam water catchment area. Generally 0 is equivalent to not significant of private land; 0.001 - 33 is low; 34- 66 is medium conflict and 67- 100 are a high level of private land percentage.
Figure 3.6: Data Acquisition Process - The Type Of Land Ownership In Selangor Dam Basins
3.4 The Effectiveness of The Existing Dam Management Systems In Selangor

3.4.1 The Generic and Specific Components of The Selangor Dam Management Systems

This research technique are used two types of data sources. First is primary data from the interview session and secondary data from the official document and report on the dam management and administration from related agencies in dam management and development surrounding the dams. The related agencies as, Selangor State Water Management Authority, State Land Department, Drainage and Irrigation Department, Town and Country Planning Department, all local government are involved, and operator such as SYABAS, ABBAS, SPLASH, National Security Council and others are related about the cope of responsibilities and their power sources in Planning, Control, and enforcement. All the data are from the official report review such as act, guidelines, standard and others. All the information has been analyze with content analysis and has come out with mind mapping of the structure of dam administration and management system in Selangor see figure 3.7.
Figure 3.7: Data Acquisition Process - The Generic and Specific Components of The Selangor Dam Management Systems
3.4.2 The Generic and Specific Of Issues And Challenges in Selangor Dam Management Systems

The technique will use is more on primary data collection. The interview session with officers from related agencies in dam management and development surrounding the dams. The related agencies as, Selangor State Water Management Board, State Land Department, Drainage and Irrigation Department, Town and Country Planning Department, all local government are involved, and operator such as SYABAS, ABBAS, SPLASH, National Security Council and others are related about the scope of responsibilities and their power sources in enforcement. And for better analysis all the issues are highlight from the interview session will be discus with all the data from the official report review such as act, guidelines, standard and others from the guidance from government officer to relate the existing act and regulation with their problem facing. Especially about the act and regulation conflict in land use control at the dam's water catchment area sees Figure 3.8.
Figure 3.8: Data Acquisition Process - The Generic and Specific Issues and Challenges In Selangor Dam Management Systems
3.4.3 The Selangor Dam Management Effectiveness Tracking Tool

To know the effectiveness of dam management system in Selangor, the management effectiveness evaluation tracking tool will be created specially for the dam management, see figure 3.9. This tool will be named as Selangor Dam Management Effectiveness Tracking Tool (SDMETT). By taking the example of Management Effectiveness Tracking Tool (METT) version 2007 provided by the World Bank / WWF Alliance for a special area. The indicator of the tool is provided a base on the Management Effectiveness Evaluation for Protected Area Framework by The World Conservation Union (IUCN). However, not all questions in METT of WWF Alliance, meet or correspond with dam management, because it is specially designed for specific specialty areas. In this regard, to make sure that it is appropriate and answered questions of this study. Some set of questions amended accordingly. The scope of the questions is also deference with METT by WWF Alliance. Where the scope of this study is the management of the dam for the whole State of Selangor, it’s included all the agencies involved in managing and administering the seven major dams. Instead, METT by WWF Alliance just focus on one agency are in charge of unique special area for preservation. In the main assessment form (SDMETT), 41 questions are asked each with a four-point scale (0, 1, 2, and 3). The intention is the case that the scale to choose whether the situation is acceptable or not. Generally 0 is equivalent to no or negligible progress; 1 is some progress; 2 is quite good but has room for improvement; 3 is approaching an optimum situation. A series of four alternative answers are provided against each question to help assessors to make judgments as to the level of the score given. The scores are totaled and the percentage of the possible score calculated. It is noted that ‘the whole concept of “scoring” progress is however fraught with difficulties and possibilities for distortion. The current system assumes, for example, that all the questions cover issues of equal weight. Whereas this is not necessarily the case. Scores
will therefore provide a better assessment of effectiveness if calculated as a percentage for each of the six elements of the IUCN-WCPA Framework (IUCN 2007). Generally 0 - 33 is poor management; 34- 66 is Sound Manage and 67- 100 are Well Manage of land use conflict. As an added value, 4 special columns for SWOC added in the form of analysis. To fill the relevant answer related to the advantages, weaknesses, opportunities and constrain. This column will help in data collection to answer the last research question (The appropriate sustainable dam management for Selangor). The example of a question in SDMETT forms as on the table 3.2. Full set of questions will be addressed in chapter 5 - Result and Interpretation. Data acquisition and extraction to answer all questions in SDMETT form are involved two types, of data. First is primary data from interview session will be all related agencies in existing administration and management of the dam and the area in State of Selangor. Second data is from the official report, Act and regulation, and document related to the dam management system in State of Selangor.
Figure 3.9: Data Acquisition Process - The Selangor Dam Management Effectiveness Tracking Tool
Table 3.1: Example Question in Dam Management Effectiveness Evaluation Tool Form

<table>
<thead>
<tr>
<th>Issues</th>
<th>Criteria</th>
<th>Score</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Threats from human settlements or other non-agricultural land uses with a substantial footprint</td>
<td>Commercial and industrial areas</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Housing and settlement</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tourism and recreation infrastructure</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not Significant</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not Significant</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

3.5 The Sustainable Dam Management System Model For Selangor

3.5.1 Toward a Sustainable Dam Management Systems In Selangor.

To get the appropriate sustainable dam management system for Selangor, the technique is used as, qualitative technique. The data will absorb from the SWOC column in Selangor Dam Management Effectiveness Tracking Tool (SDMETT) from which, in research question eight (The effectiveness of dam management system in Selangor) see Figure 3.10. Data analysis method and technique is SWOC analysis technique. SWOC analysis is consistent with SWOT analysis. The deference. Is the word of threat are replaced to constrain. SWOT analysis is just an established method for assisting the formulation of strategy, Dyson, R. G. (2004).

SWOC analysis is same with SWOT analysis but in the dam management context, this study is more look on to constrain as the replacement to the threats. Because this study is more relate to the human, capital, infrastructural, and financial. There are limitations, meaning that an effective Dam Management System are limited or constrain by these shortcomings. SWOC analysis is to determine the strengths, weaknesses, opportunities, and constrain in Selangor Dam Management Systems. This analysis is involved in the collection of information about the internal and external factors, which
have an impact on the management system. SWOC analysis is involved two steps of analysis, 1st is listing and identify strengths, weaknesses, opportunities, and constrain, 2nd is prioritize them.

3.5.1.1 Prioritization For Strengths And Weaknesses.

Strengths and weaknesses evaluated in 3 categories:

(a) **Important.**

Important shows how important of strengths or weaknesses in the dam management system, as some might be more important than others. A number from 0.01 (not important) to 1.0 (very important) should be assigned to each strength and weaknesses. The sum of all weight should equal 1.0 (including strengths and weaknesses).

(b) **Rating.**

A score from 1 to 3 is given to each factor to indicate whether it is major (3) or Minor (1).

(c) **Score.**

Score is a result of important multiplied by rating. The highest score is a main focus on management system.

3.5.1.2 Prioritization For Opportunities, And Constrain.

(a) **Important.**

Importance shows what extent the external factor might impact the dam management system. A number from 0.01 (no impact) to 1.0 (very high impact) should be assigned to each item. The sum of all weight should equal 1.0 (including opportunities and constrain).
(b) **Probability.**

Probability of occurrence is showing how likely the opportunity or constraint will have an impact on dam management system. It should be rated from 1 (low probability) to 3 (high probability).

(c) **Score.**

Important multiplied probability will give a score to prioritize opportunities and constrain. The highest score will be the main attention in dam management system.

At the end of the analysis to the appropriate sustainable dam management system in Stat of Selangor is listed and compared with the sustainable dam management system policy by World Commission On Dam. Detail analysis will be discussed in chapter 5 – Result and Interpretation.
Figure 3.10: Data Acquisition Process - Toward a Sustainable Dam Management Systems For Selangor
3.6 Sampling Technique

Sampling technique is a useful tool to help this research to identify the group, location or respondent. For some researcher their sampling frame maybe wide so the sampling technique will help the researcher to choose the right respondent. In this research on sampling is being use is all sample in the sample frame. Sample take part in this research has two categories of sample. Fist dam and location and additional agencies are involved in dam management system. Initial sampling technique is exhaustive sampling. Exhaustive sampling is contained an exhaustive inventory of members of the population, (Martella, Nelson, Morgan, & Marchand-Martella, 2013). Which mean all sample from a sample frame are chosen as a sample. The dam are choose as a sample is all main dam in Selangor, 1) Klang Gate Dam, 2) Batu Dam, 3) Langat Dam, 4) Semenyih dam, 5) Tasek Subang dam, 6) Sungai Selangor Dam, and 7) Sungai Tinggi Dam.

The same sampling technique is also being used to choose the related agencies are involved in dam management system in Selangor. Where all the related agencies are chosen as a sample in this research.

3.7 Structured Questions Interview Technique

The type of interview technique is used in this research are a personal interview technique and structured interview. Personal interviews method requires a person known as the interviewer asking questions generally in a face-to-face contact with the other person or persons, were at the times the interviewee may also ask a certain question and the interviewer respond to these, (Kothari, 2004). Kothari also mentions, the method of collecting information through personal interviews, is usually carried out in a structured way, where the interviews as a structured interviews are involved the use of a set of predetermined questions and of highly standardized technique of recording,
the interviewer in a structured interview follow a grid procedure laid down, asking questions in a form and ordered prescribed, (Kothari, 2004). In this research, the structured interview will be involved the set of predetermined interview questions as shown at Selangor Dam Management Effectiveness Tracking Tool (SDMETT)

3.8 Conclusion

All of research technic are used in this research is a qualitative and quantitative method that involved the field study, report and document review, map review and interview session. Analysis technics are used in this research is mapping and spatial analysis technic, observation analysis, content and context technic, comparative analysis, Selangor Dam Management Effectiveness Tracking Tool (SDMETT) and lastly a SWOC analysis technic are used to answer the research question, objective and last to help this research to archive the research aims.