

ASSESSMENT OF WILLINGNESS TO ACCEPT UPGRADING WATER
SUPPLY SYSTEM FOR RURAL INDIGENOUS SETTLEMENT

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A dissertation submitted in partial fulfilment of
the requirements for the award of the degree of
Doctor of Engineering (Technology and Construction Management)

School of Civil Engineering
Faculty of Engineering
Universiti Teknologi Malaysia

JULY 2019

DEDICATION

I owe thanks to a very special person, my wife, Suzita Binti Husin for her continued and unfailing love, support and understanding during my pursuit of Eng.D that made the completion of thesis possible. You were always around at times I thought that it is impossible to continue, you helped me to keep things in perspective. I appreciate my children Batrisya Humairah, Basyir Uzair and Muhammad Yusuf for abiding my ignorance and the patience they showed during my thesis writing. Words would never say how grateful I am to all of you. I consider myself the luckiest in the world to have such a lovely and caring family, standing beside me with their love and unconditional support. Finally, I acknowledge the people who mean a lot to me, my brother, Faruk Bin Muhammad, for showing faith in me and giving a great support in facing the obstacles to complete my studies. I salute you for the selfless love, care, pain and valuable prayers you did to shape my life and I would never be able to pay back your sacrifices and goodness. Thanks

ACKNOWLEDGEMENT

In preparing this thesis, I was in contact with many people, researchers, academicians, and practitioners. They have contributed towards my understanding and thoughts. In particular, I wish to express my sincere appreciation to my thesis supervisors, Assoc. Prof. Ir. Dr. Mohd. Fadhil Bin Md. Din and Dr. Shazwin Binti Mat Taib for encouragement, guidance, critics and friendship. I am also very thankful to Puan Ermaniza Binti Abd Rahman from Office of Graduate Studies, School of Civil Engineering, Faculty of Engineering, UTM for her assistance. Without their continued support and interest, this thesis would not have been the same as presented here.

I am also indebted to Ministry of Health for funding my study. Profound gratitude to the staff at Engineering Services Division, Engineering Unit of State Health Departments of Negeri Sembilan and Health District Office of Jelebu that helped to conduct the research. Librarians at UTM, UKM and UPM also deserve special thanks for their assistance in supplying the relevant literatures.

My fellow postgraduate student should also be recognised for their support, especially to Dr. Md Rajuna Bin Ahmad Shakri. My sincere appreciation also extends to all my colleagues and others who have provided assistance at various occasions. Their views and tips are useful indeed. Unfortunately, it is not possible to list all of them in this limited space.

ABSTRACT

Everyone has the right to access clean water because it is one of the basic needs of human being. In Malaysia, in 2017, 96.50% of rural households had access to clean water supply. Of these, 15.31% were using alternative water supply systems. Gravity Feed System (GFS) is one of the water supply schemes that contributes the biggest quantity to the coverage of rural water supply systems. The sources of water supply which were free from pollution at the beginning of the project, are now suffering from deterioration of water quality. Ministry of Health under Rural Water Supply and Sanitation Programme is taking part to implement the roles accordingly by making upgrades to systems supplied to the rural communities. However, the upgrading projects are often unable to sustain due to of incompatibility of the systems and acceptance by the rural community especially indigenous people. The government is giving emphasis on clean water supply, whether in urban or rural area. Thus, the aim of this study is to identify significant methods to improve delivery approaches for upgrading GFS. Data was collected from eight different indigenous settlements. Based on the objectives, there were three phases conducted, which included water quality assessment, site investigation and survey/ interview session to determine the causes of contamination and acceptance level by the indigenous people. In general, the results show that water quality was within the range of acceptance level of National Drinking Water Quality Standard for raw water except for turbidity. In addition, it is discovered that the areas surrounding GFS have been developed for agriculture activities. Furthermore, health concern is the most important factor which influenced the Willingness-To-Accept among indigenous communities. By applying awareness of health and hygiene practices, it can help in the success of the plan to upgrade GFS through self-ownership realization.

ABSTRAK

Setiap orang mempunyai hak untuk mendapatkan air bersih kerana ia adalah salah satu keperluan asas manusia. Di Malaysia, pada tahun 2017, 96.50% isi rumah luar bandar mempunyai capaian kepada bekalan air bersih di mana 15.31% daripadanya menggunakan sistem bekalan air alternatif. Sistem Bekalan Air Gravitasi (GFS) adalah salah satu daripada skim bekalan air yang menyumbang jumlah terbesar kepada liputan sistem bekalan air luar bandar. Sumber bekalan air yang bebas daripada pencemaran pada permulaan projek, kini mengalami kemerosotan kualiti air secara umum. Kementerian Kesihatan di bawah Program Bekalan Air dan Sanitasi Luar Bandar mengambil bahagian untuk melaksanakan peranan sewajarnya dengan melaksanakan projek naik taraf kepada sistem yang dibekalkan kepada masyarakat luar bandar. Walau bagaimanapun, projek menaik taraf sering tidak dapat dikekalkan kerana ketidaksesuaian sistem dan penerimaan oleh masyarakat luar bandar terutamanya penduduk orang asli. Kerajaan memberikan penekanan kepada bekalan air bersih, sama ada di kawasan bandar atau luar bandar. Oleh itu, matlamat kajian ini adalah untuk mengenal pasti kaedah yang signifikan untuk meningkatkan pendekatan penyampaian bagi menaik taraf GFS. Data dikumpul dari lapan penempatan orang asli yang berbeza. Berdasarkan objektif, terdapat tiga fasa yang dijalankan, termasuk penilaian kualiti air, penyiasatan tapak dan sesi tinjauan/ temubual untuk menentukan punca pencemaran sumber bekalan air dan penerimaan oleh masyarakat orang asli terhadap sistem yang akan dinaik taraf. Secara umum, keputusan menunjukkan bahawa kualiti air berada dalam lingkungan tahap yang boleh diterima mengikut Piawaian Kualiti Air Minum Kebangsaan bagi air mentah kecuali kekeruhan. Di samping itu, didapati bahawa kawasan sekitar GFS telah dibangunkan dengan aktiviti pertanian. Kesedaran kesihatan adalah faktor terpenting yang mempengaruhi Kesediaan-Untuk-Menerima dikalangan masyarakat orang asli. Dengan menerapkan kesedaran tentang amalan kesihatan dan kebersihan diri, ia dapat membantu dalam mencapai kejayaan rancangan untuk menaik taraf GFS melalui realisasi pemilikan diri.

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LIST OF ABBREVIATIONS

MOH	-	Ministry of Health, Malaysia
TMP	-	Tenth Malaysia Plan
EMP	-	Eleventh Malaysia Plan
ASM	-	Akademik Sains Malaysia (Academy Sciences of Malaysia)
WHO	-	World Health Organization
UNICEF	-	United Nations Children's Emergency Fund
UNDESA	-	United Nation Department of Economic and Social Affair
UNDP	-	United Nations Development Programme
IWGIA	-	International Work Group for Indigenous Affairs
TEC	-	The European Commission
WASH	-	Water Sanitation and Hygiene Project
GFS	-	Gravity Feed System
BAKAS	-	Bekalan Air dan Kesihatan Alam Sekitar (Rural Water Supply and Sanitation)
KLBW	-	Kementerian Luar Bandar dan Wilayah (Ministry of Rural and Regional Development)
WTA	-	Willingness To Accept
DWQS	-	Drinking Water Quality Surveillance
HDPE	-	High-density Polyethylene
JAKOA	-	Jabatan Kemajuan Orang Asli (Department of Orang Asli Development)
KPLB	-	Kementerian Pembangunan Luar Bandar (Ministry of Rural Development)
JPBD	-	Jabatan Perancangan Bandar dan Desa (Department of Town and Country Planning)
NGO	-	Nongovernmental Organization

LIST OF SYMBOLS

Y	-	A predicted value of Y
B_0	-	The “Y Intercept”
B_1	-	The change in Y for each 1 increment change in X_1
B_2	-	The change in Y for each 1 increment change in X_2
X	-	X score (X is our Independent Variable) for which we are trying to predict a value of Y (WTA)
X_1	-	(Do you agree that safe and clean water is very important in life? -Yes)
X_2	-	(Do you and household practice at home drinking water treatment? -Yes)

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CHAPTER 1

INTRODUCTION

1.1 Background of The Study

Portable water is one of the basic needs of every human and everyone has the right to access to the water that is considered safe to drink and meets the local established drinking water standards. Humans need portable water to ensure their survival to meet the needs of drinking, food preparation, personal hygiene, clothes and dish washing and the fulfilment of other needs. Water supply that reaches the household must be free from bacteria, parasites and chemical contamination that can cause dangerous to human health when consumed or used. Aside from being free from dangerous pathogens and hazardous materials, the quality of drinking water must also can be accepted in terms of physical appearance and odour by the public. An adequate quantity of safe water is another crucial factor that can prevent diseases. It is important to provide a significant supply of clean and safe water into households to allow for a better standard of living environment. Although it may be clear and taste fine, it is not considered potable or safe to drink, unless it has passed at certain standards of water quality testing. Nowadays, potable water can become contaminated and no longer considered potable or drinkable due to various changes of human actions. Munyao (2018, p. 1) states that ‘worldwide, pollution of rivers and streams has become one of the most crucial environmental problems of the 20th Century’ hence, it is important to control water pollution, monitor water quality.

In Malaysia the government is giving emphasis on clean water supply, whether in urban or rural areas, where coverage of Improve Drinking Water Sources as a whole reached at a satisfactory condition (WHO and UNICEF, 2014). For rural water supply, collaboration with Ministry of Rural and Regional Development (KLBW) and Ministry of Health (MOH) actions have been taken to improve the standard living in rural communities as well as safe water quality. MOH under Rural Water Supply and

Sanitation (BAKAS) Programme is taking part to implement the roles accordingly (MOH, 1984).

There are three large groups of indigenous people in peninsular Malaysia namely Negrito, Senoi and Melayu Proto (Anuar, Salleh and Moktar, 2014). High percentage of poverty rates and a lack of asset ownership among indigenous peoples add more constraints to seek cooperation in the success of any programme that does not involve the addition of income or returns for them (Mohd Nur, 2012). Nevertheless, it is not desirable to impose any unreasonable fees beyond their ability to perform upgrades to the water supply system, which they have received for free.

Gravity Feed System (GFS) is one of the water supply schemes that comprises of secure catchment areas, weir or dam and piped water supply network. Most of the systems produce untreated, but wholesome water and therefore the rural people are advised to boil their drinking water. Nevertheless, safe and clean water supply remains as one of the main priorities of BAKAS programme because water is the basic need of every human being. One of the primary procedures to accomplish the BAKAS programme's goal is to provide low cost technologies for water supply plans and exercises with partial subsidy projects in the form of construction materials. Aside from subsidizing partially the general expenses of the project, the provincial groups are additionally required to partake effectively in the construction work, with close supervision and specialized expertise from the Ministry of Health staff. GFS is the system that is designed with the low-cost technology schemes for the people who are impoverished. Basically, the low-cost technology scheme aims to serve as temporary system while waiting for proper infrastructure to reach at their area.

Generally, less emphasis is given on rural communities that are exposed to the pollution of water resources due to the rapid development of infrastructure and agriculture. For indigenous communities in Malaysia, most of the water supply system is supplied under GFS scheme as they are also facing the same issues regarding the deteriorating of water supply quality. Based on the naive circumstances of indigenous people, strategic approaches must be reviewed and enhanced as well as in line with policy and management approaches.

1.2 Problem Statement

The sources of water supply system in rural area of Malaysia which were free from pollution at beginning of project, now suffer from deterioration of water quality in general due to rapid development. Most of the systems is not binding with treatment mechanisms since at the beginning of the construction, they were facing the challenges to upgrade the water supply system which maintained by the rural communities. Nowadays, the status of 'safe and clean' has always been questioned and put into doubt due to status of the water quality. Several efforts have been taken to improve rural water quality by making upgrades to systems supplied to the rural indigenous settlement, however the up-grading projects are often unable to be sustained because of incompatibility of the systems and acceptance by the rural indigenous community.

Due to some circumstances of the indigenous people where low levels of education and high illiteracy rates hinder the process of health awareness and hygiene practices, especially on the issue of water quality. No studies have been conducted for indigenous people in Malaysia to study and assess their desirable toward factors acceptance of the upgrading of the water supply system.

The locations of settlement of indigenous people are situated too far in a remote area, terrain and the problem of accessibility is becoming a vital problem to the both parties, community and the government. A method must be identified to undertake upgrading of water supply projects that will be carried out in an effective manner.

1.3 Objectives

Five objectives have been defined as follows: -

- i. To conduct water quality study on the sources of Gravity Feed System.
- ii. To identify non-point sources of pollution to the selected rivers.

- iii. To assess the factors influencing Willingness To Accept (WTA) for upgrading the GFS.
- iv. To identify the significant factors affecting WTA.
- v. To determine the appropriate strategy to upgrade GFS for rural indigenous settlement.

1.4 Scopes of Study

The water supply system of this study are focusing on the GFS which were built under BAKAS programme, Ministry of Health, Malaysia. Eight GFS in eight different settlement of Ingenious People located in the Jelebu District, State of Negeri Sembilan, Malaysia. A list of indigenous villages involved are as follows;

- i. Kampung Orang Asli Tohor, Kenaboi Sub District.
- ii. Kampung Orang Asli Bertam, Kenaboi Sub District.
- iii. Kampung Orang Asli Jeram Lesung, Kenaboi Sub District.
- iv. Kampung Orang Asli Dusun Kubur, Kenaboi Sub District.
- v. Kampung Orang Asli Lakai, Teriang Hilir Sub District.
- vi. Kampung Orang Asli Banir Tengkoh Kuala Klawang
- vii. Kampung Orang Asli Ulu Kelaka Ulu Klawang Sub District.
- viii. Kampung Orang Asli Ulu Kemin Ulu Klawang Sub District.

Water quality sampling and testing involved, measuring of the physical characteristics of water on-site, while the microbiological and inorganic chemical tests were carried out at Lab of District Health Office, Jelebu, Negeri Sembilan. The Willingness To Accept survey was conducted to all the villages selected in water quality study except for Kampung Orang Asli Lakai because for being opposed to continuing research on safety reasons.

1.5 Limitation of Study

- i. The study only covered for eight villages in rural area of Jelevu District out of fifteen villages that use GFS as a water supply system.
- ii. Only water supply systems that use GFS scheme were studied in this research whereas there are some other systems used by the rural community such as Hand Pump Well, Well with Connection and Rain Water Collection.
- iii. Parameters involved in water quality investigating in pre-study only limited to certain parameters. Water testing was done on-site and Laboratory of District Health Office, Jelevu.
- iv. Review and analysis of the rural water quality supply for a period of 14 years of Environmental Health Engineering Reports, State Health Department of Negeri Sembilan were specified only for the District of Jelevu as a whole.

1.6 Significant of Study

Analysis on the drinking water quality from preliminary study and secondary data is necessary to predict the trend of the water quality level as well as to develop a better water resource management plan of GFS for rural communities.

From the analysis of the questionnaires answered by the Indigenous People respondents towards the GFS water supply system, it can determine the significant factors that influence the behaviour and level of acceptance in designing the strategies for upgrading the water supply system if necessary. The main constraint to up-grade the GFS system is the involvement of indigenous people because it deals with participation, responsibility for operation & maintenance and a small donation of money to ensure that the water treatment system is working properly and sustain. Outcomes from Statistical Analysis of WTA are used as very strong basis tools to strategize and plan an optimal management to sustain the system and water quality as a whole.

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