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ENHANCING SUSTAINABILITY IN THE MBSJ COMMUNITY GARDEN THROUGH INNOVATIVE INTEGRATION OF AN UNDERGROUND WATER TANK SYSTEM

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ABSTRACT

The primary and crucial resource for plant growth, alongside sunlight, is water. While sunlight is generally abundant, the availability of water can be disrupted, especially in Selangor, due to droughts or contamination affecting water treatment plants. To address this issue, an effective alternative method for sourcing water is through an Innovative Underground Water Tank System known as Tube Wells. Unlike traditional wells commonly found in rural areas, Tube Wells tap into Confined Aquifers deep underground, where water of high quality is accessed and remains unaffected by droughts or pollution. Hence, meticulous planning and subsurface soil investigation using Electrical Resistivity Imaging (ERI) for Geomap Survey are essential for locating and determining the position of these Confined Aquifers. The Tube Well system enables access to groundwater at depths ranging from 10 meters to several hundred meters, depending on specific site conditions. The concept of community gardens, under the purview of Majlis Bandaraya Subang Jaya (MBSJ), promotes local plant-based activities by fostering community-based agriculture that also contributes to economic development. In addition to serving as a local food source and supporting agriculture, community gardens contribute to green spaces and enhance the aesthetics of urban environments. The inaugural community garden project was launched at Garnet Apartments on October 3, 2013. Over time, the number of community gardens in MBSJ has grown to encompass 69 areas. To facilitate the development of these gardens, geological scanning and Geomap Survey activities are conducted at proposed garden locations. These surveys provide valuable insights into the sub-surface soil layers, aiding in garden planning and development. The use of a Boring Machine for the Tube Well project requires suitable access to ensure the machine reaches the desired location effectively. It is recommended to create a 6-inch diameter pipe hole using a 1 Horsepower (1HP, equivalent to 0. 75 kW) Submersible Water Pump, capable of pumping 3,600 liters per hour (3.6 cubic meters per hour). Notably, the electrical consumption during pump operation is minimal, with a power rating of only 750 Watts or 0.75 kW. To track and manage water usage from the Tube Wells, water meters will be installed, further enhancing sustainability within the MBSJ Community Garden initiative.

Key Words: Tube Wells Innovation, Community Gardens, Confined Aquifers, Electrical Resistivity Imaging, Water Sustainability

1. INTRODUCTION

Besides sunshine, water is the most essential fundamental source for plants. Water resources, particularly in the state of Selangor, are constantly disturbed, whether because of the rainy season or water pollution that is identified by water treatment facilities. While it can be argued that sunlight is always present, water resources are not. The Tube Bay system (Tube Well) is, in this sense, the finest alternative approach for obtaining water resources. It differs from the well frequently found in communities in that the water for well comes from the Unconfined Aquifer, whereas the water for tube wells comes from the Confined Aquifer located deep within the earth and is pumped out for various purposes, as illustrated in Figure 1.

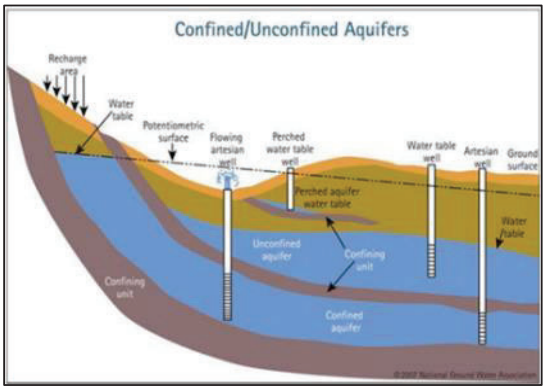

Figure 1. Confined Aquifer and Unconfined Aquifer

The Confined Aquifer is a reliable source of high-quality water that is not harmed by wet weather or pollution problems. Therefore, it is crucial to conduct an underground soil research and plan carefully, which led to the creation of the Geomap Survey. Predicting locations and locations of encased aquifers requires the use of Electrical Resistivity Imaging (ERI) to create a Geomap Survey (Confined Aquifer). Depending on the location of a given site, it can be hundreds of meters beneath the surface of the earth.

1.1. Background of Study

In response to the critical challenges faced by Selangor, where water scarcity and contamination threaten plant growth and local communities, a comprehensive study has been initiated. The primary objective is to promote community-based agriculture, stimulating economic development and regional crop production through initiatives like community gardens. These green spaces not only enhance food production but also beautify urban areas. This endeavour aligns with key Sustainable Development Goals (SDGs), including combating hunger (SDG2), addressing water and sanitation issues (SDG6), promoting innovation and infrastructure (SDG9), creating sustainable cities and communities (SDG11), and taking action on climate change (SDG13). To ensure success, the project seeks support from stakeholders like Ar. Kamarul Hisham bin Yeop Hashim and has chosen the USJ 3/4 Community Garden as its focal point. Moreover, it aims to inspire other community gardens across different sites in Selangor, fostering sustainable agriculture and green urban environments. This study, rooted in the importance of water resources, agriculture, and SDGs, has the potential to transform Selangor by addressing water challenges, promoting economic growth, sustainable communities, and a greener, more appealing urban landscape.

2. METHODOLOGY

Geological scanning or geo-map survey work at the proposed plantation site is essential to obtain an initial overview of the sub-surface soil layers. Figure 2 illustrates a sample image of the geological scanning or geo-map survey work being conducted by the research team. The machinery or Boring Machine utilized for the Tube Well project is depicted in Figure 3. Adequate access is necessary to ensure that the machine can reach the desired location.

Figure 2. Sub-surface soil layers can be identified early on using a geological scan or geomap

Figure 3. Boring Machine

Besides that, 12 tons of trucks were used to convey the drilling rig, a compressor, a crawler box, and drilling equipment. The drilling rig weighed 2.6 tons. In the video below, both High Performance Tube Well Technique and Low Performance Tubewell Technique are demonstrated. One horsepower submersible water pumps with drill holes of 6" and 8" in diameter are used. One horsepower is comparable to 0.75 kW. It has a maximum water pumping capacity of 3600 liters per hour (3.6 cubic meters per hour). Using a fibre optic camera with a maximum depth of 656 feet, the depth of object is measured. Other than that, pumping only uses 750 watts, or 0.75 kW, of electricity, hence it consumes relatively little electricity. Additionally, a water meter will be put in place to track how much water is consumed through each pipe.

3. PROJECT OUTCOMES

From this project, the tube well system enables access to groundwater at depths ranging from 10 meters to several hundred meters, depending on specific site conditions. Figure 4 below indicates pictorial summary of the overall project with the description of geo-material and depth of coring.

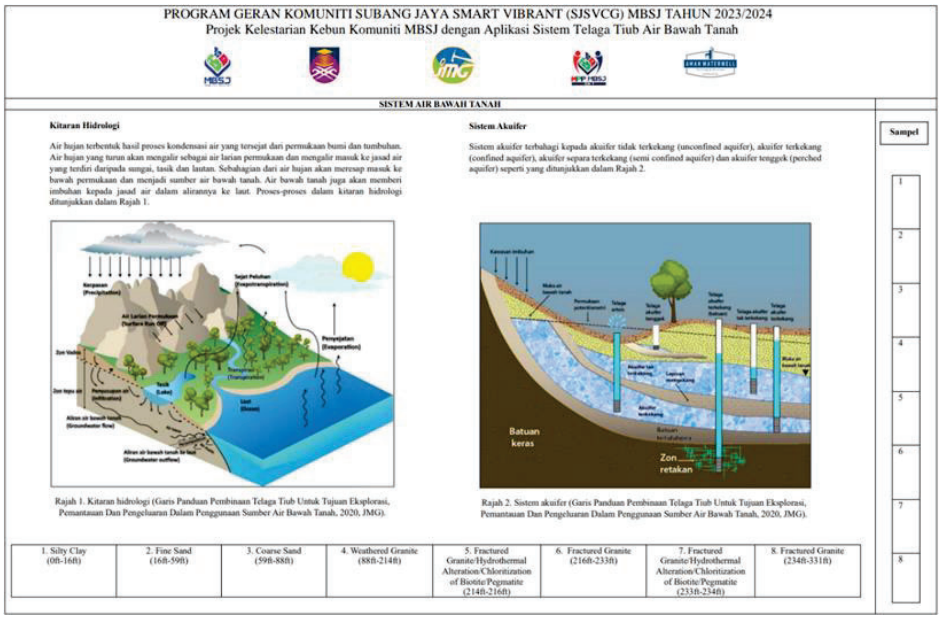

Figure 4. Summary of the overall project with the description of geo material and depth of coring

4. DISCUSSION

The Majlis Bandaraya Subang Jaya (MBSJ) idea of community gardens encourages local plant-based activities by supporting community-based agriculture, which also contributes to economic growth. Community gardens contribute to green spaces and improve the aesthetics of urban surroundings, in addition to providing as a local food supply and supporting agriculture. On October 3, 2013, the first community garden initiative was established at Garnet Apartments. The number of community gardens in MBSJ has increased over time to 69. Geological scanning and Geomap Survey operations are carried out at potential garden locations to aid in the building of these gardens. These studies give useful information on the subsurface soil layers, which aids in garden design and growth.

5. CONCLUSION

This project offers a free watering system for community gardens, potentially serving as a local water reserve during water contamination emergencies. It has the potential for expansion to more locations upon request. The Chief Investigator has initiated discussions with Selangor Water Management Quality (LUAS) to seek fee exemptions based on the project's limited use and purpose. As the irrigation water used is efficiently returned to the soil system and drawn from the Confined Aquifer zone, the project has no adverse neighborhood effects. The project is meticulously supervised by experts in geology, hydrogeology, geotechnical engineering, and soil engineering from UiTM and JMG, ensuring its responsible execution.

6. RECOMMMENDATION

Given the evident benefits experienced by the local community in the project area, it is highly recommended to consider the expansion and implementation of this project in another district. The success of this endeavour in providing free watering for community gardens, serving as a potential local water reserve during emergencies, and fostering responsible water resource management is a strong indicator of its positive impact. By extending this project to a different district, the advantages it brings, such as supporting local agriculture, enhancing water resilience, and community engagement,

can be replicated and further contribute to sustainable development and well-being in new areas. This not only leverages the success of the existing project but also aligns with the broader goal of addressing water-related challenges and fostering community-based agriculture in a more extensive geographical context.

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