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Employment of Rainwater Infiltration Wells for Flood Mitigation

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ABSTRACT

This region holds considerable attraction for tourists. The extensive expansion of tourist attractions renders this hamlet susceptible to waterlogging during the rainy season, attributable to insufficient water infiltration, resulting in frequent occurrences of waterlogging. The community also encounters the issue of inadequate management of spring water supplies. The approach we proposed involved the implementation of infiltration wells. This well serves as a receptacle for rainfall that either descends or flows from upstream and is then collected into a reservoir (SPAH). The Rainwater Harvesting System (SPAH) is a method for utilizing rainwater for everyday requirements. The fundamental premise is that the water entering the infiltration well is channeled to the reservoir. This initiative involves the establishment of infiltration wells to facilitate the acquisition of clean water for communities while mitigating concerns of waterlogging during the rainy season. We aim to assist the community by providing a complimentary clean water supply.

Keywords: Standing Water; Contributions; Infiltration Wells.

INTRODUCTION

Tourists find this region to be highly attractive. The extensive development of tourist attractions renders the hamlet susceptible to waterlogging during the rainy season. This condition is attributable to insufficient water infiltration, resulting in frequent waterlogging in residential areas. Fluctuating precipitation can render the earth unstable, posing a risk of landslides that may occur at any moment. The hamlet community has another issue: inadequate management of spring water sources. Water is essential for living organisms, although the supply of clean water in sufficient quantity and quality is limited. Rainwater may serve as a remedy; however, it requires additional treatment (Tamagnone et al., 2020). Water is thus the most essential element for human existence and all its endeavors. We utilize rainwater in conjunction with a basic filtration apparatus to enhance its physical quality for household applications (Sohn et al., 2020). This program seeks to assist individuals affected by flooding

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and the risk of landslides. In addition to these issues, we encourage the local community to utilize the rainwater available in their surroundings at no cost (Moura et al., 2016). A method to harness rainwater is via rainwater reservoirs. This study aims to determine the tank's capacity and design, the population size, and the fluctuations in water requirements while also assessing the cost of constructing a PAH reservoir. We can utilize this construction to mitigate the incidence of floods and landslides within its vicinity.

RESEARCH ELABORATIONS

We design the community service program based on observations of the community environment. This method examines the circumstances around natural disasters and associated activity. We conduct socialization to provide the community with an overview and guidance. The design of infiltration wells and shelters aims to mitigate the incidence of waterlogging that formerly affected the surrounding area. This program incorporates two infiltration wells, each with a depth of 1 meter, and a reservoir with a depth of 3.5 meters and a volume of 15.75 m^3, along with the implementation of a filtration system.

The objective is to facilitate rainwater absorption, subsequently rendering the water suitable for community use, which will then be conveyed through floating pipes to the nearest location. The filtration system operates in two stages: initially, it utilizes traditional methods with natural components in an infiltration well, followed by further filtration in the water reservoir. Filtering is achieved by researching conventional ingredients using online reference sources and purchasing filtering technologies from e-commerce platforms. Subsequently, the water content will be assessed using a pH meter to determine the moisture levels applicable to human activities (Qin, 2020). The community began to come together to improve the hamlet's aesthetic, which was noticeable throughout the development phase until it was completed. We assess this service activity by examining changes in the environmental circumstances of the impacted community, and we plan to expand it to many additional locations.

RESULTS AND DISCUSSIONS

This service aims to enhance aesthetics through the construction of infiltration wells and shelters. This service program enables students and the community to strengthen collaborative efforts in fostering village empowerment, with the expectation of addressing both short-term and long-term needs.

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Table 1. Stages of Success

Stages of Activity	Activities
Visit 1	Field surveys and observations
Visit 2	Surveys, observations and interviews
Visit 3	Preparation of activities
Visit 4	Socialization and counseling
Visit 5	Development Process
Visit 6	Evaluation of Results
Visit 7	Closing of Activities

Source: Activity data processing

This activity persisted from August until November. At this juncture of the survey, the team visited the hamlet of Temple Gum to assess the surrounding conditions, identify obstacles, and subsequently plan a direct interview with the community. The interviewee was the head of the hamlet, enabling the team to gain a clearer understanding of the events in this area characterized by significant rainfall. This significant rainfall results in issues such as waterlogging on roadways and residential yards, as well as soil destabilization, which increases the risk of landslides.

The subsequent step involves the team's development of proposals, which begins with compiling an overview, formulating a budget, and designing the building structure. The team assigns specific responsibilities to each individual, starting with the chairman and continuing with the secretary, public relations, design division, equipment construction, and materials management. Once all preparations are complete, remember to solicit guidance from the accompanying lecturer regarding future considerations, as well as any necessary modifications or adjustments. Socialization is conducted to get additional information directly from the community and to furnish an overview and explanation of the development plan; this activity was attended by the local citizens' secretary.

We secured approval for the subsequent construction of the development in the residents' yards. The construction phase commences once all arrangements have been finalized and sanctioned by the relevant team and socialization has concluded. Subsequently, the team reaches the site to initiate the development process. The construction process is in front of residents' homes, with the team selecting this location due to its high susceptibility to water logging during rainy circumstances. The team constructed two infiltration wells, each measuring 1 meter in depth, in conjunction with a conventional filtration system. Next, they established a reservoir with dimensions of 2.5 x 2.5 meters and a depth of 3 meters.

The shelter building features a contemporary filtration system, comprising a device with three tiers of components. Additionally, a pump serves as a mechanism for transporting water through pipelines directed to other adjacent sectors. This concept employs rainwater, which penetrates the well's depth, travels to the reservoir's depth, and undergoes filtering during

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distribution. Throughout the building phase, the team collaborated with the community for roughly two weeks, commencing with the excavation of 3 meters of earth, followed by the drilling and casting of a 1-meter-deep well. Many times, inclement weather conditions, particularly severe rainfall, interrupted the work. The team has assembled various materials, including cement, iron, wood, culverts, and paint. Subsequently, filtering tools and supplies are supplied upon construction completion. Evaluation occurs upon completion of the full construction process, highlighting numerous areas for enhancement and ongoing development. We assess the rainwater's quality using pH measurement, which reveals persistent turbidity

CONCLUSIONS

Upon completion of the infiltration well's construction, the area witnessed a reduction in rainfall, which had previously affected nearly the whole hamlet, thereby successfully mitigating the incidence of floods. However, other regions remain inundated, and in the future, they will be expanded and constructed upon to enhance the likelihood of future flooding.

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