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Enhancing local government management of wastewater issues in the Phichit River at Khlong Khachen subdistrict

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ABSTRACT

Water pollution in Phichit province has significantly impacted the local economy, environment, and quality of life. A 2017 survey revealed that the Phichit River was severely polluted, with a Water Quality Index (WQI) ranging from 31 to 60 and dissolved oxygen (DO) levels below acceptable standards. Key contributing factors include the discharge of domestic wastewater directly into the river and the construction of weirs that obstruct water flow. Approximately 200 households were found to be encroaching on the riverbanks, with most having septic tanks that discharged directly into the river. Additionally, concrete roads and bridges served as barriers to water flow. To address these issues, relocating toilets and septic tanks away from the riverbanks has been proposed. River restoration efforts have been supported by the community and relevant agencies, including those involved in water management, weed removal, and community engagement. Collaborative efforts and inclusive participation have been crucial for river restoration. Through effective collaboration, the Phichit River can be revitalized and sustainable development can be achieved.

Keywords: dam construction, weir construction, water management, community empowerment

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1. Introduction

Water pollution in Phetchabun province poses a significant threat to the local economy, environment, and quality of life. A 2017 survey revealed that the Phichit River was severely polluted, with a Water Quality Index (WQI) of 31-60 and dissolved oxygen (DO) levels below the acceptable standard of 2 mg/L. Additionally, the biochemical oxygen demand (BOD) exceeded the permissible limit of 4.0 mg/L, resulting in severe water pollution events, including fish kills. Key contributing factors include excessive aquatic weeds, encroachment by riverside residents who discharge untreated domestic wastewater directly into the river, and the construction of weirs and cross-river structures that obstruct water flow. The reduced water flow and poor water quality have created a critical situation for the Phichit River. Under the polluter pays principle, riverside residents who discharge wastewater into public water bodies should be held accountable and participate in solving the pollution problem. A community-based approach is considered the most suitable solution for the current situation. However, there is often confusion and overlap in the responsibilities of various agencies involved in addressing midstream and downstream pollution. Furthermore, there are legal and regulatory frameworks that lack requirements for urban communities to establish collective wastewater treatment systems. The construction of such systems requires significant investments, detailed design, and environmental impact assessments (EIA), which can significantly delay the resolution of water pollution problems.

2. Objective

To propose an enhanced management strategy for wastewater treatment in the Phichit River, particularly in Khlong Khachen, Rong Chang, and the Old City, empowering local communities to sustain positive behavioral changes

3. Methodology

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Building community resilience in the Khlong Khachen, Rong Chang, and Old City sub-districts, as well as engaging the head of the Yan Yao Sub-district Administrative Organization, to implement the following community empowerment mechanisms

1.1 Form a team comprising members from the Khlong Khachen, Rong Chang, and Old City sub-districts, along with the head of the Yan Yao Sub-district Administrative Organization and relevant government agencies, to serve as the core coordination group. This team should share a common goal of raising public awareness about water management, encouraging people to refrain from dumping waste into the river, and coordinating with relevant government agencies.

1.2 Conduct planning meetings to establish policies, set objectives, assign responsibilities, and identify or select project areas.

1.3 Conduct a feasibility study to assess community readiness, available resources (including facilities and materials), and the financial feasibility of the project.

1.4 Implement community education and engagement programs, including training on source water pollution control, with a focus on the 3Rs: Reduce, Reuse, and Recycle.

1.5 Develop activities, indicators, and regulations. All stakeholders should collaborate in selecting activities, setting indicators, and developing regulations to support these activities. Generally, activities can be categorized into three cases: 1) Households or small buildings aiming to reduce wastewater generation, separate wastewater, treat wastewater, and reuse wastewater. 2) Households or small buildings that do not aim to reduce wastewater but are willing to separate and treat it for reuse. 3) Households or small buildings that do not aim to reduce or separate wastewater but are willing to conduct essential wastewater treatment.

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1.6 Monitor and evaluate the project after a certain period (e.g., 3 or 6 months) based on the established indicators. If the project does not meet its targets, revisit step 1.5 to refine activities, indicators, and regulations.

4. Results

Khlong Khachen Sub-district in Phichit Province has a total population of 9,352, comprising 4,340 males and 4,735 females. Rong Chang Sub-district of Phichit Province has a total population of 5,729, comprising 2,767 males and 2,962 females. Mueang Kao Sub-district in Phichit Province has a total population of 6,007, comprising 2,917 males and 3,090 females. The combined population of these three sub-districts is 21,088. Through a joint meeting with local administrative organizations, a survey was conducted with the following results.

1.1 Survey of households, factories, shops, and other buildings adjacent to the river**.** Based on the Department of Marine's announcement in 2018, a registration of riverside households was conducted. It was found that approximately 200 households were encroaching on the Phichit River in 2018. Currently, there are no new encroachments.

1.2 Survey of Wastewater Management and Treatment Systems in Households Encroaching on the Phichit River: All households located within the river zone have septic tanks or seepage pits, and none have wastewater recycling systems.

1.3 Survey of water obstructions in the Phichit River, Mueang District, Phichit Province: The survey revealed that the most common water obstructions in the Phichit River, particularly in Khlong Khachen, Rong Chang, and Mueang Kao sub-districts, are concrete roads with pipes, followed by dirt roads with pipes, and concrete-pile wooden-floored and roofed bridges.

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Table 1: Waterway Obstructions in the Phichit River

No.	Sub-district	Type of Obstruction	Quantity
1	Khlong Khachen	Concrete road with pipes	1
		Dirt road with pipes	3
		Asphalt road with pipes	1
2	Rong Chang	Concrete road with pipes	5
		Concrete-pile, wooden-floored and roofed bridge	1
		Asphalt road with pipes	1
		Dirt road with pipes	2
3	Mueang Kao	Concrete road with pipes	4
		Dirt road with pipes	1
		Water gate with two non-functional panels	1

This table provides a summary of the various obstructions found in the Phichit River, specifically within the Khlong Khachen, Rong Chang, and Mueang Kao sub-districts. The obstructions are primarily artificial structures such as roads, bridges, and water gates.

1 Types of obstructions: The most common obstructions are roads made of concrete, dirt, or asphalt, often with pipes embedded within them. There are also concrete bridges with wooden floors and roofs, as well as water gates.

2 Quantity: The table lists the number of each type of obstruction found in each sub-district.

3 Sub-districts: The obstructions are categorized based on the three sub-districts where they are located.

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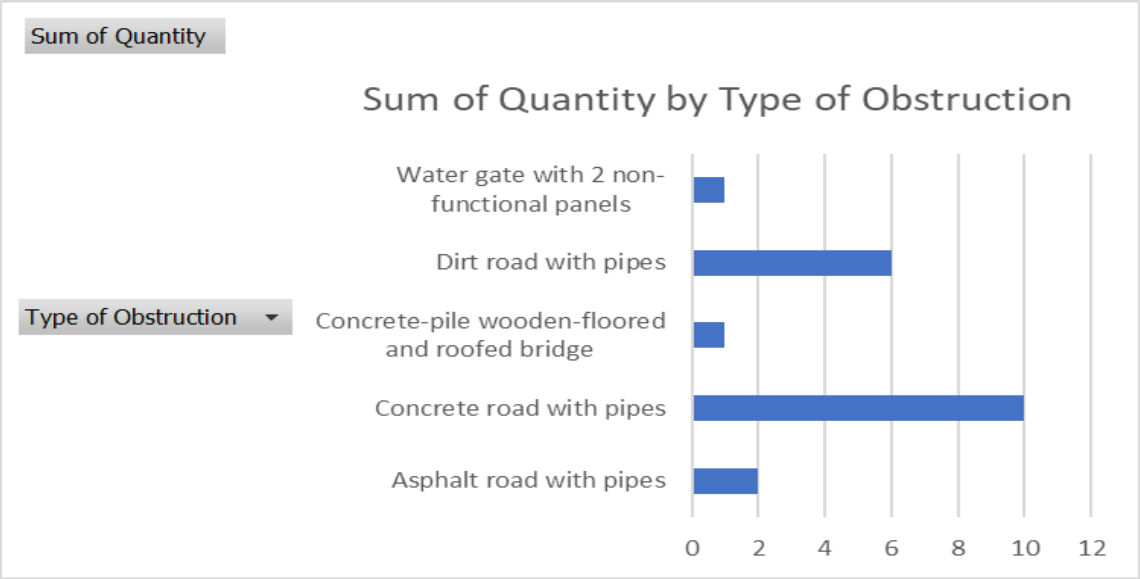

Figure 1. Sum of Quantity by Type of Obstruction

From Figure 1. The bar graph visually represents the total number of each type of obstruction found in the Phichit River across the three sub-districts: Khlong Khachen, Rong Chang, and Mueang Kao. The x-axis represents the quantity of obstructions, while the y-axis categorizes the different types of obstructions.

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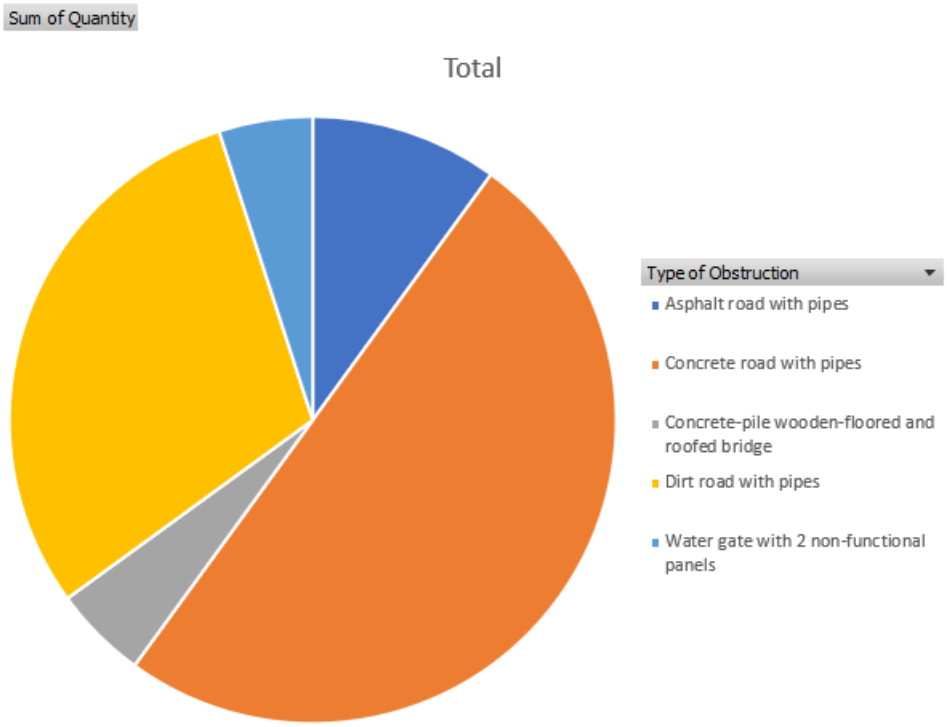

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Figure 2. The pie chart demonstrates the Phichit River.

From Figure 2. This pie chart provides a visual representation of the distribution of different types of obstructions found in the Phichit River across the three sub-districts: Khlong Khachen, Rong Chang, and Mueang Kao. Each slice of the pie represents a specific type of obstruction, and the size of the slice corresponds to the proportion of that obstruction relative to the total number of obstructions.

Survey results indicate that one of the primary causes of water pollution in the Phichit River is the encroachment of households. These households have constructed toilets and septic tanks directly within the river, discharging wastewater into the river. To address this issue, it has been decided to relocate these toilets as far away from the river as possible. A joint meeting with three local administrative organizations (LAOs) has concluded that toilets and septic tanks will be relocated away from the riverbank in Moo 5, Khlong Khachen sub-district, for the benefit of two

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households. Funding for this project will be provided by the "Father Puu" River Conservation Group.

5. Conclusion and Recommendation

Survey results revealed that the lower section of the Phichit River, which is a broader area, still contained a small amount of water. This led to a collaborative effort to find ways to replenish the Phichit River, ensuring continuous water flow. Villagers with agricultural land adjacent to the river were invited to help open the Dong Sretthi water discharge structure, which replenishes the Phichit River. This initiated a large-scale restoration process of the Phichit River basin, attracting more agencies to join the restoration efforts.

A significant driving force behind the "Father Puu" River Conservation Group's initiative to restore the Phichit River basin was the spark of an idea to revitalize the river. The group collaborated with local homes, temples, and schools to promote environmental awareness among villagers, encouraging them to regularly remove water hyacinth to maintain water quality.

Thanks to the collective efforts of villagers, local and national agencies, the Phichit River has been successfully revitalized. The river now has an improved drainage system, which reduces flooding and helps restore its ecosystem. Villagers have regained their reliance on the river as a source of protein. The success of the Phichit River restoration project is a testament to the strength of community involvement.

Additional Recommendations:

1. **Foster community engagement and awareness:** Encourage active participation and a sense of shared responsibility among community members.

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2. **Promote knowledge and facilitate processes for wastewater separation and reuse:** Educate the community about the importance of separating wastewater and explore ways to recycle it.
3. **Implement wastewater separation and reuse:** Establish systems to separate wastewater and utilize it for beneficial purposes.
4. **Install wastewater treatment systems:** Construct wastewater treatment facilities for buildings and communities, located away from the river.
5. **Focus on creating participatory activities and fostering a shared sense of responsibility:** Organize activities that promote community involvement and environmental consciousness.
6. **Establish an environmental conservation fund:** Create a fund to finance the construction of wastewater treatment systems.
7. **Form a provincial task force for wastewater management:** Establish a dedicated team to oversee wastewater management at the provincial level.
8. **Develop a sustainable river development plan:** Create a comprehensive plan for the long-term conservation and management of the river.
9. **Relocate buildings and houses encroaching on the riverbank:** Move structures that have illegally expanded into the river area.
10. **Strictly enforce existing laws:** Ensure that current environmental protection regulations are effectively implemented.
11. **Promote new legislation for the management and control of the Phichit River:** Advocate for the development of specific laws to protect and regulate the river.

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