Managing the Flow: Project Management Approaches to Unravelling Challenges in Malaysia's Flood Forecast and Warning Programme

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ABSTRACT

This paper examines the intricacies of Malaysia's flood forecast and warning programme, highlighting the significant challenges posed by recurrent flooding and the need for robust solutions. Utilizing a project management framework, this study identifies key problems such as inadequate infrastructure, data integration issues, and community engagement barriers. Leveraging established project management methodologies, the paper proposes strategic solutions designed to enhance the efficiency and effectiveness of flood prediction and response systems. By integrating technology with stakeholder collaboration and risk management practices, the proposed solutions aim to optimize resource allocation, improve decision-making processes, and ensure timely communication. The paper concludes with recommendations for policy updates and future research to bolster Malaysia's resilience to flood-related disasters, ultimately safeguarding communities and minimizing economic impacts.

Keywords: flood forecasting, warning system, project management, Malaysia

INTRODUCTION

The National Forecasting and Warning Program (PRAB) was established by the Department of Irrigation and Drainage Malaysia under the Ministry of Energy Transition and Water Transformation in response to the significant floods of December 2014, which impacted eight states: Kelantan, Terengganu, Pahang, Perak, Perlis, Johor, Sabah, and Sarawak. The program is focused on achieving four main objectives, directly benefiting flood victims. These objectives include developing a system capable of forecasting monsoon floods seven days in advance using weather forecast data, enhancing both the warning capacity and dissemination reach of the current warning systems, improving flood forecast accuracy, and creating a system to alert the public of flash floods 1 to 3 hours in advance (Public Info Banjir, n.d.). PRAB aims to transform existing flood forecasting and warning systems into more advanced frameworks, increasing their impact on the public. The transformation centers around four primary elements: extending early flood forecast duration, advancing early warning capabilities, enhancing the flood warning database system, and broadening the dissemination coverage.

Despite substantial investments, totaling 129 million, recent evaluations indicate a concerning lack of accuracy, with a success rate of merely 5.6%. This shortfall undermines the program's role in protecting communities from flooding's devastating effects (New Straits Times, 2024). Additionally, numerous problems encountered during the program's implementation have adversely affected its efficacy. This paper delves into the challenges contributing to project delays and explores both implemented and prospective solutions that the government can adopt to ensure the program's successful continuation. Flood forecasting and warning programs are critical components in the management of flood risks and the mitigation of their impacts on communities and infrastructure. These programs leverage a combination of meteorological, hydrological, and technological data to predict the likelihood of flooding events, allowing for timely and accurate dissemination of warnings to potentially affected areas.

The effectiveness of flood forecast and warning programs lies in their ability to provide communities with adequate notice and actionable information, thereby reducing potential damage and safeguarding lives. According to recent studies, timely and precise flood warnings can significantly decrease fatalities and economic losses associated with flooding events (James et al., 2023). By enabling individuals and

organizations to prepare and respond effectively, these warnings can minimize the impact of floods on both human populations and the built environment. Furthermore, advancements in technology, such as the integration of remote sensing, geographic information systems (GIS), and real-time data analytics, have enhanced the accuracy and reach of flood forecasting models (Chen & Muller, 2024). These technologies allow for the continuous monitoring of weather patterns and water levels, enabling more nuanced and geographically tailored warnings that can better inform local decision-making.

The role of community engagement and education also plays a crucial part in the success of flood forecast and warning programs. By educating the public about flood risks and response strategies, authorities can improve individual preparedness and resilience (Ramly, 2023). This notion is supported by the work of Silva and Torres (2024), who emphasize the importance of public awareness campaigns in improving the effectiveness of flood warnings and response behaviors. However, challenges remain in ensuring the efficacy of these programs, particularly in developing regions where resources and access to technology may be limited. The need for international cooperation and investment in technology transfer and capacity-building is critical to bridge these gaps and enhance global flood preparedness (Ramos & Evans, 2023).

CHALLENGES OF THE POGRAMME

Public Frustration

In 2021, Malaysia was taken by surprise by a flash flood disaster that impacted multiple states. Selangor was among the affected states, with Shah Alam being one of the cities unanticipated to experience such an issue. As a consequence of the flash floods, nearly 20,000 individuals were evacuated from seven states, with Klang and Shah Alam being hit hardest. Former Malaysian Prime Minister Ismail Sabri Yaakob stated that the government had anticipated floods during the monsoon season but did not expect them in Selangor, a region not typically affected, unlike the flood-prone east coast. This highlights a lack of preparedness or contingency planning by the government for flash floods in areas not historically affected.

The PRAB initiative was launched in December 2014, yet inadequate government action to manage and prevent these floods has led to significant financial losses and several fatalities. Residents of Taman Sri Muda, one of the areas severely affected, voiced their frustration and dissatisfaction with the government's flood management efforts (Prabu, 2023). The National Flood Forecasting Programme faced criticism from Taman Sri Muda residents due to its low accuracy of just 5.6%, despite RM145 million being invested. Following the incident, Aimi Latiff, a former Taman Sri Muda resident, expressed that investing in a program with such a low accuracy rate was wasteful, suggesting that funds should be directed towards tangible mitigation efforts instead. With an accuracy of just 5.6% and only a two-day advance warning capability, PRAB has not achieved its goals years after its inception, leaving people feeling disillusioned and uncertain about its effectiveness. The government's failure to provide timely warnings and identify potential flash flood zones has left the populace unprepared for such flood events (Prabu, 2023).

Inaccurate Prediction, Warning and Notification of Flood

The National Flood Forecasting and Warning Programme (PRAB) utilizes a variety of methods to predict flood events. This program is crucial for providing authorities and communities with early and precise flood information. However, PRAB has not met expectations, particularly in issuing warnings at least two days ahead of time. Persistent issues with inaccurate forecasts, delayed warnings, and ineffective notification systems have hindered efforts to mitigate the impact of flood-related disasters (Perera et al. 2019). PRAB's use of meteorological and hydrological models aims to predict the magnitude, timing, and location of floods. Unfortunately, these models sometimes fail to gather reliable data. Moreover, delays in PRAB’s flood warnings provide insufficient lead time for emergency preparedness and response, complicating preparations for those affected, such as moving valuables to safety or assembling emergency kits. The notification system within PRAB also faces challenges. While it employs various communication platforms, such as SMS alerts and mobile apps, these are often ineffective due to technical faults, coverage limitations in certain areas, and language barriers (Rosmadi et al. 2023). Consequently, some individuals remain unaware of flood warnings, complicating efforts to mitigate flood-related damage. Research conducted in Kelantan, Terengganu, and

Pahang indicates the program's awareness level is still low, with only 2 percent of respondents familiar with PRAB

The deficiencies in prediction accuracy, timely warnings, and communications within PRAB present significant challenges to effectively reducing flood-related damage. Therefore, it is essential for the government and relevant agencies to address these critical concerns to ensure PRAB fulfills its mission of delivering accurate forecasts, timely warnings, and effective notifications, thereby benefiting the community and the nation as a whole.

Insufficient Justification for the Costs

Organizations must carefully assess the costs and benefits of any program or initiative to ensure alignment with their goals and to avoid waste. This is particularly relevant in the case of Phase One of the National Flood Forecasting and Warning Program (PRAB). The implementation costs of such programs are significant, and without clear communication of the benefits or effectiveness of the flood forecasting and warning systems, or if more cost-effective alternatives exist, justifying the expense becomes problematic (Qistina, 2024). It is crucial for governments and organizations to ensure that the cost of such programs is consistent with their expected benefits and outcomes.

The cost justification for PRAB in Phase One is questionable. According to the Public Accounts Committee (PAC), the program's accuracy in measuring and predicting flood water levels was just 5.6%, raising concerns about its effectiveness. PAC Chairman Datuk Mas Ermieyati Samsudin noted during committee proceedings on January 16 that these accuracy issues impeded the program's ability to achieve its objectives and efficiently disseminate urgent information. With a project cost of RM129 million, the expectation for more accurate and effective flood forecasting and warning systems is understandable. Furthermore, the PAC found that delays in the installation of the PRAB system significantly impacted individuals affected by the floods due to the absence of a "subject to fines" clause, which could have ensured preventive maintenance. Additionally, challenges with 3G and 4G network upgrades created data transmission problems, further complicating the program's implementation and causing delays in work on the rivers of Kelantan, Terengganu, and Pahang.

These issues collectively highlight the lack of cost justification for the National Flood Forecasting and Warning Program. Addressing these challenges and making necessary improvements are essential to ensure the program's effectiveness and safeguard the well-being of communities affected by floods.

ACTION TAKEN TO MITIGATE THE CHALLENGES

Implementation of Preventive Measures by the Government

In the aftermath of the December 2021 flood events, the government has addressed the concerns and complaints of the residents of Taman Sri Muda in an exemplary manner. According to Thamm (2023), the Selangor government's efforts to support the community in both their recovery and in enhancing future flood resilience have been met with approval from local residents. In response to the flood catastrophe, the government has implemented various preventive measures and aid to those adversely affected, ranging from basic necessities and clothing to food and financial aid. This support was crucial in light of the severe impact of the flash flood disaster, which resulted in significant property losses amounting to tens of thousands of Ringgits and, tragically, the loss of family members (Prabu, 2023). The government’s aim in providing this assistance was to alleviate the immediate suffering of the flood victims and to ensure that their basic needs were adequately addressed.

Moreover, Menteri Besar Dato' Seri Amirudin Shari announced that RM1,000 would be allocated to each household affected by the floods from the Bantuan Selangor Bangkit fund, with RM10,000 earmarked for the families who lost loved ones in Selangor's recent flood disaster (Bernama, 2022). This financial assistance was designed to offer both relief and support during their time of mourning, and to aid affected households in their recovery and rebuilding efforts. Beyond immediate relief and compensation, the government also concentrated on facilitating the cleanup and recovery processes. Further assistance was pledged to all families impacted by

the disaster, resulting in each flood-affected household in Selangor receiving at least RM2,000, including an additional RM1,000 from the federal government to aid in cleanup and rehabilitation efforts. Additionally, the state government agreed to waive the water bill fees for affected customers for one month (Bernama, 2022). This comprehensive financial aid package aimed to bolster recovery efforts and assist individuals and communities in restoring their homes and livelihoods. Lastly, the government undertook preventive measures, such as cleaning the drains and constructing pump houses near the local bridge, to better manage water flow and mitigate the risk of future flooding.

Implementation of the Rain Distribution Simulation

According to Info Banjir (2024), the National Flood Forecasting and Warning Program (PRAB) relies on hydrological Data Detection Systems to gather essential data on flood disasters. This involves collecting information on rainfall, river levels, water discharge, soil moisture, and other pertinent parameters from hydrological monitoring stations. Despite these efforts, PRAB continues to encounter challenges in achieving accurate predictions, timely warnings, and efficient notification systems. As a result, the implementation of Rain Distribution Simulation is advocated to enable accurate, timely, and early announcements regarding flood risks. State Infrastructure, Public Amenities, Agriculture Modernisation, and Agro-Based Industry Committee Chairman Ir. Izham Hashim has indicated that the government must move beyond conventional methods that primarily focus on upstream areas for water storage to improve early flood forecasting. Instead, the government should encourage PRAB to conduct profiling or topographical assessments across river systems and terrain to better understand the dynamics of water flow under flood conditions and locations (Bernama, 2022).

Rain Distribution Simulation involves modeling the spatial and temporal patterns of rainfall within a specific area. By analyzing historical data and employing advanced modeling and simulation techniques, meteorologists can gain a comprehensive understanding of precipitation dynamics, including rainfall intensity, duration, frequency, and geographical distribution—critical factors for accurate flood prediction. The adoption of Rain Distribution Simulation would enable PRAB to forecast the occurrence and location of severe rainfall events more effectively. This foresight would allow authorities to issue early warnings to the public and emergency services, facilitating preventative measures such as setting up relief centers and coordinating rescue and food supply efforts. Moreover, by comparing simulated rainfall data with actual measurements, meteorologists can refine their models, enhancing their accuracy and reliability. This iterative approach ensures that PRAB warnings are as precise and reliable as possible. Therefore, PRAB should not depend solely on hydrological data detection technologies for rainfall data collection, as these methods are insufficient for fully developing PRAB's flood prediction and warning capabilities.

Importance to Track Time, Cost, Quality and Provision

Development projects are evaluated based on four key criteria: time, cost, quality, and provision. Time is critical for ensuring smooth progress; cost management is essential for maintaining financial control; quality assures that objectives are met; and provision guarantees that all requirements are fulfilled. The Public Accounts Committee (PAC) has proposed six measures for PETRA and the Department of Irrigation and Drainage (JPS) to enhance the National Flood Forecasting and Warning Program (PRAB) in Malaysia. Among these measures is the conversion of 79 out of 118 monitoring stations to Remote Terminal Units (RTUs). RTUs are sophisticated devices designed to collect and transmit real-time data on water levels, rainfall, and other vital parameters. This upgrade will significantly enhance the accuracy and efficiency of the PRAB system, improving flood forecasting capabilities and the timely dissemination of warnings. Additionally, this conversion will ensure comprehensive data coverage and availability across flood-prone regions, thereby facilitating more effective decision-making and response strategies during flood events. Ultimately, this action will contribute positively to flood management and mitigation efforts in Malaysia (Choy, 2024).

The PAC has granted a two-month period for PETRA and JPS to report on their progress in implementing the proposed recommendations. This time frame is crucial for ensuring accountability and transparency in executing these measures. The two-month window provides PETRA and JPS with the opportunity to diligently implement the recommended actions, address any arising challenges, and make necessary adjustments. The

PAC's allocation of this period underscores their commitment to actively overseeing the progress made by PETRA and JPS. By requiring regular updates, the PAC can evaluate the effectiveness of the actions taken and offer additional guidance or support if necessary. This open line of communication reflects the dedication of PETRA and JPS to addressing recommendations and promoting continuous improvement.

SUGGESTIONS AS PROJECT MANAGEMENT PRACTICES

Identify the Needs, Problems and Opportunity of the Project

Identifying Needs: A project must begin with a clear identification of the needs it aims to fulfill. This involves a rigorous assessment of what is lacking or required to meet specific objectives or desires, either within an organization or a community. Needs assessment helps in defining the project's purpose and guiding decision-making processes. It involves gathering input from stakeholders, analyzing data, and aligning the project's goals with the strategic priorities of the stakeholders (Nguyen, 2021). This ensures that the project is relevant and provides tangible benefits. The primary need of a flood forecasting and warning program is to protect lives and minimize property damage by providing timely and accurate information about flood risks. This involves the need for advanced data collection systems, such as meteorological and hydrological sensors, to continuously monitor weather conditions and water levels. The program must also fulfill the need for effective communication channels to disseminate warnings to at-risk communities and emergency responders promptly. Understanding these needs is fundamental to ensuring that the program effectively safeguards communities against flood hazards.

Understanding Problems: Identifying problems is essential to ensuring that the project addresses specific challenges that obstruct desired outcomes. This requires a detailed examination of the existing conditions and an understanding of the root causes of these issues. Problem identification helps in clarifying why the project is necessary and what obstacles it needs to overcome. By understanding the problems, project planners can develop targeted solutions that directly address these challenges and enhance the overall efficacy of the project. Several problems can impede the effectiveness of a flood forecasting and warning program. Inaccurate prediction models, delayed warnings, and insufficient communication infrastructure are common issues. Additionally, there may be challenges related to data integration from various sources, the reliability of technology, and the lack of community awareness or preparedness. Addressing these problems requires identifying weaknesses in current systems, improving the accuracy of models using state-of-the-art technology, and ensuring robust and redundant communication systems to reach all vulnerable populations.

Recognizing Opportunities: In parallel with needs and problems, recognizing opportunities is crucial for the success of any project. Opportunities represent situations where the project can achieve more than just solving problems; they might include leveraging new technologies, entering untapped markets, or maximizing resources to surpass the expected outcomes. Identifying opportunities allows for strategic thinking and innovation, enabling the project to add value beyond its initial goals and providing competitive advantages or additional benefits to stakeholders. Opportunities for enhancing a flood forecasting and warning program include leveraging advancements in technology, such as machine learning algorithms for better predictive modeling and IoT devices for real-time data collection (Green and White, 2022). Collaborations with academic institutions and research organizations can lead to innovations in flood modeling and risk assessment. Additionally, integrating community feedback and participatory approaches in program design can improve public trust and compliance with warnings. There is also an opportunity to enhance international cooperation, sharing knowledge and resources across borders to improve regional flood preparedness.

Estimates and Manage Costs Effectively

Effective and management are crucial for the sustainability and success of a flood forecasting and warning program. This process starts with accurately estimating the financial requirements for essential infrastructure, ongoing operations, and potential contingencies. Budget allocation should prioritize critical components such as data accuracy, timely warning systems, and community training. Incorporating risk management and contingency planning helps to address unexpected expenses, while seeking efficiencies—like leveraging cost-effective technology and automating processes—ensures operations remain within budget (Thompson, 2020).

Performance monitoring is essential for accountability, allowing for financial adjustments to improve future cost-effectiveness. By systematically managing these financial aspects, the program can maximize its resources to effectively mitigate flood risks and protect communities (Smith and Brown, 2021).

FINAL REMARKS

Malaysia has encountered various challenges related to the delayed implementation of its Flood Forecast and Warning Program (PRAB), including inaccurate forecasts, inadequate justifications for high costs, and general dissatisfaction with flood forecasting efforts. In response, the government has adopted a comprehensive approach, prioritizing improvements in infrastructure and land-use planning, and the incorporation of advanced technologies such as Rain Distribution Simulation to enhance the timeliness and accuracy of flood forecasts. Additionally, there is an emphasis on adhering to strict project management principles concerning time, cost, and quality to ensure efficient resource use and timely project completion. It is recommended that a thorough identification of the program's needs, problems, and opportunities be conducted to facilitate more effective planning and resource allocation. Furthermore, enhancing project management practices, including rigorous cost estimation and control, is crucial to preventing delays and cost overruns. By implementing these strategies, Malaysia aims to bolster its flood forecasting and warning capabilities, thereby providing better protection for its citizens and mitigating the impact of flooding across the country.

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