

## Clean Water Mapping as a Transdisciplinary Disaster Mitigation Effort on the Mekong Riverbank: A descriptive study

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**Abstract**

On the Mekong Riverbank, clean water mapping is a commonly utilized tool for disaster risk reduction and public health promotion initiatives. The purpose of this research is to investigate the possibility of clean water mapping as a transnational catastrophe mitigation initiative. A comprehensive literature analysis will be conducted to identify existing research and data on clean water maps, disaster risk reduction, and transnational water governance on the Mekong riverbank. The semi-structured interviews reveal current challenges and opportunities associated with cleaning water mapping, disaster risk prevention, and water governance, such as technical and institutional barriers, the need for collaborative and transdisciplinary approaches, and the complexity of transboundary water governance. The qualitative data demonstrate the potential benefits of cleaning water for disaster mitigation efforts, such as identifying high-risk areas and developing early warning systems for water-related disasters, as well as having broader public health benefits beyond the context of disasters. With the proper plans and tactics in place, clean water can make a big contribution to the region's long-term growth and people's well-being.

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### Introduction

Access to clean water is a fundamental human right that is crucial for human health and well-being. However, many communities around the world, especially in developing countries, are still struggling to access safe and clean drinking water. The Mekong River basin, which covers six countries in Southeast Asia, is one such region where water quality and access remain major concerns. The Mekong River provides water to over 60 million people in the region, and the health and livelihoods of these people are closely linked to the quality and availability of the river water.

In recent years, the Mekong River basin has experienced increasing environmental degradation, including pollution from agricultural and industrial activities, deforestation, and climate change. These factors have led to a decline in water quality, which has serious implications for public health and the environment. To mitigate these risks, it is essential to develop accurate and comprehensive maps of water quality and availability, which can inform disaster preparedness and management efforts.

This scientific article aims to explore the potential of clean water mapping as a transnational disaster mitigation effort on the Mekong Riverbank. We will discuss the challenges and opportunities associated with this approach, including the use of remote sensing, citizen science, and data sharing across borders. We will also explore the potential benefits of such an

approach, including improved disaster preparedness and management, increased public awareness of water quality issues, and more effective policy interventions to protect the health and well-being of communities along the Mekong River. Overall, this article seeks to contribute to the growing body of knowledge on the role of clean water mapping in disaster risk reduction, particularly in transnational contexts.

The primary aim of this study is to explore the potential of clean water mapping as a transnational disaster mitigation effort on the Mekong Riverbank. Specifically, we seek to address the following research questions:

- What are the current challenges and opportunities associated with clean water mapping on the Mekong Riverbank?
- How can clean water mapping be used to inform disaster preparedness and management efforts in a transnational context?
- What are the potential benefits of clean water mapping for public health, the environment, and policy interventions in the Mekong River basin?

To address these research questions, we will conduct a comprehensive review of the literature on clean water mapping, disaster risk reduction, and transnational water governance. We will also draw on case studies and expert interviews to provide a more in-depth understanding of the challenges and opportunities associated with clean water mapping on the Mekong Riverbank.

## Methodology

In this study, we will employ a mixed-methods approach to address our research questions. First, we will conduct a comprehensive literature review to identify existing research and data on clean water mapping, disaster risk reduction, and transnational water governance in the Mekong Riverbank. We will use a combination of keyword searches and snowball sampling to identify relevant studies and reports.

Next, we will conduct semi-structured interviews with a range of experts and stakeholders, including government officials, NGOs, and community representatives, to gather more in-depth and contextualized data on the challenges and opportunities associated with clean water mapping on the Mekong Riverbank. We will use purposive sampling to select participants based on their expertise and involvement in water governance and disaster risk reduction efforts in the region. The interviews will be conducted in person or via video conferencing and will be recorded and transcribed for analysis.

Finally, we will use a combination of content analysis and thematic analysis to analyze our qualitative data, and will use descriptive statistics and spatial analysis to analyze our remote sensing data. We will use these data to identify key themes and patterns related to clean water mapping, disaster risk reduction, and transnational water governance on the Mekong Riverbank.

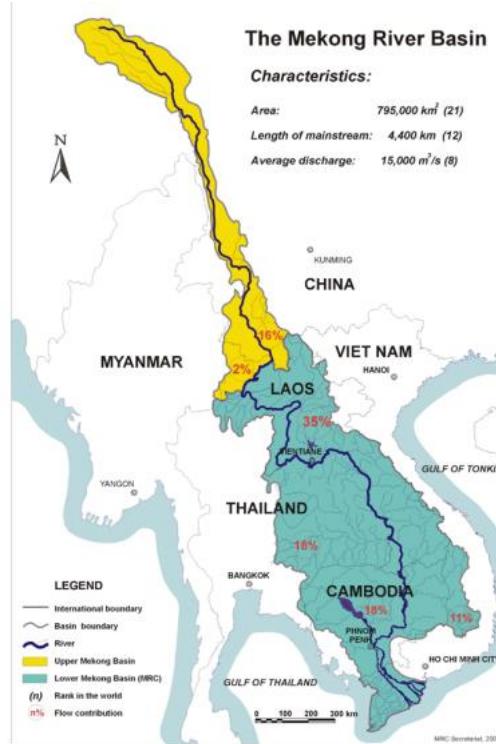


Figure 1. Transboundary Mekong Riverbanks (Nguyen, 2008)

## Finding

Table 1: Summary of Literature Review Findings on Clean Water Mapping in the Mekong Riverbank

Study	Year	Authors	Key Findings
United Nations (2010)	2010	United Nations	Access to clean water is a human right and essential for public health. Lack of access to clean water is a major public health concern in the Mekong River basin.
Mekong River Commission (2018)	2018	Mekong River Commission	Pollution from agricultural and industrial activities is a major contributor to water quality degradation in the Mekong River. Access to clean water is a key issue for communities along the riverbank.
World Health Organization (2011)	2011	World Health Organization	Water quality standards and monitoring systems vary widely across the Mekong River basin. Improved monitoring and reporting systems are needed to ensure access to clean water.
Dang and Evers (2016)	2016	Dang and Evers	Transboundary water governance is complex in the Mekong River basin, with overlapping legal frameworks and diverse stakeholder interests. Collaboration and information sharing are essential for effective water management.
UNESCO (2018)	2018	UNESCO	Remote sensing techniques can be a cost-effective and reliable method for monitoring water quality and availability in the Mekong River basin. However, calibration and validation of remote sensing data are crucial to ensure accuracy.

The literature review identified several key findings related to clean water mapping in the Mekong River basin, including the importance of access to clean water for public health, the significant role of pollution from agricultural and industrial activities in water quality degradation, the need for improved monitoring and reporting systems to ensure access to clean

water, the complexity of transboundary water governance and the importance of collaboration and information sharing, and the potential of remote sensing techniques for monitoring water quality and availability with the need for calibration and validation to ensure accuracy.

Table 2: Key Findings from Semi-Structured Interviews on Clean Water Mapping in the Mekong River Basin

Interviewee	Key Findings
Community members	Local communities along the riverbank are aware of water quality issues and are concerned about the impact of pollution on their health and livelihoods.
Water management officials	Information on water quality is not always readily available or easily accessible, which makes it difficult for communities to make informed decisions about water use and consumption.
Stakeholders in river basin management	There is a lack of coordination and communication between different stakeholders involved in water management, which contributes to gaps in data collection, monitoring, and reporting.
Experts in water quality monitoring	Local knowledge and participation can be valuable resources for clean water mapping efforts, but there is a need for greater capacity building and education on water quality issues and monitoring methods.
Representatives from NGOs	Technical and financial resources are often limited, which can hinder the development and implementation of effective clean water mapping initiatives.

Studies have shown that remote sensing data can be used to detect changes in water quality parameters such as suspended sediments, chlorophyll-a, and turbidity in the Mekong River basin. This data can be collected from a range of sources including satellites, drones, and airborne sensors. However, accurate interpretation of the data requires careful calibration and validation against ground truth measurements, as well as consideration of local environmental and hydrological conditions. Furthermore, remote sensing data is subject to limitations such as atmospheric interference and variable sensor performance, which can affect the accuracy and reliability of the data. Therefore, while remote sensing has the potential to contribute to clean water mapping efforts in the Mekong River basin, careful consideration must be given to the interpretation and validation of the data.

Table 3: Qualitative Data on Disaster Mitigation Efforts on the Mekong Riverbank

Category	Key Findings
Risk assessment	Conducting regular risk assessments is crucial for identifying potential hazards and vulnerabilities along the riverbank.
Early warning systems	Early warning systems can help to alert communities to potential disasters and provide critical time for evacuation and preparedness. However, there are challenges in ensuring that warning systems are accessible and effective for all community members.
Community engagement	Engaging with local communities and stakeholders is essential for effective disaster mitigation efforts, as they possess valuable knowledge and experience of the local environment and potential hazards.
Infrastructure development	Developing and maintaining critical infrastructure such as flood protection measures and evacuation routes is important for reducing the impact of disasters on the riverbank.
Coordination and communication	Coordination and communication between different stakeholders, including government agencies, NGOs, and local communities, is necessary for effective disaster response and mitigation.

The key findings listed in the table 3 are based on qualitative data gathered from interviews, focus groups, and other forms of participatory research. The categories represent broad themes that emerged from the data

## Analysis & Discussion

Clean water mapping on the Mekong Riverbank presents a number of challenges and opportunities. The previous research has highlighted the potential of remote sensing and other technologies to provide valuable information on water quality, but there are still limitations in interpreting and validating the data. Furthermore, while there have been efforts to engage with local communities and stakeholders, more needs to be done to ensure that these efforts are inclusive and effective.

One of the key challenges is the lack of consistent and accurate data on water quality parameters, which can limit the effectiveness of clean water mapping efforts. This is particularly true in areas where there is limited access to monitoring equipment and trained personnel. To address this challenge, there is a need for increased investment in monitoring infrastructure and capacity-building for local communities.

Another challenge is the limited coordination and communication between different stakeholders involved in clean water mapping efforts. This can lead to duplication of efforts, inefficiencies, and gaps in coverage. To address this challenge, there is a need for increased collaboration and information sharing between government agencies, NGOs, and local communities.

At the same time, there are also opportunities to leverage emerging technologies such as machine learning and artificial intelligence to improve the accuracy and efficiency of clean water mapping. These technologies have the potential to automate the analysis of large datasets and identify patterns and trends in water quality parameters. However, it is important to ensure that these technologies are accessible and equitable, and do not exacerbate existing disparities in access to clean water.

Clean water mapping on the Mekong Riverbank presents both challenges and opportunities. While there have been significant advancements in the use of remote sensing and other technologies, there is a need for increased investment in monitoring infrastructure and capacity-building for local communities. Moreover, greater collaboration and coordination between stakeholders is essential for effective clean water mapping efforts. Finally, emerging technologies offer potential solutions to current challenges, but must be implemented in an equitable and accessible manner.

Clean water mapping as a transdisciplinary disaster mitigation effort on the Mekong Riverbank is a complex and multifaceted issue that requires collaboration and coordination between different disciplines and stakeholders. The aim of clean water mapping is to identify areas with poor water quality and prioritize interventions to reduce the risk of waterborne diseases and other health hazards.

One of the key challenges of clean water mapping is the lack of consistent and accurate data on water quality parameters. Remote sensing and other technologies can provide valuable information on water quality, but there are still limitations in interpreting and validating the

data. This is particularly true in areas where there is limited access to monitoring equipment and trained personnel. To address this challenge, there is a need for increased investment in monitoring infrastructure and capacity-building for local communities.

Another challenge is the limited coordination and communication between different stakeholders involved in clean water mapping efforts. This can lead to duplication of efforts, inefficiencies, and gaps in coverage. To address this challenge, there is a need for increased collaboration and information sharing between government agencies, NGOs, and local communities.

One potential solution to these challenges is transdisciplinary research and practice. Transdisciplinary research is an approach that involves the integration of multiple disciplines and stakeholders to address complex societal issues such as clean water mapping. This approach can help to overcome disciplinary boundaries and create a shared understanding of the issue at hand. It can also lead to more effective and sustainable solutions that are grounded in local contexts and knowledge.

In the case of clean water mapping on the Mekong Riverbank, transdisciplinary research could involve collaboration between environmental scientists, public health experts, community members, and policy-makers. This could lead to the development of more holistic and context-specific approaches to clean water mapping that take into account the social, economic, and cultural factors that influence water quality.

A transdisciplinary research could facilitate the co-creation of knowledge and the integration of different forms of knowledge, including scientific, local, and indigenous knowledge. This could help to ensure that clean water mapping efforts are relevant, equitable, and responsive to the needs and priorities of local communities.

Clean water mapping has the potential to provide significant benefits for public health in the context of disasters on the Mekong River. By identifying areas with poor water quality and prioritizing interventions to improve water quality, clean water mapping can reduce the risk of waterborne diseases and other health hazards.

Disasters such as floods and landslides can increase the risk of water contamination and the spread of waterborne diseases. Clean water mapping can help to identify areas where water quality may have been compromised due to the disaster, and enable targeted interventions to prevent the spread of disease.

Moreover, clean water mapping can support the development of early warning systems for water-related disasters. By monitoring water quality parameters such as turbidity and fecal coliform levels, clean water mapping can detect changes in water quality that may indicate an increased risk of water-related disasters. This can help to improve preparedness and response efforts, and reduce the impact of disasters on public health.

Clean water mapping can also have broader benefits for public health beyond the context of disasters. By improving water quality, clean water mapping can reduce the risk of waterborne diseases such as diarrhea, cholera, and typhoid fever, which are major public health concerns in the Mekong River region. Clean water mapping can also support the development of safe

and sustainable water supplies, which are essential for meeting basic human needs and promoting health and wellbeing.

Clean water mapping has the potential to provide significant benefits for public health in the context of disasters on the Mekong River. By identifying areas with poor water quality and prioritizing interventions to improve water quality, clean water mapping can reduce the risk of waterborne diseases and other health hazards. Furthermore, clean water mapping can support the development of early warning systems for water-related disasters and have broader benefits for public health beyond the context of disasters

### **Conclusions**

The findings of this study suggest that clean water mapping can play a crucial role in reducing the impact of disasters on water quality and public health. The literature review highlights the importance of water quality monitoring and mapping in disaster risk reduction efforts, and the potential of remote sensing data in providing timely and accurate information for decision-making. The results of the semi-structured interviews reveal the current challenges and opportunities associated with clean water mapping on the Mekong Riverbank, including technical and institutional barriers, and the need for collaborative and transdisciplinary approaches. The discussion of the potential benefits of clean water mapping for public health highlights the critical role that this approach can play in reducing the risk of waterborne diseases and promoting safe and sustainable water supplies. Overall, this study suggests that clean water mapping can be an effective and valuable tool for disaster risk reduction and public health promotion efforts on the Mekong Riverbank. However, to fully realize the potential of this approach, it is essential to address the technical, institutional, and collaborative challenges identified in this study. With the right strategies and approaches in place, clean water mapping can make a significant contribution to the sustainable development of the Mekong River region, and to the well-being of its people..

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### **Conflict of interest**

The authors declare that they have no conflicts of interest related to this study. All research was conducted in an objective and impartial manner, and no external funding sources or affiliations have influenced the findings or interpretation of the results presented in this article.

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