

IDENTIFICATION OF THE POTENTIALS AND CONSTRAINTS OF SELOKAN MATARAM UTILIZATION THROUGH A HERITAGE TOURISM APPROACH

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Abstract:

This article examines the potentials and constraints of utilizing Selokan Mataram as a heritage tourism resource in the Special Region of Yogyakarta. As an active irrigation structure designated as cultural heritage, Selokan Mataram possesses interconnected historical, social, technological, cultural, scientific, and landscape values. However, its continuing technical function also creates challenges for tourism development and heritage management. This study aims to identify the significant values, potentials, constraints, and tourism readiness of Selokan Mataram while formulating preliminary management strategies. The research employs a descriptive-analytical qualitative approach through literature review by integrating values-based heritage management and the 4A tourism framework (attraction, amenity, accessibility, and ancillary). The findings indicate that Selokan Mataram has strong potential as a living cultural landscape supported by historical narratives, irrigation technology, and its relationship with agrarian landscapes and community life. Nevertheless, its tourism readiness remains limited due to environmental degradation, infrastructure deterioration, inadequate facilities, and the absence of tourism-oriented institutional management. Therefore, tourism development should be implemented selectively and gradually through environmental improvement, interpretative strengthening, infrastructure rehabilitation, and collaborative institutional management to maintain a balance between conservation, tourism utilization, and irrigation functions.

Keywords: Selokan Mataram, heritage tourism, values-based heritage management, cultural landscape, 4A tourism framework

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1. Introduction

Selokan Mataram is an irrigation structure that plays a significant role in supporting the agricultural system in Special Region of Yogyakarta, particularly in Sleman Regency. The structure extends from the Opak River to the Progo River, traversing eight

districts, namely Kalasan, Depok, Gamping, Mlati, Godean, Seyegan, Tempel, and Ngluwar. The primary function of Selokan Mataram as an irrigation canal has been well maintained, making it one of the technical infrastructures that demonstrates continuity of function since its construction. In 2021, Selokan Mataram was officially designated as a Provincial Cultural Heritage Structure through the Decree of the Governor of the Special Region of Yogyakarta Number 231/KEP/2021. This designation was based on the historical, technological, educational, cultural, and economic values embodied within the structure (Gubernur Daerah Istimewa Yogyakarta, 2021)

The construction of Selokan Mataram began during the Japanese occupation between 1942 and 1944 under the direction of Sultan Hamengku Buwono IX. The primary objective of the canal development was to protect the people of Yogyakarta from forced labor (Romusha) imposed by the Japanese occupation government. Through this project, the Sultan ensured that local laborers could work within their own region, thereby avoiding exploitation outside Java (Syafudin, 2001). The construction not only provided a solution to the social issue of forced labor but also contributed to increasing agricultural productivity through an irrigation system that continues to function to the present day.

In the discourse of *heritage tourism*, cultural heritage is not merely understood as a tourism object, but as a cultural resource that requires a balance between value preservation and tourism utilization. This approach emphasizes the importance of value interpretation, community involvement, and the sustainability of site functions in heritage-based tourism development (Avrami et al., 2019). Therefore, the development of *heritage tourism* is not solely oriented toward creating attractions, but also toward enabling visitors to understand and experience historical, social, technological, and landscape values contextually.

Various studies on cultural heritage management have examined the identification of potentials and constraints in the development of *heritage tourism* through spatial approaches, cultural landscape planning, and area management analysis (Suprihardjo, 2014; Febrianto, 2018; Maharani, 2024). These studies generally focus on heritage areas that already function as tourist destinations or are intended for cultural tourism development. Meanwhile, studies on Selokan Mataram have primarily discussed irrigation systems, environmental conditions, water quality, and conservation pressures caused by urbanization and changes in the cultural landscape (Syafudin, 2001; Rahmi & Setiawan, 2021; Kusumawati, 2019). These studies demonstrate that Selokan Mataram possesses significant cultural values and faces various threats to the sustainability of its cultural landscape; however, they have not specifically addressed its potential utilization as *heritage tourism*. On the other hand, studies concerning the utilization of canal structures as part of cultural heritage tourism in Indonesia remain limited. Adi et al. (2022) demonstrated that canal revitalization in the Muarajambi Temple Complex potentially alters the waterscape and diminishes the cultural context attached to the area (Adi, et al., 2022). This indicates that the utilization of canal structures for tourism cannot be separated from considerations of heritage values and existing functions. In this context, Selokan Mataram is viewed not only as a cultural

heritage structure, but also as an active irrigation system that possesses tourism potential while simultaneously presenting utilization limitations.

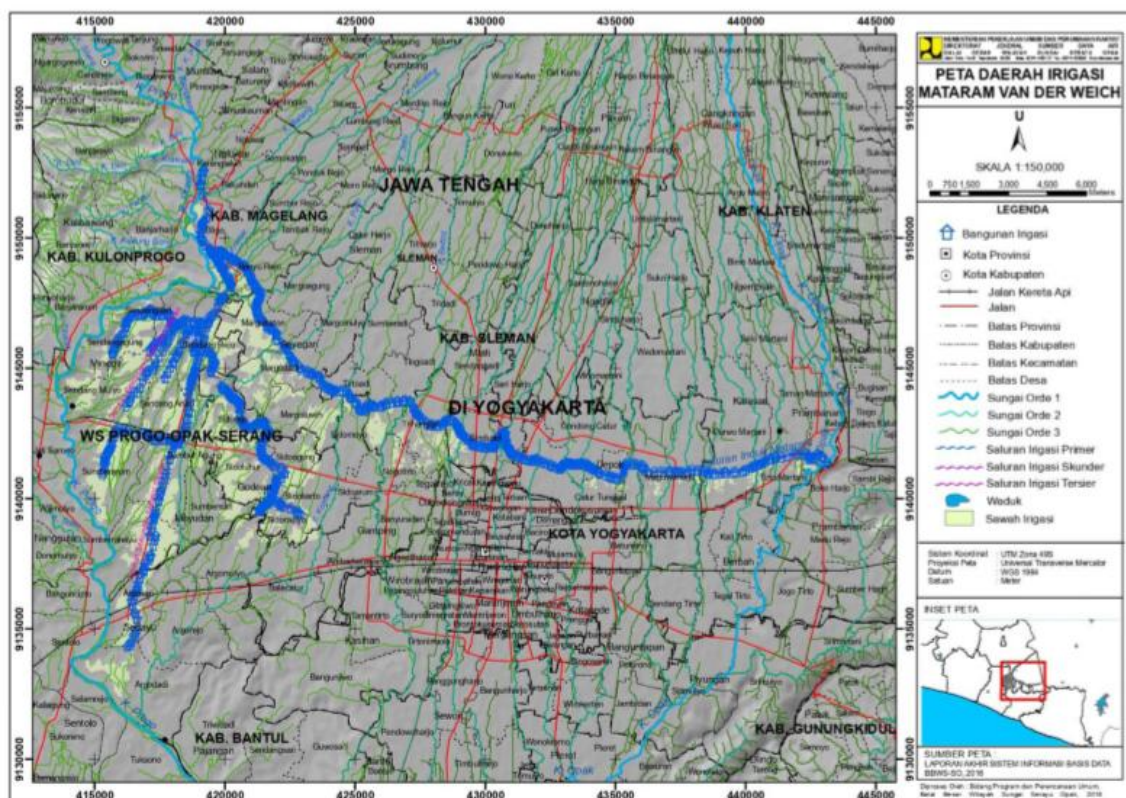


Figure 1. Map of the Selokan Mataram and Van der Wijck Waterways (Mataram Irrigation Network)
 Source: BBWS Serayu Opak (Dewanti, 2023)

Based on these conditions, this article seeks to fill the existing research gap by integrating a *values-based heritage management* approach with 4A tourism analysis to identify the potentials, constraints, and level of readiness of Selokan Mataram as *heritage tourism*. This approach is intended to demonstrate that heritage tourism development in active irrigation structures requires different strategies from those applied to conventional cultural tourism sites, as it must simultaneously consider the sustainability of technical functions and the preservation of heritage values.

2. Method

This study employs a descriptive-analytical qualitative approach through literature review by integrating *values-based heritage management* and the 4A tourism analysis (*attraction, amenity, accessibility, and ancillary*). The data were obtained from various written sources, including scientific journals, books, research reports, policy documents, and other publications related to Selokan Mataram, cultural heritage management, and *heritage tourism*.

The analysis was conducted in several stages. The first stage involved identifying the significant values of Selokan Mataram using the *values-based heritage management* approach (Avrami et al., 2019). At this stage, the data were analyzed to identify

historical, social, technological, cultural, educational, and landscape values based on information regarding the history of construction, irrigation functions, technical systems, community involvement, and the relationship between the canal and its surrounding environment. The output of this stage was the classification of Selokan Mataram's significant values. The second stage involved identifying potentials by linking the identified heritage values with possible forms of tourism experiences and heritage interpretation. The analysis focused on how these values could be translated into *heritage tourism* potentials without diminishing the canal's primary function as an active irrigation system. The third stage involved identifying constraints through a review of various issues discussed in the literature, such as environmental pollution, physical deterioration of the canal, limited facilities, urbanization pressures, and management-related challenges. The results of this stage were used to understand the factors influencing the possibility of tourism development. The fourth stage consisted of readiness analysis using the 4A approach (Cooper, 2005), which was applied to evaluate the readiness level of Selokan Mataram as *heritage tourism*. The *attraction* aspect was analyzed based on the appeal of cultural and landscape values; *amenity* was assessed through the availability of supporting facilities; *accessibility* was examined through access conditions and the canal's physical characteristics; while *ancillary* was evaluated based on institutional and management conditions. The final stage involved formulating a *preliminary strategy* through the synthesis of the identified potentials, constraints, and 4A analysis results. This strategy is not intended as a final recommendation, but rather as an initial management direction that still requires further validation through field research.

This study has limitations because the entire analysis was conducted solely through literature review without field observation or interviews with stakeholders. Therefore, the study produces preliminary strategies that are conceptual and interpretative in nature, particularly in assessing tourism readiness and formulating management strategies.

3. Results and Discussion

3.1. Identification of the Significance Values of Selokan Mataram as Heritage Tourism (Values-Based Heritage Management)

Based on the Decree of the Minister of Education, Culture, Research, and Technology Number 317/M/2023 concerning the Designation of Selokan Mataram as a Cultural Heritage Structure, Selokan Mataram possesses significant values, namely:

- "c. having special significance for history, as it represented Sultan Hamengku Buwono IX's strategy to prevent the mobilization of Romusha laborers outside the Yogyakarta region; for science, because it integrated traditional surface and underground irrigation systems by considering the topographical characteristics of the hilly areas between the Progo and Opak Rivers; and/or for education, because it serves as an example of Sultan Hamengku Buwono IX's diplomatic capability; and
- d. possessing cultural value for strengthening national identity, as one of the examples of a mid-twentieth-century artificial canal utilizing the traditional

agrarian knowledge and technology of the Yogyakarta community.” (*Keputusan Menteri Pendidikan, Kebudayaan, Riset, Dan Teknologi Republik Indonesia Nomor 317/M/2023 Tentang Penetapan Selokan Mataram Sebagai Struktur Cagar Budaya*, 2023).

The construction of Selokan Mataram was grounded in various considerations reflecting philosophical, socio-economic, and nationalist values. Philosophically, the concept was associated with the teachings of Sunan Kalijaga regarding the importance of managing water flows from the two rivers flanking the Yogyakarta region, which later became the conceptual foundation for Sultan Hamengku Buwono IX in designing the canal. From a socio-economic perspective, the construction of Selokan Mataram aimed to protect local communities from forced labor (*Romusha*) during the Japanese occupation while simultaneously providing an irrigation system to support agricultural activities. Furthermore, Sultan Hamengku Buwono IX's success in negotiating with the Japanese authorities to secure financial support for the project reflected a form of nationalism expressed through policies oriented toward public welfare (Utomo, 2021). Sultan Hamengku Buwono IX convinced the Japanese administration that the irrigation system would increase agricultural productivity and support Japan's military food supply needs by emphasizing the limited agricultural potential of Yogyakarta, which primarily produced cassava and dried cassava. He proposed the construction of a canal connecting the Progo River in the west and the Opak River in the east to irrigate agricultural land. The project commenced on 20 July 1944 and was completed on 5 July 1945, entirely constructed by the people of Yogyakarta under the coordination of the Sultanate. The project engineers were Ir. Hiromatsu and Ir. K.R.T. Martonegoro. This 30.8-kilometer canal was recognized as “the largest irrigation project in Java,” involving approximately 2.72 million labor days with an average of 7,700 workers per day, including unpaid laborers. Due to the lack of heavy equipment, construction relied heavily on manual labor, while construction materials were substituted with local resources such as crushed brick and timber (Dewanti, 2023). Initially named *Gunsei Hasuiro* and *Gunsei Yosuiro*, the term *Selokan Mataram* began to be used in 1944. Following its inauguration in 1945, the irrigation system continued to undergo modifications, including the addition of bridges, sluice gates, washing steps, and aqueducts. Cold lava floods from Mount Merapi repeatedly damaged the aqueduct at the Krasak River, which in 1970 was replaced with a reinforced concrete siphon with a discharge capacity of 5–10 m³/second. Major renovations were conducted in 1950 and 1980 by the Department of Public Works, followed by revitalization efforts initiated in 2021 and targeted for completion in 2023 to optimize irrigation for 544 hectares of rice fields (Gubernur Daerah Istimewa Yogyakarta, 2021).

Based on the description above, *Selokan Mataram* embodies interconnected historical, educational, cultural, social, technological, and scientific values. Its historical value is reflected in the background of its construction during the Japanese occupation through the diplomatic strategy of Sultan Hamengku Buwono IX, demonstrating the role of local policy in responding to colonial conditions. Its educational value is demonstrated through the construction process itself, which illustrates Sultan Hamengku Buwono IX's

diplomatic capability in protecting the interests of the local population during the occupation period. Its cultural value is represented through its contribution to strengthening national identity as an example of a mid-twentieth-century artificial canal that utilized the traditional agrarian knowledge and technology of the Yogyakarta community. Its social value can be observed through community participation in the construction process and its continuing function as an irrigation system supporting agricultural activities. Meanwhile, its technological value is reflected in the construction methods that relied on manual labor, the use of local materials, and the evolution of technical structures such as aqueducts and siphons that underwent modifications over time. Furthermore, its scientific value is evident in the implementation of an irrigation system combining surface and underground water flows while considering the topographical conditions of the region, particularly the hilly landscape situated between the Progo and Opak Rivers.

3.2. Identification of the Potentials for Utilizing Selokan Mataram as Heritage Tourism

Based on the identified significance values, the potential of Selokan Mataram as a heritage tourism resource lies in its capacity to be developed as a spatial experience system integrating historical narratives, technical functions, and a living cultural landscape. Due to its linear form and continuing function as an active irrigation canal, Selokan Mataram is more appropriately developed as a tourism corridor with multiple visitation points rather than as a single destination.

This potential is primarily supported by its historical and educational values, which are reflected in the narrative of Selokan Mataram's construction during the Japanese occupation and the role of Sultan Hamengku Buwono IX in protecting local communities through diplomatic strategies (Utomo, 2021). Narrative-based approaches have been shown to enhance visitor engagement and appreciation toward cultural heritage resources (Roque, 2022). In addition, the potential of Selokan Mataram is also reinforced by its social value, as demonstrated through community involvement in the construction process and the continuing function of the canal as part of everyday life. Agricultural activities, water distribution systems, and community interactions with the canal indicate the existence of a living heritage that continues to persist to the present day (Rahmi & Setiawan, 2021). This social value creates opportunities for the limited development of activity-based tourism, such as observing irrigation systems and agrarian practices, without altering the canal's primary function.

Further potential emerges from the technological and scientific values embodied in the canal's construction system, including siphons, aqueducts, and water distribution mechanisms adapted to the region's topographical conditions (Dewanti, 2023). These attributes function not only as technical infrastructures but also as representations of local knowledge and technological adaptation during their period of construction. Within the context of cultural tourism, such technical systems, which remain directly observable, may become tourism attractions when communicated through effective interpretative approaches (Suprihardjo, 2014). On the other hand, the cultural value of Selokan Mataram is reflected in the utilization of traditional agrarian knowledge that strengthens the local identity of the Yogyakarta community. This value demonstrates

the continuing relationship between humans, simple technology, and the environment, thereby providing opportunities for the development of contextual tourism experiences grounded in local wisdom (Alamsyah, et al., 2023).

The interrelation among these values subsequently forms a landscape value characterized by the connection between the canal, rice fields, settlements, and rivers within an integrated spatial system. This condition enables the development of route-based tourism experiences, through which visitors may understand the changing spatial characteristics along the canal corridor. Such a corridor-based approach has the potential to distribute tourist movement more evenly while supporting the principles of sustainable tourism development (Alam et al., 2022).

Overall, the potential of Selokan Mataram does not lie in the creation of new attractions, but rather in its capacity to interpret existing historical, social, technological, cultural, and landscape values into experiences that can be contextually understood by visitors. Nevertheless, this potential remains conceptual and requires further verification through field-based data, particularly regarding aspects of accessibility, safety, and limitations of utilization, considering that the canal's primary function as irrigation infrastructure must continue to be maintained.

3.3. Identification of the Constraints in Utilizing Selokan Mataram as Heritage Tourism

In addition to the strengths that constitute its potential for heritage tourism development, Selokan Mataram also possesses several conditions that may hinder tourism management, particularly because the tourism sector is often not fully aligned with the principles of cultural heritage conservation. One of the primary constraints is water pollution within Selokan Mataram caused by domestic waste disposal and urbanization in the surrounding areas. This condition may reduce its tourism appeal and potentially disrupt water-based tourism activities such as gondola rides. Furthermore, the water quality of Selokan Mataram has been significantly affected by household septic tank discharge, food waste, and the persistent habit of local communities disposing of waste directly into the canal. One of the factors contributing to river pollution through community behavior is the population growth in Yogyakarta City, which has not been matched by the adequate provision of residential land, thereby encouraging settlement development along riverbanks (Kusumawati, 2019). Waste management and increasing public awareness regarding environmental cleanliness therefore constitute major challenges that must be addressed before tourism utilization can be effectively implemented.

Moreover, during the past three decades, several sections of the canal have required structural repairs. Kusumawati et al. (2019) identified various forms of deterioration, including canal leakage at several points that became visible during periods of reduced water flow. In addition, many bridges along the canal are considered inadequate due to their deteriorated condition, low elevation close to the water surface, and structural designs that are unsuitable for water-based tourism activities. These conditions may increase the risk of erosion, while bridges with insufficient clearance cannot accommodate gondolas or kayaks during periods of high water discharge. Consequently, further studies concerning repair and renovation are necessary,

particularly in vulnerable areas, in order to prevent more severe deterioration of both the canal and bridge structures.

On the other hand, as an irrigation system that remains actively utilized, Selokan Mataram continues to play a vital role in supporting agricultural productivity. Its utilization for heritage tourism purposes potentially risks disrupting this primary function, particularly if tourism activities result in structural modifications or uncontrolled visitor activities. This issue is further exacerbated by the ongoing decline in the fundamental values of agricultural practices and the reduction of agricultural land in the surrounding areas (Rahmi & Setiawan, 2021). Therefore, these challenges require careful management involving local communities, particularly farmers, through comprehensive and well-planned management strategies.



Figure 2. The Deteriorated Condition of Selokan Mataram, Including Leakage, Bridge Erosion, Waste Accumulation, Bridges Positioned Too Close to the Water Surface, and Bridge Designs Unsuitable for Tourism Activities.

Source: Kusumawati (2019)

In addition, the historical and cultural values embodied in Selokan Mataram have not yet been fully recognized and understood by the wider community. This condition

persists despite the growing number of tourists who are increasingly aware of and interested in cultural heritage in Special Region of Yogyakarta, particularly those seeking to learn about history, art, and traditional ways of life that continue to be preserved (Alamsyah, et al., 2023). The limited availability of compelling tourism narratives and effective promotional strategies constitutes one of the major constraints in attracting visitors' attention. Therefore, strengthening documentation, research, and digital-based promotional initiatives may contribute to addressing these challenges.

3.4. Tourism Readiness Analysis Using the 4A Framework (Attraction, Amenity, Accessibility, and Ancillary)

Based on the identification of the values and characteristics of Selokan Mataram, the level of readiness for its development as a tourism destination may be examined through the 4A framework (attraction, amenity, accessibility, and ancillary) as proposed in tourism studies (Cooper, 2005). From the attraction perspective, Selokan Mataram demonstrates tourism appeal derived from interconnected historical, social, and technological values, particularly through the narrative of its construction during the Japanese occupation, the role of Sultan Hamengku Buwono IX, and the continuity of its irrigation function that remains active to the present day (Dewanti, 2023; Rahmi & Setiawan, 2021). Furthermore, the diverse landscape characteristics traversed by Selokan Mataram from upstream to downstream strengthen its potential as a cultural landscape that may be developed within the context of heritage tourism.

From the amenity perspective, the presence of various attributes of Selokan Mataram, including bridges, sluice gates, and canal structures, indicates the existence of basic infrastructure supporting its technical irrigation function. Nevertheless, several studies indicate that the physical condition of certain sections still requires considerable attention, both in terms of quality and suitability for activities beyond irrigation purposes (Kusumawati, 2019). This condition suggests that the existing facilities were not originally designed to support tourism activities and therefore require adjustments if tourism utilization is to be developed.

In terms of accessibility, Selokan Mataram possesses relatively strong spatial accessibility potential because it traverses several districts within Magelang Regency and Sleman Regency and is situated within a regional network that is relatively easy to access (Gubernur Daerah Istimewa Yogyakarta, 2021). However, certain physical conditions, such as bridge structures and canal width, indicate technical accessibility limitations that should be carefully considered in tourism development planning.

Meanwhile, from the ancillary perspective, the management of Selokan Mataram remains primarily oriented toward its principal function as an irrigation system administered by government institutions, namely the Ministry of Public Works and Public Housing (Ministry of PUPR) through the Directorate General of Water Resources and its technical unit, the Serayu Opak River Basin Agency (BBWS-SO) (Dewanti, 2023). This condition indicates that institutional arrangements specifically supporting the management of culture-based tourism have not yet been established. Therefore, although Selokan Mataram possesses strong appeal as a cultural resource, its readiness for development as a heritage tourism destination remains limited and requires further

strengthening in terms of facilities, technical accessibility, and institutional management.

3.5. Management Strategy for Selokan Mataram as Heritage Tourism

Based on the identification of potentials, constraints, and the tourism readiness analysis using the 4A framework, the development of Selokan Mataram as a heritage tourism destination demonstrates that the attraction aspect has been relatively well established, while the amenity, accessibility, and ancillary aspects remain limited. Therefore, management strategies should be formulated gradually by prioritizing the improvement of fundamental conditions before tourism development is implemented.

The initial stage should focus on environmental restoration and infrastructure improvement, considering that water pollution and physical deterioration of the canal constitute the primary constraints directly affecting the feasibility of tourism utilization. Controlling domestic waste disposal and increasing public awareness regarding environmental cleanliness represent essential measures to maintain water quality, in line with the primary function of Selokan Mataram as an active irrigation system. In addition, the repair of structural elements such as bridges and damaged canal sections is necessary to ensure safety while maintaining their technical functions (Kusumawati, 2019). Once these fundamental conditions have been addressed, development efforts may be directed toward strengthening the attraction aspect through a value-based interpretation system. In this regard, the historical, technological, and landscape values of Selokan Mataram should become the primary focus translated into interpretative narratives. The establishment of interpretation routes based on specific points and corridor experiences would enable visitors to understand the construction process, irrigation system, and the relationship between the canal and community life. This approach has been considered effective in increasing visitors' understanding of and engagement with cultural heritage resources (Roque, 2022).

Subsequently, tourism development should be directed toward limited and contextual tourism activities by considering the existing limitations in terms of amenity and accessibility. The proposed activities should not be oriented toward mass tourism, but rather toward small-scale educational experiences, such as observation of irrigation systems or exploration of interpretative routes. In this context, the utilization of the canal as a medium for spatial and educational experiences should be prioritized over the creation of new attractions, thereby ensuring that neither the canal's primary function nor the integrity of the cultural heritage structure is compromised. However, tourism development in active irrigation systems requires a cautious approach to avoid disrupting both the primary function and the cultural values embedded within the area. The management experience of the Subak system in Bali as a *living cultural landscape* demonstrates that increasing tourism activities may create pressure on water use, trigger land-use changes, and lead to the commodification of cultural landscapes when not accompanied by integrated management (Salamanca et al., 2015). This condition indicates that the tourism potential of Selokan Mataram should be understood in a limited and gradual manner, not as a transformation of the canal into a mass tourism

destination, but rather as an effort to interpret cultural heritage while maintaining its active irrigation function.

In practice, the development of *heritage tourism* in Selokan Mataram should be carried out selectively by considering the physical characteristics and sensitivity level of each canal segment. Not all sections of Selokan Mataram need to be designated as tourism spaces; instead, development can be focused on areas that possess clear historical significance, relatively good environmental conditions, and minimal interference with the irrigation system. This approach allows tourism development to be implemented in a limited and adaptive manner while minimizing risks to both the canal's technical function and the preservation of the cultural heritage structure. In addition, periodic evaluations of tourism impacts are necessary to ensure that visitor activities do not create new pressures on environmental quality and the sustainability of the irrigation system.

On the other hand, strengthening the ancillary aspect represents an important stage in supporting sustainable management. At present, the management of Selokan Mataram remains primarily focused on its technical irrigation function under the authority of government institutions. Consequently, institutional development is required to accommodate tourism functions in a limited and controlled manner. Such institutional strengthening should be carried out through collaboration among government agencies, academics, local communities, and the private sector. UNESCO emphasizes that multi-stakeholder collaboration frequently produces innovative and sustainable management strategies at various World Heritage sites (Debrine, n.d.). Therefore, a collaborative approach is essential in designing an adaptive and sustainable management model for Selokan Mataram.

Accordingly, the management strategy for Selokan Mataram as a heritage tourism destination should not be directed toward immediate tourism commercialization, but rather toward a gradual process beginning with the improvement of fundamental conditions, followed by the strengthening of interpretative systems and institutional development. This strategy remains conceptual and preliminary in nature and therefore requires further verification through field-based studies to ensure its compatibility with actual conditions while maintaining a balance between conservation and utilization.

4. Conclusion

The study demonstrates that Selokan Mataram possesses historical, social, technological, cultural, and scientific values that provide considerable potential for development within the framework of *heritage tourism*. In particular, the strength of its historical narrative, the visibility of its irrigation technology, and the persistence of its living cultural landscape constitute important cultural resources that can support interpretative and educational tourism experiences.

However, the findings also indicate that the readiness of Selokan Mataram for tourism development remains limited. Although the *attraction* aspect is relatively strong, the *amenity*, *accessibility*, and *ancillary* aspects have not yet adequately supported tourism utilization. Environmental pollution, deterioration of canal infrastructure, limited tourism facilities, and the absence of integrated tourism

management remain the principal constraints. Furthermore, the study highlights that tourism development in active irrigation heritage sites involves a fundamental tension between tourism utilization and the preservation of technical functions and cultural values. In this context, the experience of managing living cultural landscapes such as the Subak system in Bali demonstrates that uncontrolled tourism development may generate new pressures on environmental sustainability and cultural continuity. Therefore, the development of Selokan Mataram as *heritage tourism* should not be oriented toward mass tourism expansion, but rather toward selective, gradual, and value-based utilization. Tourism development should focus on limited interpretative experiences, environmental improvement, infrastructure rehabilitation, and institutional strengthening while maintaining the canal's primary irrigation function. Conceptually, this study demonstrates that the integration of *values-based heritage management* and 4A tourism analysis can serve as an initial framework for understanding the opportunities, limitations, and readiness of active irrigation heritage within the discourse of *heritage tourism* and *living cultural landscapes*.

Nevertheless, this study remains limited because the analysis was conducted solely through literature review without field observation or stakeholder interviews. Future research is therefore needed to examine community perceptions, governance readiness, visitor management capacity, and the feasibility of site-specific tourism interpretation through empirical field-based approaches.

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