

Cultural and Environmental Services in Batang Arau River: Heritage and Sustainability

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ABSTRACT

This study examines the interconnection between cultural ecosystem services, community practices, and environmental degradation in the downstream area of the Batang Arau River, Indonesia. Using a qualitative descriptive approach, data were collected through in-depth interviews, archival analysis, and field observations. Findings indicate that the river functions not only as an ecological system but also as a cultural and social space, historically tied to traditions such as Selaju Sampan Dayung Palinggam and riverside livelihoods. However, ecological decline—driven by pollution, sedimentation, and weak institutional coordination—has disrupted cultural services, reduced community attachment, and weakened environmental stewardship. The results emphasize that sustainable ecosystem management (SEM) in urban river systems requires more than ecological restoration; it must also include socio-cultural revitalization and participatory governance. Theoretically, this study expands sustainability literature by underscoring the role of cultural ecosystem services and place-based identity. Empirically, it provides grounded evidence that informs inclusive policy strategies, highlighting community-based tourism, heritage conservation, and environmental education as pathways to restore ecological and cultural integrity.

ABSTRAK

Penelitian ini mengkaji keterkaitan antara jasa ekosistem budaya, praktik komunitas, dan degradasi lingkungan di wilayah hilir Sungai Batang Arau, Indonesia. Dengan menggunakan pendekatan deskriptif kualitatif, data dikumpulkan melalui wawancara mendalam, analisis arsip, dan observasi lapangan. Temuan menunjukkan bahwa sungai tidak hanya berfungsi sebagai sistem ekologis, tetapi juga sebagai ruang budaya dan sosial yang secara historis terikat dengan tradisi seperti Selaju Sampan Dayung Palinggam dan mata pencaharian masyarakat di tepi sungai. Namun, penurunan kualitas ekologi—yang dipicu oleh pencemaran, sedimentasi, dan lemahnya koordinasi kelembagaan—telah mengganggu jasa ekosistem budaya, mengurangi keterikatan masyarakat, serta melemahkan peran mereka dalam menjaga lingkungan. Hasil penelitian menegaskan bahwa pengelolaan ekosistem berkelanjutan (SEM) pada sistem sungai perkotaan tidak cukup hanya melalui restorasi ekologi; melainkan juga harus mencakup revitalisasi sosial-budaya dan tata kelola partisipatif. Secara teoretis, penelitian ini memperkaya literatur keberlanjutan dengan menekankan peran jasa ekosistem budaya dan identitas berbasis tempat. Secara empiris, penelitian ini memberikan bukti nyata yang dapat mendukung strategi kebijakan inklusif, dengan menyoroti pariwisata berbasis komunitas, pelestarian warisan budaya, dan pendidikan lingkungan sebagai jalur untuk memulihkan integritas ekologi dan budaya.

1. Introduction

Sustainable ecosystem management (SEM) has become a central focus in global environmental research, given the increasing degradation of ecosystems due to anthropogenic pressures, urbanization, and climate change [1], [2]. SEM entails a holistic approach that integrates ecological, social, and cultural dimensions to maintain a balance between conservation and the sustainable utilization of natural resources [3]. In the context of urban river areas, SEM becomes increasingly complex due to the interaction of multiple

stakeholder interests and the dynamic socio-economic conditions of the community [4].

Effective implementation of SEM requires the recognition of ecosystem services, an understanding of community behaviors, and active participation in planning and decision-making [5]. Specifically, in the downstream area of the Batang Arau River in Padang, the main challenge lies in integrating cultural, historical, and ecological aspects that have long shaped the identity of the region. Therefore, understanding how cultural elements and community practices

influence ecosystem sustainability is crucial for further investigation.

The downstream area of the Batang Arau River represents a location rich in cultural and historical heritage, yet it now faces serious threats due to environmental degradation, such as sedimentation, domestic waste pollution, and the loss of local cultural activities like the traditional rowing competition (Selaju Sampan Dayung Palinggam) [6]. This phenomenon reflects a disconnect between the embedded cultural values within the community's social system and the suboptimal environmental management practices. Previous studies reveal that urban ecosystem degradation is often driven by weak institutional coordination, low environmental literacy, and limited community involvement in ecosystem-based planning [7], [8]. This highlights the urgent need for integrative research exploring the relationship between cultural ecosystem services, community practices, and ecosystem sustainability in Batang Arau. Utilizing a qualitative approach, this study contributes not only to the academic discourse on local cultural river ecosystems but also offers practical insights for community-based policy interventions.

Cultural ecosystem services represent a category of ecosystem services that reflect non-material values such as recreation, spirituality, education, aesthetics, and cultural heritage derived from human interaction with natural landscapes [9], [10]. In the Batang Arau context, cultural elements such as rowing competitions, water sports training, and riverside community traditions exemplify tangible forms of cultural services that have historically supported the area's local identity [11]. Empirical studies show that the existence and continuity of these services rely heavily on environmental quality and institutional support that sustains these cultural practices [12], [13]. Unfortunately, environmental degradation in riverine areas has disrupted these cultural activities, leading to a weakening of social cohesion and the community's cultural identity [14]. Therefore, mapping and revitalizing cultural ecosystem services represent strategic steps in sustainable ecosystem management that considers the local socio-cultural context.

Community practices represent collective behavioral patterns in how people interact with their surrounding environment, including the use, preservation, and management of natural resources [15]. In the Batang Arau region, local practices such as fishing, riverside jogging, and participation in river-based social events have long been integral to residents' daily lives. However, increasing urban pressure and inadequate environmental infrastructure have led to a shift toward environmentally harmful behaviors, such as waste disposal into the river and neglect of public sanitation [16], [17]. Recent studies emphasize that transforming community behavior is a key determinant in the

success of ecosystem management programs, particularly through participatory approaches and environmental education [18], [19]. Thus, identifying community practices that support or hinder ecosystem management is crucial for developing adaptive and contextually relevant intervention strategies.

Environmental degradation in river areas is a manifestation of anthropogenic pressures, including water pollution, sedimentation, and loss of biodiversity [20]. In the downstream segment of the Batang Arau River, water quality has drastically declined and is currently classified under Class IV according to Government Regulation No. 22 of 2021, indicating that it is no longer suitable for recreational or domestic use [21]. The impacts of this degradation are not only ecological but also social, such as the loss of cultural activities and the decline of local tourism appeal [22]. Many studies stress the importance of mitigating degradation through integrated watershed management approaches, including ecological drainage systems, household waste control, and riparian vegetation restoration [23]. Therefore, the analysis of environmental degradation in this study focuses not only on its physical aspects but also its socio-cultural and economic implications for the local population.

This study aims to analyze the integrated relationship between cultural ecosystem services, community practices, and environmental degradation in relation to sustainable ecosystem management in the downstream area of the Batang Arau River. This objective is pursued through a qualitative approach involving in-depth interviews, archival studies, and field observation. Theoretically, this research contributes to expanding literature on the intersection of cultural ecosystem services and environmental sustainability in urban local contexts. Empirically, the study provides grounded evidence of the critical role of community participation and cultural preservation as core strategies for community-based ecosystem management. Accordingly, the findings of this study are expected to offer strategic recommendations for policymakers and local actors to develop integrative approaches for sustaining the Batang Arau River ecosystem.

2. Research Method

This study employed a qualitative descriptive approach to explore the integration of cultural and environmental services in the downstream area of the Batang Arau River. The qualitative method was chosen to understand in-depth the lived experiences, social meanings, and cultural practices embedded within local communities that interact with the river. Such an approach allows researchers to capture the complex interplay between ecological systems and human values, particularly in urban areas where both cultural heritage and environmental degradation coexist [24], [25]. Qualitative research is especially effective in

assessing cultural ecosystem services, which are often intangible and context-specific.

The research site was strategically located in the downstream section of the Batang Arau River, covering five sub-districts: Berok Nipah, Pasa Gadang, Kampung Pondok, Seberang Palinggam, and Batang Arau. These areas were selected due to their socio-cultural relevance and historical connection to the river. The riverbanks in this area have long functioned as cultural landscapes that support recreational, educational, and aesthetic ecosystem services. However, these communities are also the most affected by environmental degradation, such as pollution, sedimentation, and reduced biodiversity, thus offering a critical setting for examining sustainable ecosystem management [26].

Data collection was conducted through two main techniques: in-depth interviews and archival document analysis. The in-depth interviews targeted 13 key informants, selected using a cluster sampling method to represent each of the five sub-districts. Informants consisted of community elders, youth leaders, cultural practitioners, traders, and residents who have a long-standing relationship with the river. Interviews were conducted in a semi-structured format, each lasting between 45 to 90 minutes. This format enabled the elicitation of nuanced and reflective responses while providing room for probing emerging themes [27]. Simultaneously, the research utilized archival data such as historical books (Paco-Paco Padang, Bandar Padang), government reports, environmental quality assessments, and urban planning documents. The use of archival analysis enriched the study with a diachronic perspective, highlighting how the cultural significance of the river evolved over time [28].

All qualitative data were analyzed using thematic analysis, following the step-by-step procedure [29]. These steps included data familiarization, coding, theme identification, review, and interpretation. Thematic analysis was suitable for identifying recurring patterns related to community engagement, degradation impacts, and the preservation of cultural values. To support data organization and analysis, NVivo 12 software was used, enabling the researchers to trace linkages between environmental conditions and socio-cultural responses. This approach allowed for both inductive and deductive analysis, grounded in participant narratives while guided by relevant theoretical frameworks on ecosystem services and community-based environmental governance.

To ensure trustworthiness, the study applied multiple validation strategies. Triangulation was conducted by cross-referencing data from interviews, field observations, and archival documents. Member checking involved sending interview summaries back to the informants for verification, while peer debriefing and audit trails were employed during analysis to

maintain methodological rigor [30]. These strategies strengthened the study's credibility, transferability, dependability, and confirmability, which are essential criteria in qualitative research.

Ethical considerations were fully observed throughout the research process. All participants gave informed consent, and confidentiality was assured by anonymizing personal data. Participants were informed of their right to withdraw at any stage without consequence. The research was conducted under the ethical standards of qualitative inquiry and obtained clearance from the ethics committee at Andalas University, ensuring compliance with both local and international research ethics norms [31].

3. Result and Discussion

The findings of this study revealed that the downstream area of the Batang Arau River functions not only as an ecological system but also as a cultural landscape that embodies community identity, memory, and everyday practices. Historical and current narratives from local residents underscore the multifunctional role of the river as a space for recreation, traditional rowing events, and social gatherings. The cultural ecosystem services (CES) identified—such as Selaju Sampan Dayung Palinggam, riverside fishing, and jogging—represent significant non-material benefits that connect people to nature and strengthen social cohesion. However, these cultural services are rapidly disappearing, largely due to the river's ecological decline. This affirms that CES are inherently fragile and contingent upon ecological integrity, as demonstrated in other studies across urban riverine systems [32]. The weakening of these cultural services not only reflects a loss of heritage but also represents a fracture in the community's socio-ecological fabric.

Furthermore, the study found that community practices around the Batang Arau River have undergone significant transformation. Older generations recalled daily interactions with the river—swimming, fishing, participating in rowing competitions—that shaped a strong sense of place and environmental stewardship. In contrast, many younger residents exhibit a growing detachment from the river, driven by perceptions of pollution, loss of recreational safety, and the absence of cultural transmission mechanisms. This generational shift mirrors findings in broader literature that highlight the role of environmental quality and intergenerational knowledge transfer in maintaining community-based conservation practices [33], [34]. Although some informal environmental efforts have emerged—such as clean-up initiatives and attempts to revive local traditions—they remain fragmented and lack formal support. These patterns suggest that while social memory and local ecological knowledge persist, they are insufficient to counteract degradation without institutional reinforcement and integrated planning [35], [36].

Environmental degradation emerged as a dominant theme across all interviews, with most informants citing pollution, sedimentation, and loss of aquatic biodiversity as key factors disrupting both ecological and cultural river functions. Official environmental data corroborate these perceptions, with the river's water quality now classified under Class IV, indicating severe pollution. Residents consistently linked the degradation to upstream waste inflow, lack of waste management infrastructure, and inadequate enforcement of environmental regulations. The decline in river health has not only curtailed ecosystem services but has also produced emotional and symbolic disconnection, as communities feel alienated from a river that once played a central role in their identity and livelihoods. These findings align with previous research that suggests environmental degradation leads to place detachment, reduced environmental concern, and weakened community resilience [37]. Thus, the degradation of the Batang Arau River should be viewed not merely as an ecological failure but as a multidimensional crisis affecting culture, identity, and sustainability.

These results underline the need for a paradigm shift in how sustainable ecosystem management is conceptualized and practiced in urban river systems. The Batang Arau case illustrates that sustainability cannot be achieved through technical solutions alone; it requires a socio-cultural lens that recognizes the river as a living entity embedded within local narratives and practices. Unfortunately, the current governance structure is fragmented, with weak coordination between local government, traditional leaders, and environmental institutions. This governance vacuum exacerbates the disconnection between policy interventions and community needs. Echoing critiques in contemporary literature, effective river management must incorporate participatory approaches, integrate cultural knowledge, and institutionalize community roles within planning frameworks. By doing so, cultural ecosystem services can be restored not as nostalgic relics, but as dynamic components of resilient and inclusive environmental governance.

In sum, the study demonstrates that the sustainability of the Batang Arau River ecosystem is deeply intertwined with the restoration of cultural practices, community engagement, and ecological integrity. The degradation of one dimension directly impairs the others, highlighting the need for holistic strategies that go beyond physical rehabilitation to include socio-cultural revitalization. Integrating local ecological knowledge, strengthening community-based practices, and aligning environmental policy with cultural heritage preservation are critical steps toward achieving sustainable and inclusive management of the Batang Arau River. These insights contribute not only to academic discourse on urban ecosystem governance

but also to practical strategies for cities facing similar challenges across Southeast Asia and beyond.

4. Conclusion

This study highlights the sustainability of the Batang Arau River's downstream ecosystem, shaped by the interplay between cultural ecosystem services, community practices, and environmental degradation. The river, historically intertwined with traditions like Selaju Sampan Dayung Palinggam and riverside livelihoods, faces ongoing degradation—pollution, sedimentation, and declining water quality—that has eroded cultural services, weakened community attachment, and diminished stewardship practices. The findings underscore that sustainable ecosystem management (SEM) in urban rivers must integrate ecological restoration with cultural revitalization and community engagement. The research contributes to sustainability literature by emphasizing the role of cultural ecosystem services and place-based identity in environmental governance, and provides empirical evidence from an Indonesian riverine community showing how ecological decline disrupts both symbolic and material functions. From a policy perspective, it calls for inclusive governance models that embed cultural heritage, environmental education, and community participation into SEM frameworks, advocating for a synergistic approach that unites ecological, social, and cultural dimensions for sustainable urban river ecosystems.

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