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"Warning in Spaces: Blending Heritage, Nature and Design"

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"Harmony in Spaces : Blending Heritage, Nature and Design"

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32610 Seri Iskandar Perak, Malaysia
05-3742716
uitmperakpress@gmail.com

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Balancing Ecology, Culture and Urban Growth in the Landscape Transformation of Kinta Riverfront, Ipoh

Shaqira Emelya Fatiha Shahril Fitri¹, Ahmad Zamil Zakaria²

^{1,2} Department of Built Environment Studies and Technology, Faculty of Built Environment, Universiti Teknologi MARA Seri Iskandar, 32610 Seri Iskandar, Perak

Abstract

The Kinta Riverfront in Ipoh represents a dynamic urban landscape where rapid urban growth intersects with the need to preserve ecological integrity and safeguard cultural identity. Despite its potential as a sustainable public realm, the riverfront faces challenges related to environmental degradation, uneven ecological buffering, maintenance pressure, and the gradual weakening of cultural expression within the landscape. A qualitative research approach was employed, integrating literature review, field observations, photographic documentation, and semi-structured interviews with key stakeholders. Comparative insights from international riverfront projects were also examined to inform local strategies. The findings indicate that while recent urban development has enhanced accessibility, public use, and economic activity, ecological conditions remain moderate and vulnerable, with limited biodiversity and fluctuating water quality. Cultural elements are present but insufficiently integrated to fully reflect Ipoh's historical identity. The study highlights the need for a more integrated landscape planning framework that strengthens ecological functions, embeds cultural narratives, and supports urban growth through coordinated management and community participation. These findings contribute to guiding future riverfront development in Ipoh toward a more balanced, resilient, and culturally meaningful urban landscape.

Keywords: Urban growth, Ecology, Cultural Identity, Sustainable Landscape Planning, Kinta Riverfront.

INTRODUCTION

Urban riverfronts function as critical interfaces between natural ecosystems and urban development, serving as ecological corridors, public recreational spaces, and cultural landscapes within cities. In Malaysia, the Kinta Riverfront in Ipoh, Perak, exemplifies this interaction. Historically central to Ipoh's growth as a tin-mining hub, the Kinta River shaped the city's economic structure and cultural identity. In recent decades, the riverfront has been transformed into a mixed-use urban space incorporating commercial, recreational, and tourism activities (The Star, 2025). However, rapid urbanisation has introduced challenges such as declining water quality, habitat degradation, fragmented green spaces, and weakening cultural connections between the river and local communities (Oertel et al., 2024; Jalkanen et al., 2025). These issues highlight the difficulty of balancing ecological integrity, cultural continuity, and urban growth within contemporary riverfront development.

At the global level, the United Nations Sustainable Development Goals (SDGs) provide a guiding framework for sustainable urban transformation, particularly SDG 11 on sustainable cities and communities and SDG 15 on ecosystem protection and biodiversity conservation (United Nations, 2015). In Malaysia,

the Malaysia MADANI policy introduced in 2023 emphasizes sustainability, social well-being, and responsible governance as core national development values (Government of Malaysia, 2023). These principles are further reinforced through the Environmental, Social, and Governance (ESG) framework, which promotes environmentally responsible planning, social inclusivity, and transparent decision-making in urban development (Bursa Malaysia, 2024). Supporting these agendas, national planning guidelines such as the National Urbanisation Policy 2 and the National Landscape Policy advocate sustainable, culturally sensitive, and ecologically resilient landscape planning approaches.

Within this policy and planning context, the ongoing transformation of the Kinta Riverfront presents both opportunities and challenges. While redevelopment initiatives have enhanced economic activity and public accessibility, ecological functions and cultural values risk being overshadowed by development priorities. Therefore, this research examines how sustainable landscape planning can balance ecology, culture, and urban growth in the landscape transformation of the Kinta Riverfront, Ipoh. The study aims to identify key landscape planning challenges, analyse the impacts of urban development on ecological integrity and cultural heritage, and to propose landscape planning strategies that promote ecological sustainability and cultural sensitivity alongside urban development. By doing so, the research seeks to contribute practical insights for creating a resilient, inclusive, and culturally meaningful riverfront landscape in Ipoh.

LITERATURE REVIEW

Urban landscape planning and management have become critical in ensuring sustainable urban development, particularly under the Sustainable Development Goals (SDGs) that emphasize ecological resilience, liveable cities, and community well-being. The reviewed literature collectively highlights the dynamic interaction between urban growth, ecosystem service sustainability, and community participation within both urban and rural contexts.

Urban Growth, and Ecology

Wu et al., (2024) who were examined the relationship between urban expansion and water-related ecosystem services (WESS) in Chengdu and Wuhan, two megacities along the Yangtze River Economic Belt. Their findings revealed that rapid edge-based urban expansion has significantly degraded three major WESS water yield, water purification, and habitat quality due to encroachment on natural surfaces and riparian zones. The spatial spill over effects observed highlight how urban growth in central districts negatively influences peripheral ecological systems. These results align with earlier studies on urban hydrology and ecosystem service degradation, confirming that uncontrolled expansion reduces both the ecological integrity and climate resilience of cities. The study emphasizes the importance of ecological zoning and spatial planning for water-ecological protection in megacities.

This research complements the global discussion on the impacts of urban sprawl addressed by Wu et al., (2024), who emphasized that cities are increasingly challenged by balancing built-up growth with ecological functions. They suggested spatial econometric models and green infrastructure integration to mitigate water-related ecosystem losses resonating with Malaysia's urban riverfront planning concerns, where urbanization often overlaps with sensitive water ecosystems such as mangroves and estuaries.

Sustainable Landscape Planning and Urban Growth

Wang et al., (2025) explored the “suitable compactness” of urban forms and its relationship with environmental sustainability, energy efficiency, and social well-being. Using spatial optimization models, the study demonstrated that moderately compact urban structures can significantly reduce ecological footprints, encourage mixed land use, and support efficient transportation networks. However, over-compact development may lead to reduced green space and lower environmental quality. This balance is critical in landscape planning frameworks, such as those proposed by Beijing’s urban ecological corridor systems Sun et al., (2022), which integrate compactness with ecosystem conservation.

In this sense, compact urban design becomes a guiding strategy for achieving SDG 11 (Sustainable Cities and Communities) and Malaysia’s MADANI policy emphasis on liveable, inclusive, and green urban environments. The findings also align with Environmental, Social, and Governance (ESG) frameworks, where land-use optimization and environmental stewardship contribute directly to social and governance performance indicators.

Ecology

Jalkanen et al., (2025) examined how urban green areas can be prioritized for biodiversity conservation using spatial connectivity and ecological network analysis. The study found that connectivity between fragmented green patches significantly enhances ecological resilience and biodiversity protection in urban contexts. This supports a shift toward multifunctional green infrastructure planning that integrates biodiversity, recreation, and cultural values. For cities like Penang or Ipoh, such approaches are crucial in linking urban parks, coastal mangroves, and riparian corridors into continuous ecological networks that safeguard urban biodiversity.

Similarly, Jalkanen et al., (2025) highlighted the necessity of “ecological redline” policies and land-use zoning to identify priority conservation areas in fast-growing cities. These studies underscore the importance of spatial ecology in landscape planning to ensure that biodiversity remains a foundation of sustainable urban design.

Cultural Identity

Expanding beyond biophysical ecosystems, Jiang et al., (2025) analysed cultural ecosystem services (CES) within rural heritage landscapes along the Grand Canal, China. Their research developed a “community gradient framework” using participatory mapping, linking local perceptions of cultural, recreational, and aesthetic values with spatial land-use characteristics. Results demonstrated that CES values are highest near heritage cores and decline along peripheral gradients. However, resident satisfaction is shaped more by environmental quality and accessibility than proximity alone. The study emphasized integrating community perceptions into spatial planning to enhance landscape equity, echoing SDG 11.4 (protect and safeguard cultural and natural heritage). This participatory approach provides a strong model for Malaysian heritage and ecological planning such as in Balik Pulau or George Town where community engagement and bottom-up governance can reinforce policy MADANI goals emphasizing social justice, inclusivity, and shared prosperity in sustainable development.

Ecology and Cultural Identity

Together, these studies illustrate a multi-dimensional understanding of urban and rural landscape sustainability. From the ecological regulation of water systems Wu et al., (2024) to community-based cultural valuation Jiang et al., 2025, they collectively argue for a planning paradigm that merges environmental science with socio-cultural governance. The integration of ESG principles emphasizing environmental protection, community participation, and transparent governance serves as a bridge between global sustainability frameworks and localized policies such as Malaysia's MADANI and the National Physical Plan (NPP-3).

Furthermore, the comparative analyses of megacities (Chengdu, Wuhan, Beijing) and heritage towns (Shaobo) underscore that sustainable landscape planning is not a one-size-fits-all model. Instead, it demands adaptive management that recognizes ecological constraints, cultural continuity, and social equity principles also central to SDG 13 (Climate Action) and SDG 15 (Life on Land).

METHODOLOGY

This research adopts a **qualitative** aiming to interpret the relationships between **ecology, urban growth, and cultural identity** at the Kinta Riverfront, Ipoh. The qualitative method is chosen to allow for a deeper understanding of people's perceptions, lived experiences, and expert views rather than relying on numerical data. Through observation, interviews, and comparative analysis, this study seeks to uncover how sustainable landscape planning can be achieved within the context of urban riverfront development in Malaysia.

Research Design

This research adopts a qualitative research design, focusing on understanding the relationships between ecological systems, cultural identity, and urban development along the Kinta Riverfront in Ipoh. A qualitative approach allows the researcher to explore local perceptions, lived experiences, and planning challenges in depth, rather than relying solely on numerical or statistical data (Hennink & Kaiser, 2022). Through methods such as semi-structured interviews and field observations, this approach captures stakeholders' views on environmental conditions, cultural values, and riverfront use within its real-life context. By emphasizing interpretation and contextual understanding, the qualitative design enables a comprehensive exploration of how ecological, cultural, and urban factors interact in shaping the Kinta Riverfront landscape.

Study Area

The study focuses on the Kinta Riverfront in Ipoh, Perak, Malaysia, which extends along several kilometres of the Kinta River as it passes through the city centre and surrounding urban areas. Historically, the river served as the backbone of Ipoh's tin-mining industry, shaping the city's economic development, settlement pattern, and cultural identity. Today, the riverfront has transformed into a linear urban landscape comprising recreational spaces, pedestrian promenades, public parks, commercial activities, and nearby residential developments. Although there is no single officially defined acreage due to its elongated and

phased development, the riverfront occupies a substantial riparian corridor that functions as an important ecological buffer and social space. This extensive and multifunctional landscape highlights both opportunities and challenges for sustainable landscape planning, particularly in balancing ecological restoration, cultural continuity, and ongoing urban growth within Ipoh's urban fabric.



Figure 1: The Kinta Riverfront, Ipoh, Perak. (Authors, 2025)

Respondents and Sampling Method

Respondents were selected using purposive sampling, a non-probability method that identifies participants with direct knowledge and experience of the Kinta Riverfront. This approach is appropriate for qualitative research as it prioritizes information-rich participants (Hennink & Kaiser, 2022). The sample size consisted of a minimum of eight respondents, representing four main groups:

- Two representatives from Majlis Bandaraya Ipoh (MBI) – responsible for urban planning and riverfront management.
- Two local business owners or operators – representing economic and commercial perspectives.
- Two community representatives – such as local residents or environmental group members.
- Two regular riverfront users – representing the public's daily interaction with the site.
- This selection ensures diverse viewpoints across administrative, economic, social, and cultural dimensions of the riverfront's transformation.

Data Collection Procedures

Data were collected through semi-structured interviews and field observations.

- Semi-structured interviews were conducted to explore perceptions, challenges, and aspirations regarding the development of the Kinta Riverfront. Each interview followed a set of guiding themes ecological sustainability, cultural preservation, and urban growth while allowing flexibility for participants to express their views in depth (Hennink & Kaiser, 2022).
- Field observations focused on physical site conditions, including vegetation cover, water quality indicators, landscape character, and human river interactions. Observation sheets with rating scales were used to systematically record visual and environmental data.
- All data collection were occurred over a two-weeks period, during both weekdays and weekends, to capture variations in use patterns and environmental conditions.

Data Analysis

The qualitative data obtained from interviews were analysed through interpretive analysis, focusing on

understanding respondents' perceptions, experiences, and viewpoints related to ecological conditions, cultural identity, and urban development along the Kinta Riverfront. Interview responses were reviewed and organised according to key discussion themes to allow meaningful interpretation of recurring issues and perspectives.

Field observation data were analysed using descriptive analysis, where recorded site conditions such as vegetation cover, landscape character, cleanliness, and human river interactions were systematically examined. The findings from observations were documented through narrative summaries and visual records to support the interpretation of physical and social conditions at the riverfront.

FINDINGS & DISCUSSIONS

This study examined the landscape transformation of the Kinta Riverfront, Ipoh, with the aim of understanding how ecology, culture, and urban growth are balanced within current planning practices. The findings, derived from interview data analyzed using ATLAS.ti in Figures 3 and supported by systematic field observations, reveal several interrelated issues that directly address the research objectives. The discussion below integrates empirical findings with relevant literature to interpret the implications of these patterns for sustainable landscape planning.

Landscape Planning Challenges at the Kinta Riverfront

The findings indicate that one of the key landscape planning challenges along the Kinta Riverfront is the **uneven integration of ecological, cultural, and urban functions**. While respondents acknowledged visible improvements in infrastructure, accessibility, and recreational facilities, these developments were often perceived as prioritizing usability and aesthetics over ecological depth and cultural meaning. Interview responses highlighted recurring concerns related to maintenance capacity, cleanliness, congestion during peak periods, and limited ecological buffering. These challenges were also evident in the ATLAS.ti network in Figure 3, where nodes such as “problems” in turquoise color, “challenges” in orange color, and “current development” in green color were strongly interconnected, suggesting that planning and management issues are experienced holistically rather than in isolation. In Figure 2 also, the field observation shows that the improvements of Kinta Riverfront, the cleanliness of the space and the river, and the peak hour during the weekend.

This finding aligns with existing studies that emphasize how urban riverfronts in rapidly developing cities often face governance and coordination challenges, particularly when development pressures outpace ecological planning frameworks (Oertel et al., 2024). The presence of these challenges at the Kinta Riverfront suggests that current planning approaches may lack sufficient integration between environmental management, cultural programming, and long-term maintenance strategies.



Figure 2: Observation at Kinta Riverfront (Authors, 2025)

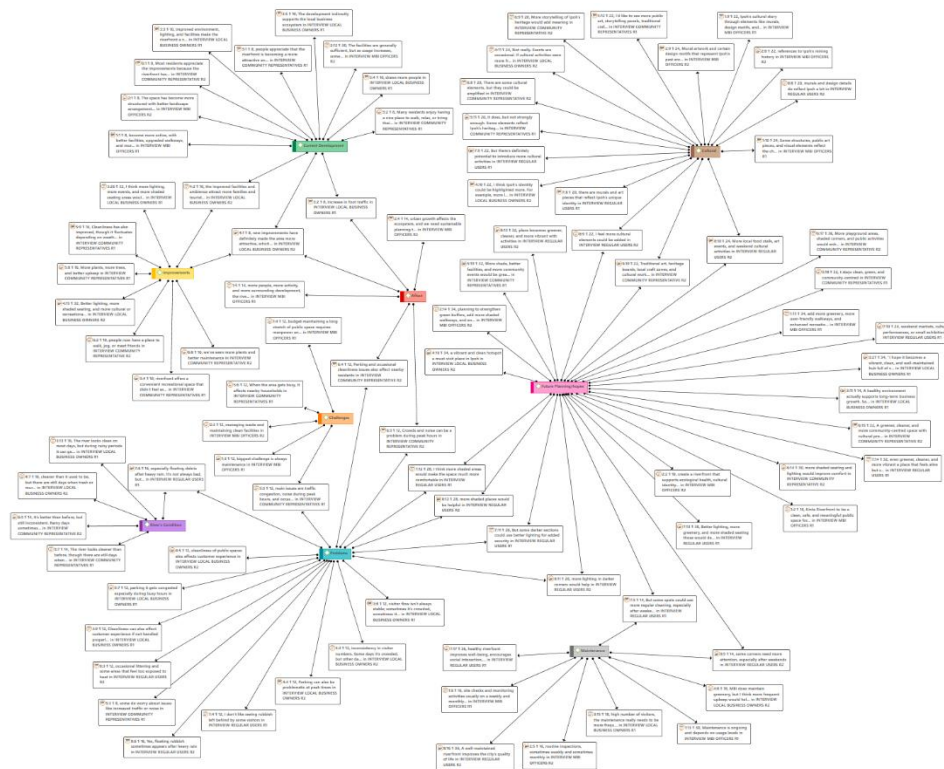


Figure 3: Network Findings Interview from ATLAS ti

The ATLAS.ti network diagram illustrates the interconnected themes that emerged from the interview data, with color-coded nodes representing key dimensions of the Kinta Riverfront transformation. The green node (Current Development) highlights respondents' perceptions of existing improvements such as upgraded walkways, lighting, public facilities, and increased visitor activity, which are closely linked to economic benefits and recreational use. The yellow node (Improvements) reflects suggested enhancements, including better lighting, increased greenery, shaded seating, and improved cleanliness, indicating stakeholders' expectations for further refinement. Environmental related issues are represented by the purple (River Condition), blue (Problems), and orange (Challenges) nodes, which collectively emphasize concerns about water quality fluctuations, littering, limited ecological buffers, maintenance constraints, congestion, and management capacity.

Cultural and forward-looking perspectives are captured through the brown (Cultural) and pink (Future Planning Hopes) nodes. These clusters show that while cultural elements such as murals, heritage references, and public art are present, they are perceived as insufficiently integrated to fully represent Ipoh's identity. Respondents expressed aspirations for stronger cultural programming, ecological restoration, and more inclusive public spaces in future planning. Overall, the network demonstrates that stakeholders view the Kinta Riverfront as a complex, interrelated system, where ecological conditions, cultural expression, and urban development are closely connected and must be addressed in an integrated manner.

Impacts of Urban Development on Ecological Integrity

The analysis shows that urban development has produced **mixed impacts on the ecological integrity** of the Kinta Riverfront. On one hand, respondents noted improvements in landscaping, cleanliness, and visual order compared to previous conditions. Field observations as shown in Figure 4, supported this perception, with vegetation cover and overall site condition generally rated as moderate to good. However, both interview data and observations revealed persistent vulnerabilities, including fluctuating water quality, limited wildlife presence, and fragmented green buffers along certain river sections.

These findings suggest that while ecological elements are present, they are not yet functioning as a cohesive ecological system. This reflects broader literature on urban river corridors, which argues that fragmented green spaces and limited native biodiversity reduce the capacity of riverfronts to provide ecosystem services such as habitat support, flood mitigation, and microclimate regulation. In the context of the Kinta Riverfront, urban growth has improved human access and activity but has simultaneously increased environmental pressure, particularly through higher usage intensity and runoff impacts.



Figure 4: Observation at Kinta Riverfront (Authors, 2025)

Cultural Identity and Sense of Place

With regard to cultural heritage, the findings indicate that **cultural identity is acknowledged but weakly embedded** within the riverfront landscape. Respondents across all groups recognized the presence of murals and artistic elements, yet many felt these features were insufficient to fully express Ipoh's historical relationship with the Kinta River. Community representatives and regular users, in particular, emphasized the need for more interpretive elements, cultural events, and storytelling features to strengthen emotional attachment and local identity.

The ATLAS.ti network diagram in Figure 3 & Figure 5 reinforces this finding by showing cultural identity, the brown colour as a node connected to both physical design and community use, indicating that cultural meaning is shaped not only by visual elements but also by activities and social engagement. This supports existing research that highlights the importance of integrating tangible and intangible cultural elements in landscape planning to foster a strong sense of place (Jalkanen et al., 2025). The limited cultural emphasis observed at the Kinta Riverfront suggests that redevelopment efforts have not yet fully translated cultural values into experiential and interactive forms.

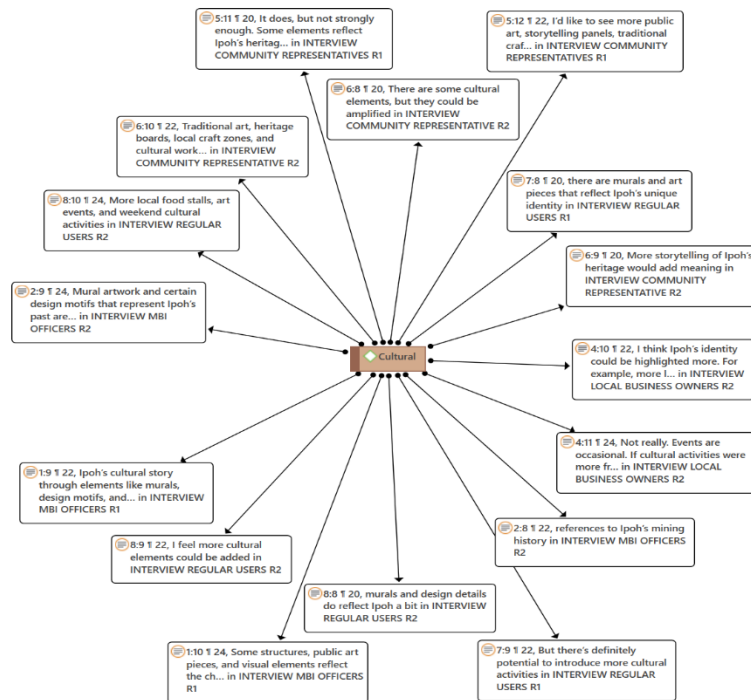


Figure 4: Observation at Kinta Riverfront (Authors, 2025)

Community Use, Safety, and Shared Responsibility

Another significant finding relates to the role of **community engagement and shared responsibility** in sustaining the riverfront. Interviews revealed high levels of public use, particularly for leisure and recreation, which was confirmed by observation data in Figure 6 showing consistent activity patterns during evenings and weekends. Respondents generally perceived the riverfront as safe and comfortable, supported by adequate lighting and open visibility, although some areas were identified as needing better shading and seating.

Importantly, stakeholders across all respondent groups expressed the view that long-term sustainability cannot rely solely on local authorities. This perspective reflects the interconnected nodes of “maintenance,” as a grey color and “future planning” as pink color in the ATLAS.ti analysis in Figure 3, highlighting the perceived interdependence between governance and public behavior. This finding resonates with sustainability literature that emphasizes participatory approaches and community stewardship as essential components of effective urban landscape management.



Figure 6: Night activities at Kinta Riverfront (Authors, 2025)

Implications for Sustainable Landscape Planning

Overall, the findings demonstrate based on Figure 3 that the Kinta Riverfront functions as a complex socio-ecological system where river conditions in purple color, cultural identity in brown color, and current development in green color are deeply interconnected. Based on Figure 7, urban growth has enhanced accessibility and economic activity, it has also introduced ecological vulnerabilities and diluted cultural expression. The discussion suggests that future landscape planning strategies should move beyond physical upgrades toward **integrated approaches** that strengthen ecological networks, embed cultural narratives, and actively involve communities.

In line with the study's objectives, the findings support the need for planning strategies that promote ecological sustainability and cultural sensitivity alongside urban development. Such strategies may include enhancing native vegetation and ecological buffers, expanding cultural programming and interpretive elements, and fostering collaborative management models involving local authorities, businesses, and residents. By addressing these dimensions collectively, the Kinta Riverfront can evolve into a more balanced, resilient, and meaningful urban landscape.



Figure 7: Urban Growth at Kinta Riverfront (Authors, 2025)

RECOMMENDATIONS

Several suggestions are put out to direct future sustainable landscape design at the Kinta Riverfront in light of the findings. First, more native and riparian vegetation should be planted, green buffers along the riverbank should be improved, and nature-based solutions to boost biodiversity and water quality should be incorporated to reinforce ecological sustainability. These actions would lessen the negative effects of urban expansion on the environment while supporting ecological processes.

Second, the riverfront landscape ought to incorporate cultural identity more thoroughly. This can be

accomplished by using storytelling elements, public art with cultural themes, heritage interpretation components, and frequent cultural events that honor Ipoh's community values and historical history. Increasing cultural prominence would strengthen consumers' emotional ties to the riverside and improve their feeling of place.

Thirdly, long-term maintenance and management plans should be used to support public amenities and urban infrastructure. Coordinated maintenance planning, sufficient resource allocation, and ongoing monitoring are crucial to maintaining the riverfront's cleanliness, safety, and functionality as visitor numbers rise. Finally, volunteer projects, environmental education, and participatory activities should all be used to increase community involvement. Long-term stewardship and more sustainable management of the riverside can be achieved by promoting shared responsibility among local government agencies, companies, and citizens.

LIMITATIONS OF THE STUDY

There are a number of limitations to this study that should be noted. The study used a qualitative methodology with a small sample size, concentrating on particular stakeholder groups that had firsthand knowledge or experience with the Kinta Riverfront. Although this method yielded detailed insights, the results cannot be extrapolated to other metropolitan settings or all riverfront users. Furthermore, because data collection was done in a short amount of time, seasonal variations in river conditions, user behavior, or environmental changes would not have been properly captured.

Additionally, the study depended on field observations and interview responses, both of which are susceptible to researchers' interpretation and respondent impression. In order to give a more thorough evaluation of riverside sustainability, future study could overcome these constraints by using longitudinal research designs, larger sample sizes, or quantitative environmental data.

CONCLUSION

This study examined how ecological sustainability, cultural identity, and urban growth might be harmonized through sustainable landscape planning in order to better understand the landscape alteration of the Kinta Riverfront in Ipoh. The results show that the riverside's status as a significant urban public area has been strengthened by recent riverfront developments that have successfully increased public accessibility, recreational use, and economic activity. However, these advancements have also brought up environmental stresses, such as inadequate biodiversity support, variable water quality, and moderate ecological fragility. Furthermore, even if there are cultural components like murals and public art, they are not properly integrated to accurately depict Ipoh's cultural identity and historical narrative.

The study emphasizes how the riverfront's biological, cultural, and urban components are intertwined and cannot be handled separately. Therefore, an integrated strategy that balances physical growth with ecological restoration and cultural continuity is necessary for effective riverside planning. The study concludes that, if future planning strategies prioritize ecological enhancement, cultural integration, and cooperative management involving both authorities and the local community, the Kinta Riverfront has a strong potential to develop into a resilient, inclusive, and culturally significant landscape.

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