

Sustainable Redevelopment of Lakeside Environments in Sub-Saharan Africa: A Case Study of Gisenyi, Rwanda

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INTRODUCTION & AIM

Several lakeside areas with significant potential for sustainable development supported by the booming tourism sector remain undeveloped in many parts of Sub-Saharan Africa. Gisenyi, a secondary city in western Rwanda bordering the Democratic Republic of Congo and adjacent to Lake Kivu, has a high level of ecological, economic and tourism potential. However, its waterfront is underdeveloped largely because of incoherent land use, inactive buffer zones, limited pedestrian accessibility, and insufficient public gathering spaces. These constraints hinder the development of tourism, small-scale economic activities and the resilience of the town in general.

The overall aim of this study is to produce evidence-based architectural and urban design strategies of restoring the lakeside of Gisenyi. To refine the study's objective, the authors focused on: (1) Evaluating the prevailing physical, environmental, and social-cultural situations around Gisenyi lakeside area. (2) Identifying the obstacles and opportunities of underutilized lake shores. (3) Comparative assessment based on redevelopments of other waterfronts around the world, and a recommendation of a sustainable, inclusive, and mixed-use architectural design suitable for the study area.

METHOD

This research adopted a mixed-methods approach; that is, qualitative and quantitative research design to capture a comprehensive analysis of the multifaceted nature of lakeside redevelopment.

Data Collection Methods:

- Site visits to assess the land use, accessibility and current environmental conditions.
- Field Surveys including structured interviews and questionnaires distributed to 140 local residents, tourists, business owners, and town authorities to assess community needs.
- Spatial analysis by utilizing Geographical Information Systems (GIS) to map buffer zones, land-use changes and infrastructure.
- Review of secondary data from policy documents, master plans, and previous studies

Sampling Techniques:

- Random sampling focused on local residents
- Purposive sampling targeted to business owners and experts
- Quota sampling focused on tourists/visitors

Data Analysis:

- Thematic analysis (qualitative).
- Quantitative descriptive statistics.
- Spatial analysis using GIS

Comparative Case Studies:

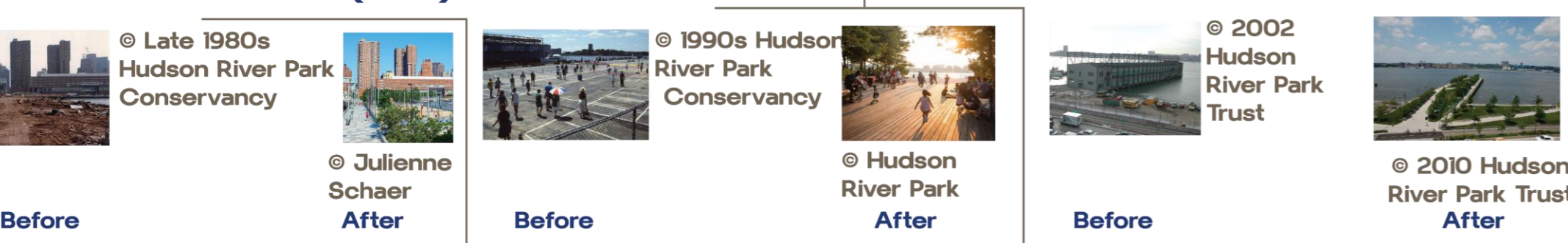
Toronto Waterfront (Canada)



Zürich Lake Promenade, Switzerland



Hudson River Park (USA)

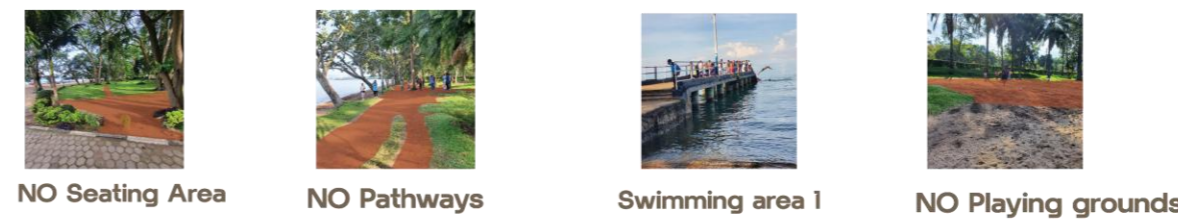


RESULTS & DISCUSSION

The results indicate the presence of severe spatial, environmental, as well as socio-economical issues:

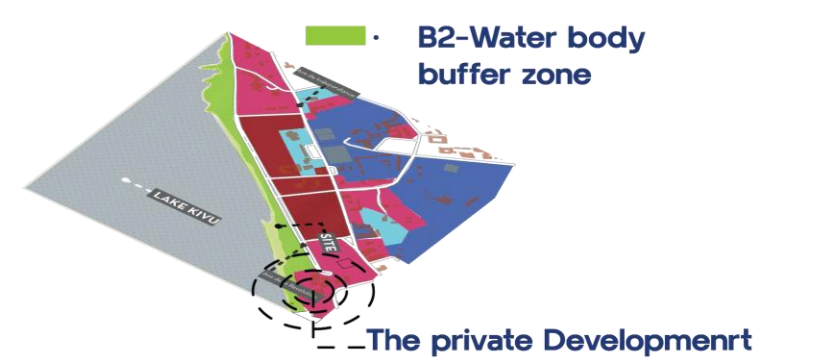
1. Spatial and Urban Issues

- Absence of pedestrian walk paths and Sitting area
- Underutilized prime lakeside land.

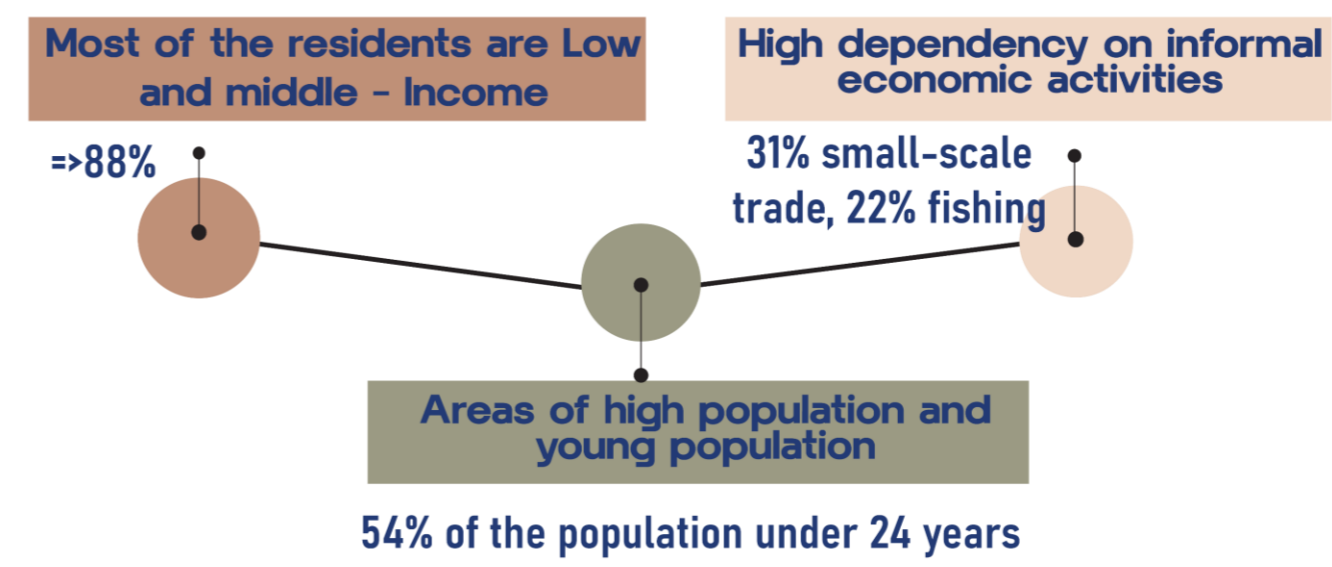


- Discontinuous land use and lax zoning regulation.

The private developments occupy more than a quarter of the buffer zone.



2. Socio-Economic Conditions



3. Environmental Challenges.

- ONE: The disappearance of biodiversity and the threat of erosion.
- TWO: Inadequate waste disposal and environmental degradation.

4. Cultural & Social Insights

- Great involvement in cultural/ communal activities such as Umuganda
- High demand for inclusive community places and cultural manifestation zones.

Comparative analysis of successful waterfronts around the world demonstrates that they have certain common features:

- Elaborate pedestrian networks to ease access for people,- Mixed-use (social, economic, and recreational) development,- Good environmental conservation and green lands,- Participation and governance structures within communities.

Comparative assessment indicates that Gisenyi town has issues due to the absence of integration between socio-economic, planning and environment systems. Nevertheless, it has a good prospect of change due to its natural environment and cultural diversity.

This proposed design covers these gaps by:

SITE PROGRAMME ZONING

- Mixed-use (public, commercial, ecological) zoning.

Uninterrupted lakeside boardwalks and network of accessibility.

Sustainable design and climate responsive strategies.

Transparent Monocrystalline Solar panel: These panels installed as shading for the pathways are made from a single, pure silicon crystal, giving them a uniform, dark appearance. They are generally the most efficient type of solar panel and can be identified by their dark color. Monocrystalline panels are also known for their longevity and ability to perform well in low-light conditions. They are to generate energy that is used to light and power the lakeside.



Infusion of cultural identity and local materials.



CONCLUSION

Gisenyi's lakeside is underutilized due to fragmented planning and poor accessibility.

Sustainable revitalization requires integrated design, environmental protection, and inclusive public spaces. A holistic, community-centered approach can transform it into a vibrant, resilient, and economically productive waterfront.

FUTURE WORK / REFERENCES

Future work should focus on detailed implementation strategies, governance frameworks, and environmental impact assessments.

Key references

1. Marshall, R. (2014). Waterfronts in urban design: Contemporary international examples. Routledge publishing.
2. Rwanda National Land use and Development Master plan 2020-2050. Ministry of Environment, Government of Rwanda.