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A System Design Solution for Sustainable Narrow Boat Tourism:

Revitalizing the Hamilton Canal in Sri Lanka

Sri Lanka, renowned for its rich cultural heritage, offers a narrative that traces its economic evolution from ancient kingdoms to the colonial era. The remnants of ruins, historical sites, and waterways have played a vital role in enriching the export economy, illustrating the intricate trade history of the island.

The waterways system in Sri Lanka dates back to the 15th century during the reign of King Vira Parakrama Bahu VIII Kotte, who connected major trade routes from inland regions to the bustling seaport of Negombo on the western coast [1]. The Sri Lankan irrigation canals not only reflect advanced engineering technologies but also hold significant historical importance.

Over the centuries, foreign traders were attracted to the island's abundant spices, particularly cinnamon, leading to the establishment of strategic fortresses and an extensive canal infrastructure. The Dutch, recognizing the economic and strategic value of Sri Lanka, expanded and improved the canal network to facilitate transportation. The Hamilton Canal, constructed by the British in 1802 [1], has since evolved from draining saltwater to serving as a vital route for transporting goods and people between Puttalam and Colombo.

For nearly two centuries, the canal functioned as an integral system for trade, supporting local communities and sustaining the fishing industry. However, in recent years, the canal system has deteriorated. Communities residing near the canal now face significant challenges due to the declining health of Hamilton Lake, which no longer functions effectively. Families reliant on the fishing

Recognizing the urgent need to revitalize the Hamilton Canal system, the Sri Lankan government has initiated collaborative efforts with non-governmental organizations [2]. These organizations aim to restore the canal's functionality through innovative solutions and

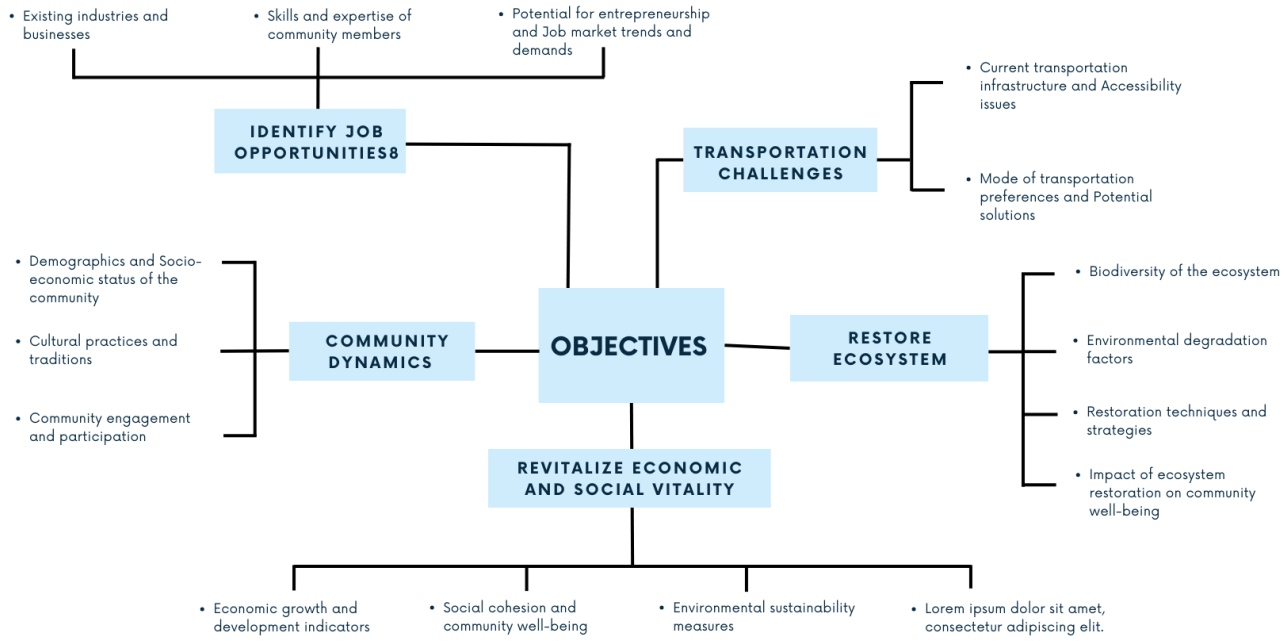

Figure 1: Research Objectives

strategic projects [3]. This research focuses on understanding community dynamics, identifying job opportunities, restoring the ecosystem, and addressing transportation challenges along the Hamilton Canal. The objective is to revive the economic and social vitality of surrounding communities while ensuring sustainable development and environmental conservation

This approach prioritizes community empowerment and economic prosperity while safeguarding water quality and the ecosystem [4]. The Negombo cluster, strategically located adjacent to the Katunayake Airport, presents significant advantages for tourism development. As tourists arrive in Sri Lanka or begin their journey toward Colombo, integrating travel along the canal becomes an attractive option. Encouraging visitors to spend their initial hours in the lagoon benefits the local fishing community. Establishing interactive gathering areas along the route allows local vendors to showcase their products and cuisine. This initiative promotes sustainable transportation, offering a vacation rental service. experience with floating cabins on the water, which can sail through the canal to enhance the community's economic prospects.

After a thorough analysis of objectives and factors derived from primary and secondary data, a comprehensive conceptual framework was developed, initially centered on the floating cabin concept. This framework evolved to include Dutch-style narrow boats tailored to the local environment, as in below Figure 2. This eco-friendly solution aligns with the project's objectives, offering a luxurious, Vacation rental service experience where each boat serves as a fully functional cabin. Designed with sustainability and comfort in mind, the boats provide a unique way for tourists to enjoy the canal's natural beauty and cultural significance while supporting the local economy.

The boat integrates a solar-powered propulsion system, with solar panels positioned on the roof to maximize sunlight capture. Equipped with a 5 kWh battery, each boat can operate for approximately 8-10 hours on a full charge, with energy-efficient appliances and lighting further reducing power consumption. This design significantly minimizes carbon footprint and fuel dependency, aligning with environmental preservation goals and supporting cost-efficiency. Leveraging the high solar radiation levels in Puttalam and Colombo, the system

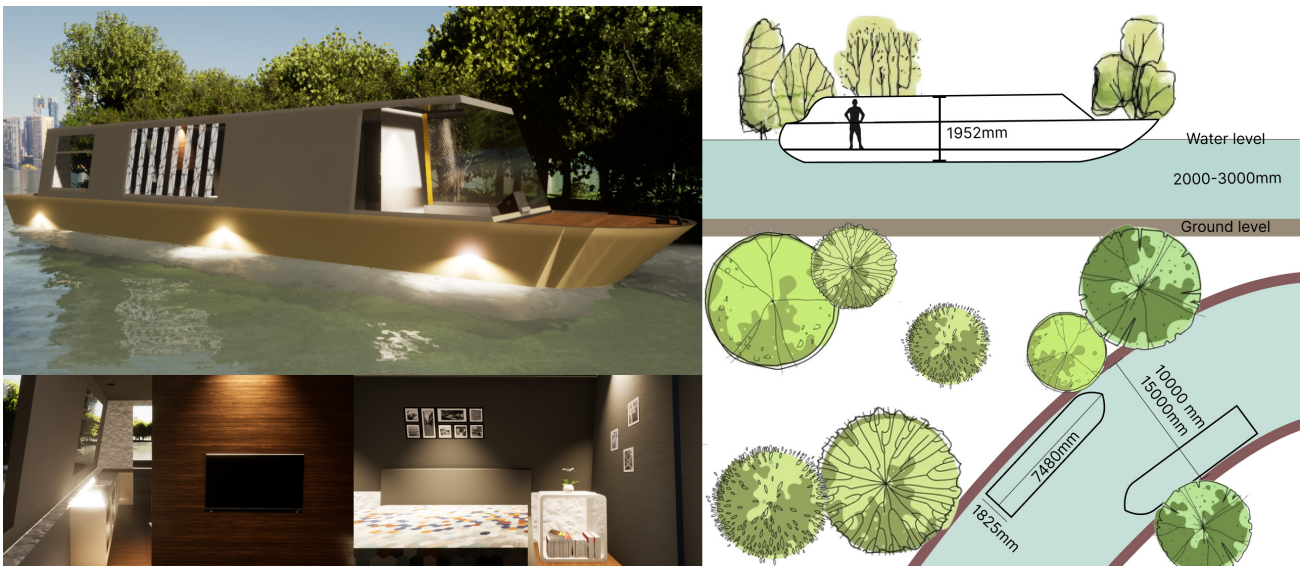

Figure 2: Boat Details

enables solar-powered self-charging, fostering long-term ecosystem health and sustainability.
Two versions of the boat, the "Serene Voyager," will be available: one with a single bedroom and another with two bedrooms, designed to accommodate individuals, couples, and families of varying sizes. The interior of each boat combines elegance and comfort, with thoughtfully planned spaces that maximize both functionality and style. Each vessel is equipped with a kitchen, bathroom, and multiple chambers, all created to enhance the visitor's experience of tranquility and luxury on the water. The lobby space, designed with a panoramic view, serves as a comfortable lounging area

Figure 3: Digital Gauge Cluster Interface

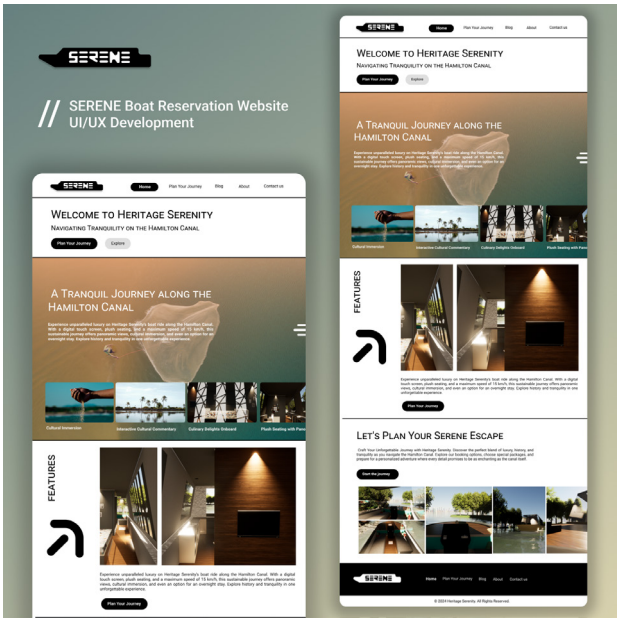

Figure 4: Web UI for Online Reservations

while housing the driving compartment for easy navigation along the canal.

A digital gauge, as shown in Figure 3, is integrated within the cluster at the helm to offer a user-friendly interface that serves as the boat's central information hub. This interface allows users to monitor and manage every operational aspect of the vessel. The touchscreen control system provides real-time updates on essential

metrics, including speed, navigation data, and environmental sensors, ensuring a seamless and informed experience for all guests.

In addition to meeting the transport and comfort needs of tourists, the "Serene Voyager" offers an immersive, eco-friendly lodging experience on the Hamilton Canal. This innovative, self-contained vessel provides a unique place to stay, promoting a balance of luxury, sustainability, and cultural connection that allows visitors to fully appreciate the natural beauty and historical significance of the waterway.

To enhance accessibility and booking, a dedicated web-based reservation system was developed as Figure 4. This user-friendly platform allows prospective renters to browse boats, view details and real-time availability, and make advance reservations, either before arrival in Sri Lanka or upon reaching the lagoon or Colombo. The system offers a step-by-step guide for selecting boat types, customizing services, and completing secure payments. Automated confirmations provide essential check-in information, while multi-language support accommodates international tourists. On the backend, administrators can manage availability, track maintenance, and analyze booking trends, making this system a robust solution that supports a seamless tourist experience and efficient operations along the Hamilton Canal.

In conclusion, this sustainable tourism initiative for the Hamilton Canal not only revitalizes the region's historical and environmental significance but also directly benefits the Negombo-based fishing communities by providing new sales channels and job opportunities. The "Serene Voyager" boats offer tourists an eco-friendly, luxurious way to experience the canal while supporting the local economy. Strategically placed gathering areas along the canal enable local fishers and vendors to increase their sales by offering fresh seafood, crafts, and local products to passing tourists, strengthening community ties and generating income. By working collaboratively with government and NGOs, this project encourages responsible tourism that respects both local culture and natural resources. For future recommendations to ensure the successful implementation and long-term sustainability of this project, it is recommended to obtain approval from the Urban Development Authority (UDA). This approach will help ensure that the Hamilton Canal becomes a vibrant center for sustainable tourism, enhancing the quality of life for residents while providing an authentic, memorable experience for visitors.

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