



# Feasibility Study Report

For the Project “Reducing Waterlogging, Environmental Pollution and Impact of Climate Change and Increasing Civic Facilities and Revenue through the Regeneration of a Canal and Surrounding Areas in Singra Pourashava”

Singra Porashava, Natore  
Bangladesh

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## Executive Summary

The proposed project, titled "Reducing Waterlogging, Environmental Pollution, and Impact of Climate Change and Increasing Civic Facilities and Revenue through the Regeneration of a Canal and Surrounding Areas in Singra Pourashava", aims to address urban challenges, promote environmental sustainability, and enhance civic amenities. It seeks to revitalise the Singra Poura Canal, a historically significant waterway for transportation and water management that is now facing neglect and degradation, resulting in waterlogging and environmental pollution.

Through a comprehensive feasibility study, the project's potential impact and feasibility have been thoroughly analysed across various dimensions:

**Section 1: Basic Information:** This section provides an overview of the project's objectives, emphasising the importance of sustainable urban development and community well-being. It sets the foundation by outlining the project's goals and objectives, highlighting its alignment with national and local policies for flood safety and sustainable urban development.

**Section 2: Introduction:** The historical significance of the Singra Poura Canal in transportation and water management is highlighted, along with the current challenges it faces due to neglect and degradation. The project's alignment with national and local policies underscores its importance in mitigating environmental risks and promoting long-term resilience.

**Section 3: Market/Demand Analysis:** The project's alignment with community demands for improved water quality, recreational spaces, and climate resilience is emphasised. Stakeholder engagement and collaboration are deemed essential for ensuring inclusivity and collective ownership.

**Section 4: Technical/Technological & Engineering Analysis:** A detailed analysis of infrastructure development, tree plantation initiatives, and water quality improvement measures is provided. The project's focus on disaster and climate change resilience is underscored, supported by cost estimates and an implementation timeline.

**Section 5: Environmental Sustainability, Climate Resilience, and Disaster Risk Analysis:** Outlines Strategies for conserving and enhancing the canal's ecosystem, mitigating climate change impacts, and reducing disaster risks. A resettlement plan addresses concerns about displacement, emphasising community engagement and effective communication.

**Section 6: Cost-Benefit Analysis:** Financial and economic analyses demonstrate the project's economic viability, with positive net present value and attractive internal rates of return. Detailed calculations support the project's potential for generating long-term, sustainable revenue.

**Section 7: Social and Community Impact Analysis:** Community-level surveys reveal widespread awareness and optimism about the project's benefits. The majority express a desire for active participation, highlighting the importance of effective communication and community involvement.

**Section 8: Economic Impact Analysis:** Community surveys indicate optimism about the project's potential to enhance business prospects and property values, emphasising the need for strategic planning and proactive community involvement.

**Section 9: Recreation, Health, and Well-being Impact Analysis:** Community perceptions of the project's impact on local amenities, health, and well-being are positive, emphasising the importance of aligning project design with community preferences.

**Section 10: Human Resources and Administrative Support Analysis:** Singra Pourashava's technical expertise and managerial capacity are deemed sufficient for overseeing the project.

Recommendations include establishing a working committee for effective governance and securing funding support for project implementation.

**Section 11: Institutional and Legal Analysis:** The project's alignment with legal boundaries and existing policies is confirmed, with recommendations for robust institutional setup and proactive engagement to address potential challenges.

**Section 12: Risk (Uncertainty) and Sensitivity Analysis:** Key strategies derived from risk and sensitivity analysis emphasise proactive engagement with stakeholders, stability in financial and economic models, and continuous monitoring of legal and regulatory compliance.

**Section 13: Recommendations and Conclusion:** A roadmap for project implementation is provided, emphasising recommendations for institutional setup, community engagement, risk mitigation, financial planning, and continuous monitoring. Despite challenges, the project holds promise for significant socio-economic benefits and sustainable development in Singra.

## 1. Section 1: Basic Information

1. Name of the Project	:	Reducing Waterlogging, Environmental Pollution and Impact of Climate Change and Increasing Civic Facilities and Revenue through the Regeneration of a Canal and Surrounding Areas in Singra Pourashava
2. (a) Sponsoring Ministry/Division	:	(a) Ministry of Local Government, Rural Development & Cooperatives (MoLGRD&C)
(b) Implementing Agency	:	(b) Singra Pourashava
3. Project Objectives (Project to be taken based on the study)	:	<p><b>Overall Goal:</b> To improve public health and increase revenue generation by reducing waterlogging and environmental pollution and increasing civic amenities in Singra Pourashava.</p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>• Ensure the natural water flow of the canal connecting to Chalan Beel;</li> <li>• Conduct re-excavation of the canal;</li> <li>• Remove garbage and debris from the canal;</li> <li>• Control mosquito and insect populations;</li> <li>• Protect and preserve biodiversity in the area;</li> <li>• Minimise methane emissions;</li> <li>• Enhance the physical and mental well-being of local residents;</li> <li>• Develop the land along the canal banks;</li> <li>• Establish new civic facilities in canal bank areas;</li> <li>• Ensure pedestrian safety and facilitate traffic flow in congested nearby areas;</li> <li>• Provide living opportunities for local residents, including women and children;</li> <li>• Diversify land use through environmental development and improved communication systems;</li> <li>• Increase revenue through changes in land use and the provision of civic amenities.</li> </ul>
4. Estimated Project Cost (BDT in Crore)	:	BDT 3754.25 (In Lakh BDT)
5. Sector & Sub-Sector	:	
6. Project Category (Based on Environment Conservation Rules 1997)	:	
7. Project Geographic Location	:	
(a) Countrywide	:	(a) Bangladesh
(b) Division	:	(b) Rajshahi

(c) District	(c) Natore
(d) Upazila	(d) Singra
(e) Others (City Corporation/Pourashva)	(e) Singra Municipality
8. Project Duration	: 2.5 years

## 2. Section 2: Introduction

### 2.1. Project Background

The “Singra Poura Canal” plays an essential role in facilitating transportation, drainage, and water management within Singra Pourashava, thereby supporting its economic, social, and environmental sustainability. However, neglect, urbanisation, and environmental degradation have reduced these benefits over time, resulting in the deterioration of the canal and presenting numerous challenges to the local community and ecosystem.

Situated in the Chalan Beel region, Singra Pourashava faces increased vulnerabilities to waterlogging and flooding. Once upon a time, the canal was connected with the river Atrai and Chalan Beel, and its approximately 650-meter stretch served as a crucial safeguard against inundation and flooding risks in the Pourashava area. However, unplanned waste dumping, illegal encroachments, and inadequate urban planning have obstructed its natural water flow, exacerbating flooding risks and compromising its functionality.

The exacerbation of these challenges is further compounded by urban expansion along the canal, with residents extensively disposing of waste, connecting septic tank lines, and encroaching upon its banks. Currently, only a 400-meter stretch of the canal retains its water catchment capacity, while the remaining areas are encroached upon by landfills and other developments, obstructing natural drainage and increasing flooding risks during the monsoons. The resulting inundation poses significant challenges to residential and commercial activities along the banks, exacerbating public health concerns and environmental degradation.

Moreover, Singra Pourashava's acute shortage of public open spaces – accounting for merely 0.16 per cent of its total area allocated for recreation - undermines community well-being, particularly during the COVID-19 pandemic. With heightened awareness of non-communicable diseases and the imperative for physical activity, the urgent need for green spaces within the municipality has become increasingly pronounced. In addition, mitigating the impacts of climate change necessitates creating a cooler, more sustainable urban environment, further underscoring the importance of regenerating the canal and its surroundings.

Although efforts to restore the canal began in 2014 with funding support of BDT 1 Crore from the Local Government Engineering Department (LGED), financial constraints have hampered full restoration. The partial development of the canal banks in 2022, under the "[Suborno Sorobor](#)" initiative, has helped reduce flooding risks and tackle broader challenges; however, more extensive action is required to fully harness the canal's potential.

In response to these challenges, Singra Pourashava proposes the implementation of the project titled **“Reducing Waterlogging, Environmental Pollution and Impact of Climate Change and Increasing Civic Facilities and Revenue through the Regeneration of a Canal and Surrounding Areas”**. This ambitious initiative aims to address the pressing demand for public space and address the risks of

waterlogging, environmental degradation, and inadequate civic amenities, thereby fostering a more resilient, sustainable, and livable urban environment.

The project aims to re-excavate the canal, remove accumulated debris, and restore its natural water flow, thereby mitigating waterlogging and flooding risks and reducing the spread of waterborne diseases such as dengue and chikungunya. In addition, creating a green canopy along the canal banks will enhance biodiversity, combat pollution, and mitigate the urban heat island effect, contributing to climate resilience and environmental sustainability.

Furthermore, the development of the canal corridor and creation of new civic amenities will provide residents with safe, accessible public spaces for recreation and leisure, promoting physical and mental well-being. By encouraging multipurpose land use and increasing economic opportunities, the project aims to enhance municipal revenue and stimulate local economic growth.

The proposed project represents a transformative opportunity to address pressing urban challenges, promote environmental stewardship, and foster inclusive, sustainable development within Singra Pourashava.

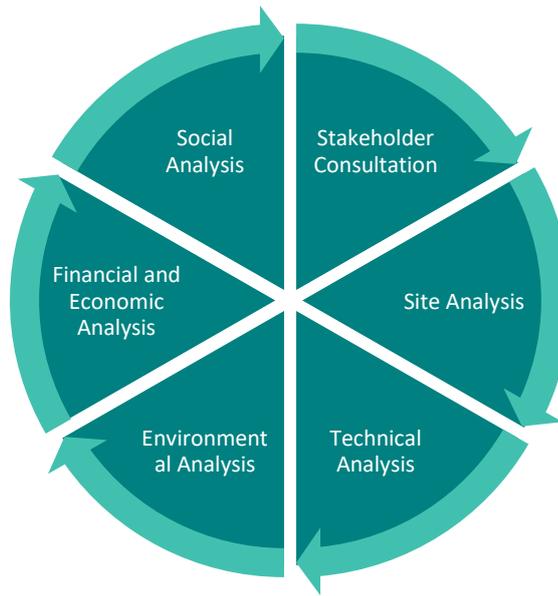
## 2.2. Objectives of the Feasibility Study

The primary objective of this feasibility study is to assess the viability and potential impact of the project on its former functionality and significance. Specifically, the study aimed to:

- Evaluate the current condition of Singra Poura Canal and identify key challenges and opportunities associated with its restoration.
- Determine the socioeconomic, environmental, and cultural benefits of regenerating the Singra Poura Canal to inform decision-making processes.
- Assess the technical feasibility of proposed restoration interventions and identify necessary resources and considerations.
- Develop a comprehensive understanding of stakeholder interests, concerns, and aspirations related to the restoration of Singra Poura Canal.
- Ensure compliance with relevant national and local policies to be aligned with the canal regeneration project.
- Develop a comprehensive project management plan outlining timelines, responsibilities, and milestones for the implementation of canal regeneration activities.

## 2.3. Approach and Methodology of the Feasibility Study

The feasibility study adopts a comprehensive approach, integrating multiple disciplines to assess the potential for regenerating the canal. This approach encompasses technical assessments, stakeholder consultations, and thorough data analysis to ensure a holistic evaluation of the canal's regeneration potential.



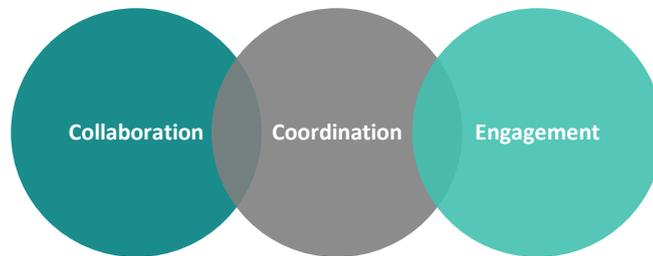
**Figure 1: Methodology Adopted for the Study**

- **Stakeholder Consultations:** Community surveys through questionnaires were conducted with a diverse range of stakeholders, including residents, businesses, public-private service holders, housewives, rickshaw pullers, NGOs, teachers, and local shop owners. These surveys aimed to gather insights into the current usage of the canal and its surrounding areas, as well as to understand the perspectives, needs, and expectations of stakeholders regarding its regeneration.
- **Site Analysis:** The site analysis involved an in-depth examination of the physical characteristics of the canal, including its length, width, and average depth. In addition, it assessed the canal's location, existing structures alongside it, and surrounding land use patterns. This analysis provided valuable insights into the current state of the canal and its immediate environment.
- **Environmental Analysis:** The environmental assessment focused on analysing the current condition of the canal, including its water quality and management practices. It identified sources of water pollution, assessed local biodiversity and ecosystems, and explored potential measures to ensure water quality. Furthermore, it evaluated long-term environmental protection measures, including flood risk reduction, air pollution control, waste and stormwater management, as well as potential resettlement opportunities and risks during implementation.
- **Financial and Economic Impact Analysis:** Financial and economic impact assessments were conducted to evaluate the feasibility and viability of the regeneration project. This involved cost-benefit analysis, assessing investment opportunities, annual revenue generation potential, cash flow projections, net present values (NPV), and internal rate of return (IRR). These assessments provided crucial insights into the economic viability and sustainability of the proposed regeneration interventions.
- **Social Analysis:** The social and community impact assessments focused on understanding stakeholders' perceptions of the regeneration project's potential impacts on their daily lives and communities. This included exploring expected changes, anticipated improvements to the canal, and potential economic opportunities. In addition, it assessed potential impacts on the local community and culture, as well as expectations regarding increased

recreational and leisure activities following implementation, and considered health and well-being implications.

## 2.4. Structure of the Feasibility Study

To ensure a well-organised and structured feasibility study for the regeneration of the canal, adequate institutional arrangements and collaboration across various stakeholders were implemented. The following key steps were followed:



- **Collaboration with Singra Pourashava:** Singra Pourashava played a pivotal role in facilitating community-level surveys and providing essential support for the feasibility study. Through close collaboration with Singra Pourashava authorities, community engagement initiatives were organised to gather valuable insights and feedback from local residents, businesses, and stakeholders. These community-level surveys were crucial for comprehensively understanding the community's needs, preferences, and concerns regarding the regeneration of the canal and its surroundings.
- **Coordination with Technical Team:** Coordination and inputs from the technical team responsible for designing the regeneration works were integral to the feasibility study. The technical team, comprising experts in engineering, hydrology, environmental science, and other relevant disciplines, provided valuable expertise to assess the feasibility and viability of proposed regeneration interventions. Close coordination between the study team and the technical team ensured that technical assessments aligned with the objectives of the study and contributed to informed decision-making.
- **Engagement with Singra Pourashava Officials:** Engagement with officials of Singra Pourashava was crucial for gaining insights into local governance structures, policies, and regulations relevant to the regeneration project. Regular consultations and interactions with Singra Pourashava officials facilitated the exchange of information, identification of potential challenges, and exploration of opportunities for collaboration. Moreover, engagement with local officials ensured alignment with municipal development plans and regulatory frameworks, thereby enhancing the project's sustainability and effectiveness.

## 3. Section 3: Market/Demand Analysis

### 3.1. Problem Statement

Historically, Singra Pourashava's urban expansion has led to the degradation of its natural waterways, notably the Poura Canal, which connects the River Atrai and Chalan Beel. The neglect and unplanned development along the canal have resulted in blockages, waste accumulation, and encroachments, exacerbating waterlogging and flooding issues during monsoon seasons. Moreover, stagnant water bodies have become breeding grounds for mosquitoes and other insects, posing significant public health risks, particularly concerning diseases such as dengue and chikungunya.

Simultaneously, the municipality grapples with a severe scarcity of open public spaces, with only a minimal fraction of the total area designated for recreational purposes. This inadequacy not only affects residents' physical and mental well-being but also undermines community resilience, particularly during crises like the COVID-19 pandemic. In addition, the absence of green spaces contributes to rising temperatures, exacerbating the effects of climate change within the municipality.

Despite past initiatives to address these challenges, such as partial development of the canal banks and establishment of public spaces, significant gaps persist in mitigating waterlogging, enhancing environmental quality, and improving civic amenities. The incomplete regeneration of the canal and surrounding areas limits the effectiveness of existing infrastructure and fails to address the root causes of waterlogging and environmental degradation. Furthermore, the lack of comprehensive development hampers the potential economic benefits and civic advantages that could arise from a fully revitalised canal corridor.

In response to these multifaceted challenges, this project aims to address the systemic issues contributing to waterlogging, environmental pollution, and inadequate civic amenities in Singra Pourashava, thereby improving public health, enhancing community resilience, and promoting economic development within the municipality.

### 3.2. Relevance of the Project Idea

**National Policies:** The proposed project must align with critical objectives outlined in both the [“Bangladesh Delta Plan 2021”](#) and the [“Perspective Plan 2021-2041”](#). Specifically, it should contribute to ensuring safety from floods and climate change-related disasters, promoting wetland conservation and estuary management, and facilitating optimal utilisation of land and water resources. In addition, alignment with environmental development, climate change resilience, and disaster management, as emphasised in the [“8th Five-Year Plan”](#), is crucial.

**Local Policies:** The project should also adhere to policies outlined in the [“Singra Master Plan \(2011-2031\)”](#) to ensure compliance with local regulations and urban development objectives. These directives encompass various initiatives such as tree planting to enhance urban aesthetics, planned urbanisation, appropriate land use, and the development and maintenance of infrastructure, including municipal roads and water resource infrastructure. By adhering to these policies, the project aims to improve the quality of life for residents and promote sustainable development within the Pourashava. In addition, to address local flood risks, the project interventions should align with the objectives outlined in the [“City Resilience Strategy for Singra”](#). This strategy emphasises key strategies for water resource management, river plain management, and stormwater drainage management, offering a comprehensive approach to mitigate flood risks and enhance urban resilience.

### 3.3. Proposed Project Interventions

The proposed interventions of this project span from earth cutting and backfilling to the installation of recreational amenities and street lights, each serving a specific purpose in improving the urban environment. Key activities include removing accumulated sludge, constructing tow walls, and enhancing drainage systems to mitigate waterlogging and flooding risks, ensuring the safety of homes, businesses, and public infrastructure. Overall, these interventions aim to create a more vibrant, inclusive, and sustainable urban environment for the residents of Singra Pourashava.

The table below provides a detailed breakdown of the interventions on each side of the canal.

**Table 1: Breakdown of the Proposed Interventions**

Interventions	Unit
Earth cutting and backfill	7500 m3
Sludge cleaning	3750 m3
Piling for tow wall	350 nos.
Tow wall	1700 sqm
Turfing	212.5 sqm
Walkway	2250 sqm
Railing	900 sqm
Sluice gate	1 No.
Drainage	1200 rm
Electrical works	850 rm
Street light	80 Nos.
Plantation	3000 Nos.
Kiosks	15 Nos.
Fountain	4 Nos.
Boats	4 Nos.
Community building	2100 sqm
Pedestrian Bridge	40 rm
Boundary wall	850 rm
Rides for the children's park	-
Walkway for children's park	-

### 3.4. Stakeholders

The following key stakeholders are likely to be involved during the project implementation:

**Table 2: Types of Stakeholders to be Engaged in the Project**

Type of Stakeholders	Expected Roles/Inputs
<b>Residents</b>	To be engaged in community meetings, provide feedback on project plans, and participate in the beautification efforts of the canal.
<b>Business Owners</b>	To be engaged during the organisation of events and activities along the canal to collect their feedback on developing some of the spots of the canal as a commercial hub.
<b>Public-private Service Holders</b>	To be engaged in improving the surrounding infrastructure, such as waste management systems, excavation and public amenities, along the canal.
<b>Rickshaw Pullers</b>	To be engaged in the consultation to gather inputs and feedback while improving the transport routes and their safety.
<b>Local I/NGOs</b>	To be engaged in community outreach efforts, raising awareness about environmental conservation and facilitating stakeholder engagement.
<b>Teachers</b>	To be engaged in organising outdoor learning activities to involve students in environmental conservation efforts.
<b>Local Shop Owners</b>	To collaborate on creating beautiful storefronts and attracting visitors to the canal area.

Type of Stakeholders	Expected Roles/Inputs
<b>Children</b>	To be engaged in participating in educational programs focused on environmental conservation, while also enjoying safe and engaging play areas created along the canal.
<b>Women</b>	To be engaged in advocating for improved sanitation facilities and recreational areas that enhance their quality of life.
<b>Elderly</b>	To engage in designing accessible walkways and seating areas, ensuring that these spaces meet their needs for socialisation and outdoor recreation.

Collectively, these stakeholders form a dynamic coalition committed to the regeneration of Singra Poura Canal, ensuring its benefits are accessible to all members of the community. By fostering collaboration and partnerships with these stakeholders, the project can effectively harness collective expertise and resources to achieve its objectives.

### 3.5. Expected Benefits from the Project

The project has both direct and indirect benefits for the local community and ecosystem. With a primary focus on Wards 4 and 5, an estimated 9,308 residents are directly set to benefit from the project's implementation. In addition, the project can have a positive impact on the broader population (49,797) of Singra Pourashava. Some of the more direct and indirect benefits expected after successful implementation of this project include:

**Table 3: Direct and Indirect Benefits of the Project**

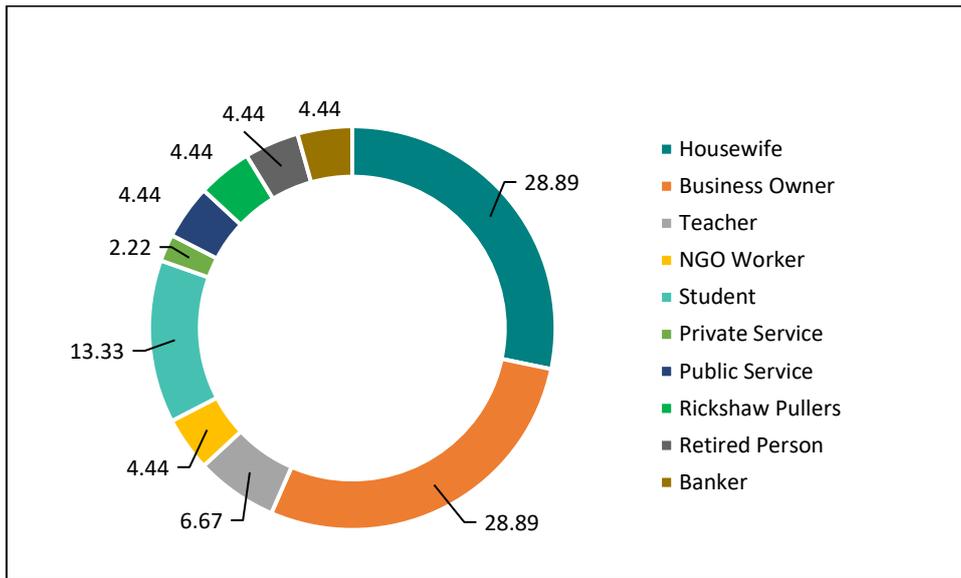
Direct Benefits	Indirect Benefits
<b>Reduction of Waterlogging and Flooding:</b> Regenerating the canal and surrounding areas can enhance drainage and mitigate the risk of waterlogging and flooding during the monsoon season, thereby safeguarding homes, businesses, and public infrastructure.	<b>Climate Resilience:</b> Incorporation of green infrastructure and climate-adaptive measures can enhance the municipality's resilience to climate change impacts, such as extreme weather events and rising temperatures.
<b>Improved Public Health:</b> By eliminating stagnant water bodies and mosquito breeding grounds, the project can reduce the incidence of waterborne diseases such as dengue and chikungunya, resulting in improved public health outcomes for residents.	<b>Community Cohesion:</b> The creation of shared public spaces and community facilities can strengthen social bonds, foster a sense of belonging, and promote community cohesion among Singra Pourashava residents.
<b>Enhanced Environmental Quality:</b> The restoration of the canal and implementation of pollution control measures can contribute to cleaner waterways, reduced air pollution, and preserved biodiversity, ultimately fostering a healthier and more sustainable urban environment.	<b>Educational Opportunities:</b> The project may provide educational opportunities through environmental awareness programs, civic engagement initiatives, and skill-building activities related to canal restoration and ecological stewardship.

Direct Benefits	Indirect Benefits
<p><b>Creation of Public Spaces:</b> The development of canal banks into accessible and well-designed public spaces can provide residents with opportunities for recreation, exercise, and social interaction, thereby promoting both physical and mental well-being.</p>	<p><b>Tourism and Cultural Promotion:</b> The beautification of the canal corridor and the creation of recreational amenities may attract tourists and visitors, showcasing Singra Pourashava's cultural heritage and promoting local tourism initiatives.</p>
<p><b>Increased Economic Opportunities:</b> The revitalisation of the canal corridor and the creation of new civic amenities may attract visitors, stimulate economic activity, and potentially increase property values, generating employment opportunities and boosting local businesses.</p>	<p><b>Sustainable Development:</b> Integration of sustainable urban development principles and environmental conservation efforts can contribute to the long-term sustainability, resilience, and livability of Singra Pourashava for current and future generations.</p>

### 3.6. Demand Analysis

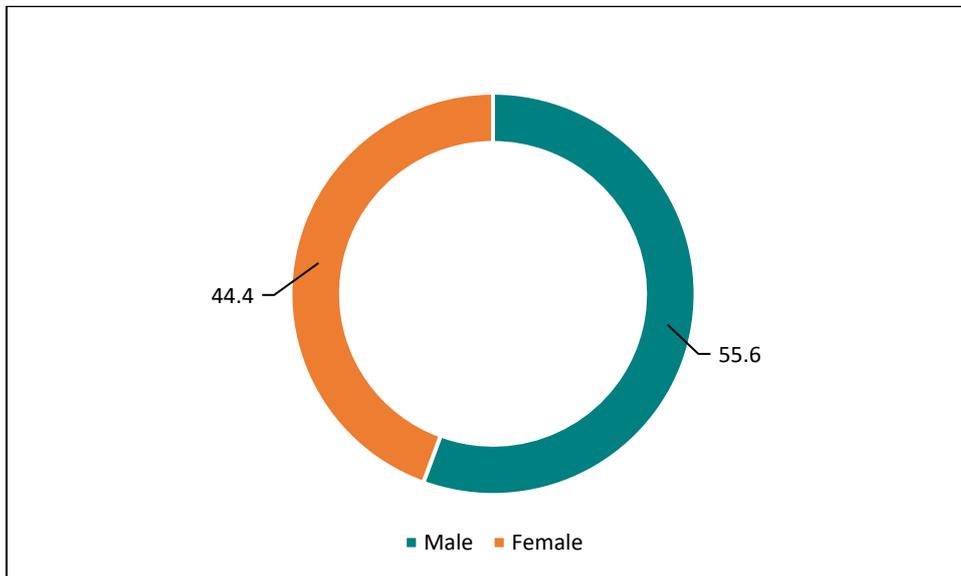
**Involved Stakeholders to Understand Community Demand:** Community feedback played a pivotal role in shaping the direction of the canal regeneration project. Through a comprehensive survey, insights were gathered from 100 individuals residing along the canal, representing diverse segments of the community, including housewives, local business owners, rickshaw pullers, students, and service providers. Notably, housewives (28.89%), shop owners (28.89%), and students (13.33%) contributed significantly to the survey, reflecting the project's aim to enhance public space accessibility, well-being, and health. Figures 2 and 3 provide a detailed breakdown of occupation-wise and gender-wise distribution among the surveyed community members.

**Figure 2: Occupation-wise Percentage of Community People**



Source: Community Survey, 2024

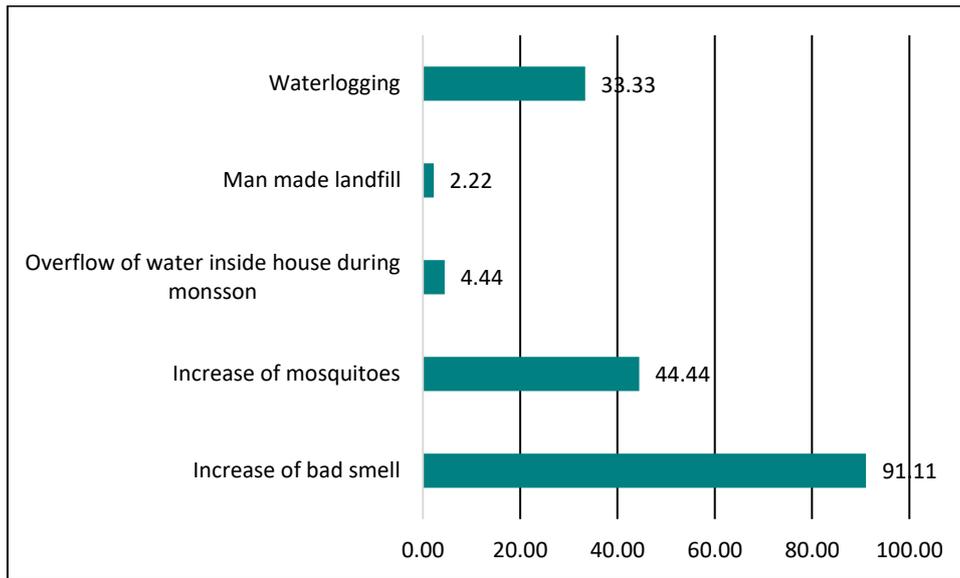
**Figure 3: Gender Distribution of Survey Respondents**



Source: Community Survey, 2024

**Community Feedback on Changes in Canal Conditions:** The survey revealed significant concerns regarding the deteriorating condition of the canal over the past few years. The majority of respondents (91.11%) highlighted an increase in bad smells as the most prevalent issue, followed by the rise in mosquitoes (44.44%). Other reported problems included waterlogging (33.33%), overflow of water inside houses during the monsoon season (4.4%), and instances of man-made landfills (2.2%). These findings underscore the urgent need for interventions to address the deteriorating state of the canal and mitigate its adverse impacts on the local residents. Figure 4 illustrates the negative changes in canal conditions over the past years.

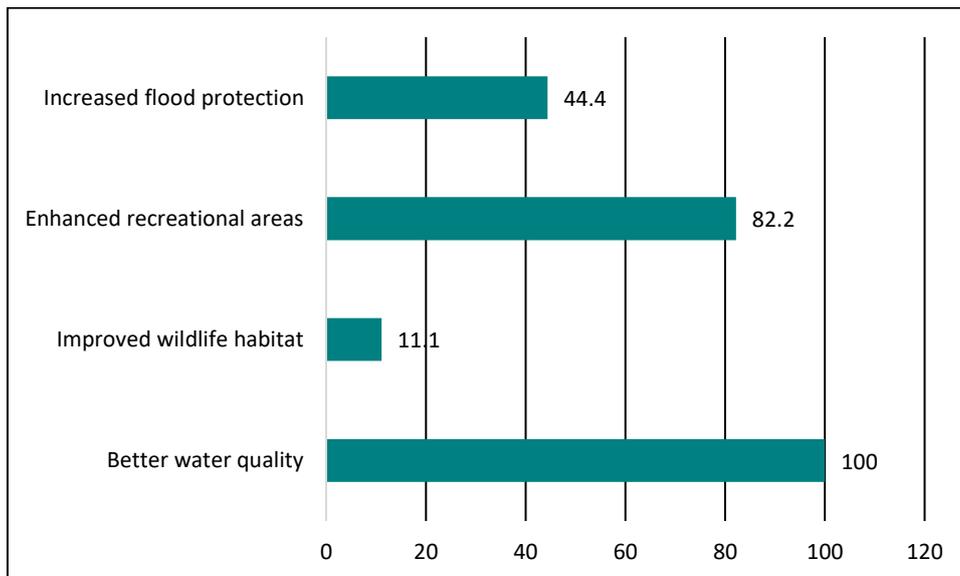
**Figure 4: Negative Changes in the Canal Conditions Over the Past Years**



Source: Community Survey, 2024

**Community Expectations for Project Improvement:** The community's expectations for the canal regeneration project are diverse yet aligned with common goals. Respondents anticipate significant improvements, including better water quality (100%), enhanced recreational areas (82.2%), increased flood protection (44.4%), and improvements in wildlife habitat (11.1%). These expectations emphasise the importance of prioritising measures to enhance water quality, create recreational spaces, and improve flood protection within the project scope. Figure 5 illustrates the anticipated improvements resulting from the project.

**Figure 5: Expected Improvements from the Project**

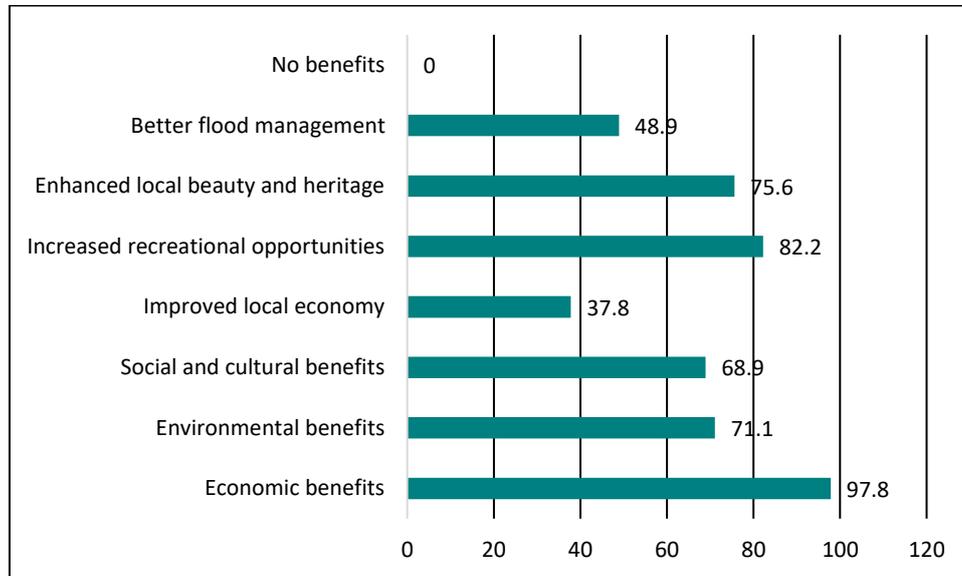


Source: Community Survey, 2024

**Community's Expectations on Project Benefits:** The project holds promising prospects for various aspects of community well-being and development, as indicated by the expectations expressed by respondents. Economic benefits (97.8%), environmental benefits (71.1%), social and cultural benefits

(68.9%), increased recreational opportunities (82.2%), and enhanced local beauty and heritage (75.6%) are among the anticipated benefits. These findings underscore the multifaceted benefits that the canal regeneration project is expected to deliver, ranging from economic prosperity to social cohesion. Figure 6 illustrates the expected benefits from the project.

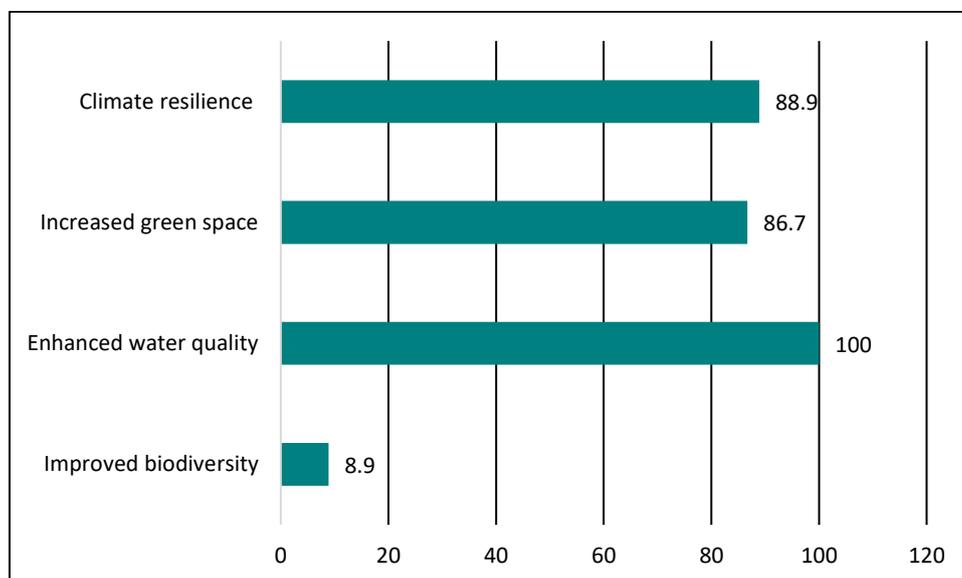
**Figure 6: Expected Benefits from the Project**



Source: Community Survey, 2024

**Community's Expectations on Long-Term Benefits:** Anticipated long-term benefits of the canal regeneration project reflect a forward-thinking approach towards building a resilient and sustainable community. Enhanced water quality (100%), climate resilience (88.9%), increased green space (86.7%), and improved biodiversity (8.9%) are among the expected long-term benefits. These findings align closely with the project's objectives of promoting environmental conservation and sustainable development. Figure 7 presents the expected long-term benefits from the project.

**Figure 7: Expected Long-Term Benefits from the Project**



Source: Community Survey, 2024

The demand analysis for the canal regeneration project highlights the pressing need for interventions to address the deteriorating condition of the canal and meet the community's expectations for improvement. With a balanced representation of stakeholders and an understanding of their diverse needs and preferences, the project is poised to deliver significant benefits in terms of economic prosperity, environmental sustainability, and social well-being. By incorporating effective strategies to enhance water quality, create recreational spaces, and improve flood management, the project can contribute to building a resilient and livable community over the long term.

### 3.7. SWOT Analysis

The following strengths, weaknesses, opportunities and threats have been identified for the proposed project:

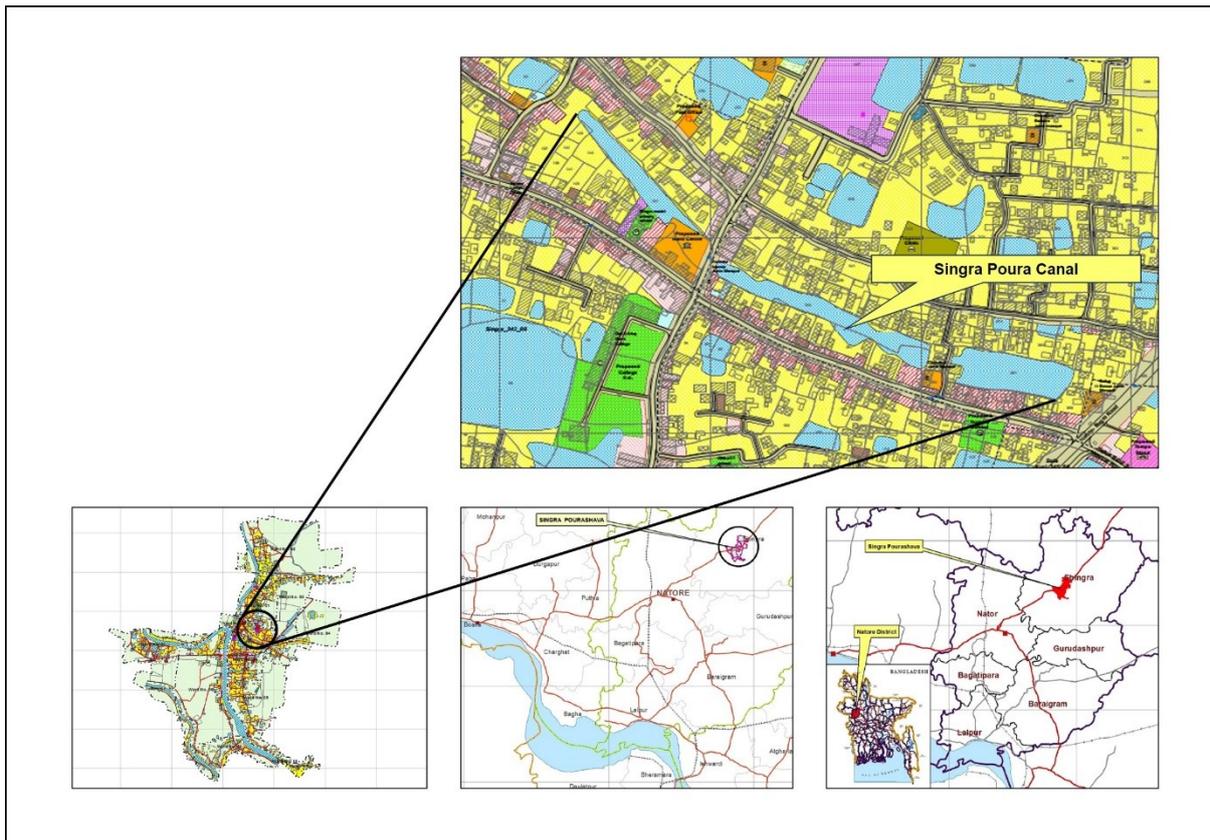
Strengths	Weaknesses
<ul style="list-style-type: none"> <li>● Availability of local skilled labour for construction and restoration work.</li> <li>● Support from Singra Pourashava for the project implementation.</li> <li>● Potential for improving water quality and ecosystem health in the surrounding area.</li> <li>● Opportunity to enhance recreational activities and tourism along the restored canal.</li> <li>● Possibility of creating employment opportunities for local communities during and after the regeneration process.</li> </ul>	<ul style="list-style-type: none"> <li>● Limited financial resources for conducting comprehensive regeneration work.</li> <li>● Potential for resistance or opposition from certain stakeholders, such as landowners or businesses affected by the project.</li> <li>● Challenges in coordinating with various government agencies and departments involved in regulatory approvals and permits.</li> <li>● Vulnerability to environmental risks and uncertainties, such as changes in weather patterns or natural disasters.</li> <li>● Lack of public awareness and community engagement regarding the benefits of canal regeneration.</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>● Access to funding opportunities from national or international development agencies for infrastructure projects.</li> <li>● Potential partnerships with local NGOs or community-based organisations for implementing regeneration initiatives.</li> <li>● Possibility of integrating innovative technologies for sustainable water management and environmental monitoring.</li> <li>● Opportunity to establish collaborative initiatives with neighbouring communities or Pourashavas for shared benefits.</li> <li>● Potential for leveraging the restored canal as a catalyst for broader urban revitalisation efforts in the region.</li> </ul>	<ul style="list-style-type: none"> <li>● Risk of project delays or disruptions due to unforeseen technical challenges or regulatory hurdles.</li> <li>● Potential for conflicts or disputes over land ownership or property rights along the canal corridor.</li> <li>● Vulnerability to climate change impacts, such as increased flooding, affects the long-term viability of the restoration.</li> <li>● Threat of pollution or contamination from upstream sources, compromising water quality and ecosystem health.</li> <li>● Risk of insufficient community participation and support, leading to sustainability challenges in maintaining the restored canal over time.</li> </ul>

## 4. Section 4: Technical/Technological & Engineering analysis

### 4.1. Location

The Singra Poura Canal is situated within the boundaries of Wards 4 and 5. It runs adjacent to Natore Highway on the eastern side and is bordered by Singra Bazar and Singra Bazar Central Mosque on the northwestern side. Cutting through the canal's middle is the Singra Upazila Road. Approximately 310 meters away from Singra Bus Stand lies Suborno Sorobor, marking the midpoint of the canal. The following maps show the visual status of the canal.

**Map 1: Location of Singra Poura Canal**



### 4.2. Land Ownership

The entire canal area is situated on public land (khas land) and managed by Singra Pourashava. However, it is advisable to liaise with the local administration office (AC Land Office) to proactively address any potential local challenges that may arise during the implementation, land acquisition and cleaning phases.

### 4.3. Availability of Land

The entire land area of the canal spans approximately 650 meters, but currently, only about 400 meters of the canal retains its water catchment capacity. The remaining areas are filled with landfills and encroachments, obstructing natural drainage and increasing flood risks during monsoon seasons. The average width of the canal is approximately 10.67 meters. In various sections, the width ranges

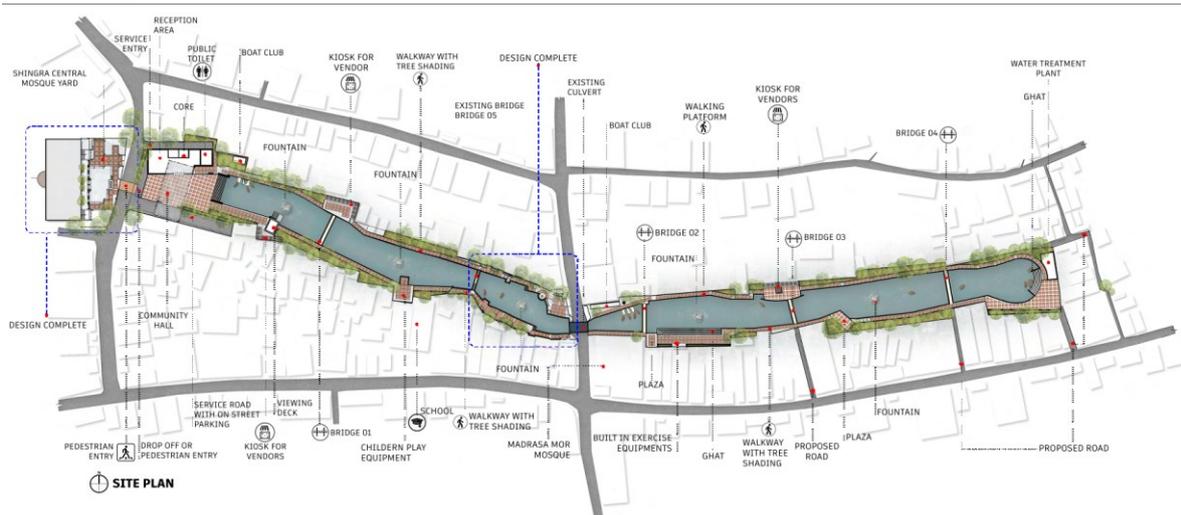
from 9.14 meters (30 feet), 10.67 meters (35 feet), to 13.72 meters (45 feet). The average depth of the canal is approximately 3.35 meters and varies between 2.44 to 4.57 meters in different sections.

#### 4.4. Existing Physical Features

Adjacent to the canal, there are predominantly small shops, a mosque, a madrasa, and semi-pucca residences, along with apartment buildings. Currently, there exists a small bridge over the canal, near the Suborno Sorobor area, facilitating passage from one side to the other. Most of the apartment and commercial structures are two to three-storied, with some single-storied ones also present. In addition, semi-pucca residential buildings have cropped up near the canal, with many of them utilising the canal area for waste disposal.

#### 4.5. Technical Design

In the northern section, the proposed infrastructure development spans approximately 850 meters, covering a 400-meter-long area. The design includes the construction of walking paths using durable, non-slip materials to ensure safety and longevity. Seating and gathering spaces will be strategically located, utilising weather-resistant materials and designed to accommodate various public activities. The recreational infrastructure will feature multifunctional spaces, incorporating sustainable materials and environmentally conscious designs. An efficient drainage system is planned, capable of managing local precipitation patterns and preventing flooding. In addition, a revenue-generating community building with modern amenities will be constructed, alongside 15 commercial shops equipped with energy-efficient lighting and ventilation systems. Tree planting will be strategically executed to enhance the local ecosystem, and a comprehensive water treatment plan will be implemented to improve the canal's water quality.



Site Plan



**Proposed Community Building**



**Walkway**

In the southern section, the technical design includes 600 meters of infrastructure development surrounding two water bodies, which together cover an area of approximately 8,500 square meters. The walking paths and public spaces will be designed with accessibility in mind, facilitating smooth pedestrian flow and promoting community engagement. Traditional ghats will be constructed with reinforced structures to ensure stability and safe access to the water bodies. Tree planting will complement the surrounding landscape, while water quality enhancement measures, such as filtration systems, will be integrated to maintain ecological balance. A retention pond covering 3,200 square meters will be developed, engineered to optimise water retention and minimise overflow. This pond will be connected by a 250-meter-long natural drain designed for efficient water flow and erosion reduction. Furthermore, the plan includes the construction of 15 commercial shops, following sustainable design principles, and a 6,000-square-meter children’s park featuring safe, eco-friendly play structures and landscaping that encourages biodiversity.

#### 4.6. Output Plan

The output plan of the project encompasses several key components aimed at enhancing infrastructure, public amenities, and environmental quality within the Singra Pourashava:

Northern Part Development	Southern Part Development
Infrastructure development covering approximately 850 meters, including footpaths, seating areas, public gathering spaces, recreational facilities, and drainage systems.	Infrastructure development spanning 600 meters, comprising walkways, public spaces, and embankments around two reservoirs covering an area of approximately 8,500 square meters.
Construction of a revenue-generating community building and 15 shops to foster economic activity and enhance local commerce.	Implementation of tree plantation programs and initiatives to enhance water quality within the reservoirs.
Tree planting initiatives and measures to improve the quality of canal water along a 400-meter perimeter in the northern part.	Creation of a retention pond covering an area of 3,200 square meters, alongside the construction of a 250-meter-long natural drain connected to it for efficient water management.
	Establishment of 15 shops and the development of a children's park spanning 6,000 square meters to provide recreational

Northern Part Development	Southern Part Development
	opportunities and enhance community well-being.

## 4.7. Cost Estimates

The table below provides a breakdown of the major items and associated estimated expenditures for the project aimed at the regeneration of the canal and surrounding areas in Singra Pourashava. Each item/component is listed along with its respective quantity and estimated expenditure in Bangladeshi Taka (BDT) lakh.

**Table 4: Major Items and Estimated Expenditures of the Project**

SL No.	Major items/components of the project (with quantities)	Estimated Expenditure (BDT in Lakh)
1	Infrastructure construction cost of the canal and surrounding area of Singra Pourashava	2311.11
2	Community building construction cost	784.00
3	Computer (5), Printer (3), Scanner (1) and Photocopier (1)	13.90
4	Office equipment	5.00
5	Furniture	5.00
6	Summation of Project Management Unit (PMU) Expenses	293.96
7	Add: Physical Contingency (2%)	68.25
8	Add: Price Contingency (8%)	273.03
	<b>Total Project Expenses</b>	<b>3754.25</b>





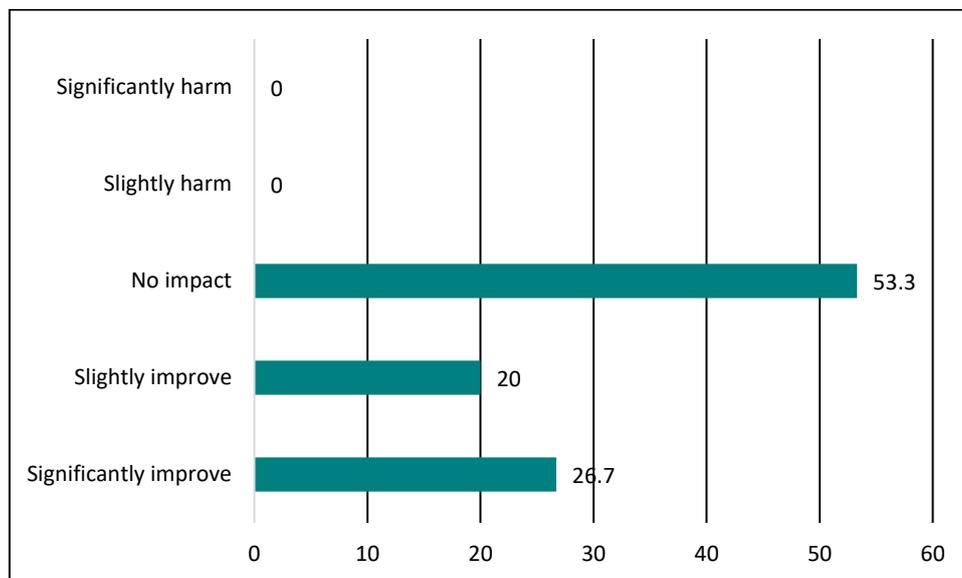
## 5. Section 5: Environmental Sustainability, Climate Resilience and Disaster Risk Analysis

### 5.1. Environmental Sustainability

**Impacts:** In Singra, the biodiversity and ecosystems are undergoing significant changes due to rapid urbanisation. Low-lying areas are being filled with buildings and commercial structures, leading to a reduction in wetland areas and a decline in local fisheries and birds. This loss of habitat is contributing to a decrease in fish species diversity. In addition, the Singra Poura Canal is experiencing a decline in its ecological benefits.

However, the proposed project aims to mitigate these impacts by conserving and enhancing the ecosystem of the canal and its surrounding areas. Community members believe that the project will have a significantly positive impact on local biodiversity. Their perceptions are reflected in Figure 8, which illustrates the potential impact of the project on local biodiversity.

**Figure 8: Potential Impact of the Project on Local Biodiversity**



Source: Community Survey, 2024

The average width of the canal spans approximately 10.67 meters, though varying across different sections, ranging from 9.14 meters to 13.72 meters. These discrepancies are attributed to landfill and encroachment, compounded by waste dumping activities. Presently, the average depth of the canal measures around 3.35 meters, fluctuating between 2.44 to 4.57 meters in various segments.

According to the community survey findings (shown in Figure 9), a significant majority of community members (97.8%) perceive the water quality of the canal as very poor, with none regarding it as quite good. Although the canal water is not currently utilised for any activities, the onset of monsoon poses heightened risks to the surrounding population, particularly in terms of waterborne diseases, when inundation occurs.

**Figure 9: Water Quality of the Canal**



Source: Community Survey, 2024

Household solid waste and human excreta are identified as the primary sources contributing to the pollution of the canal water. According to the community people, both household waste and excreta are being directly disposed of into the canal, with the outlets of septic tanks from many residences leading directly into the waterway.

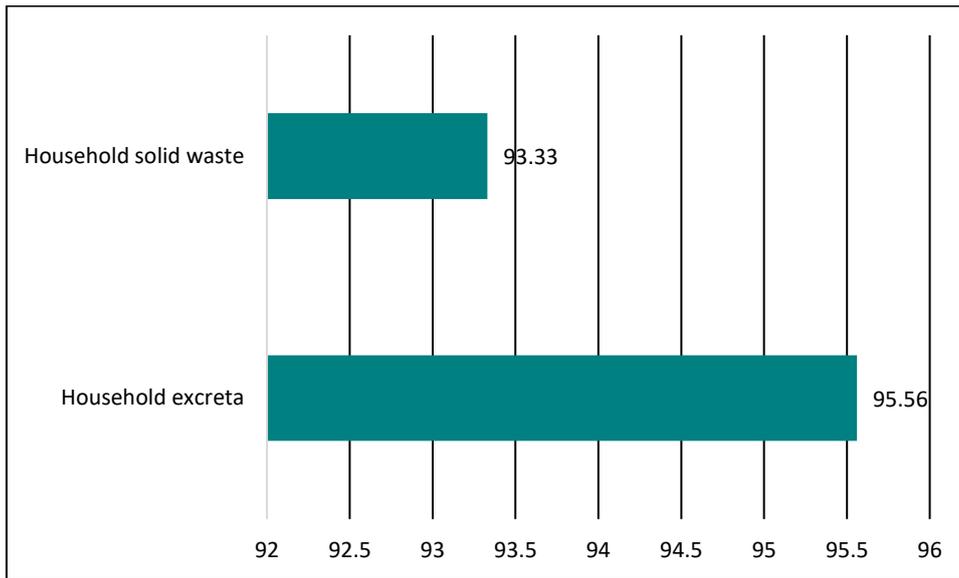
**Figure 10: Waste Disposed in the Canal**



Source: Community Survey, 2024

This practice creates the impression that the canal is being utilised as a drainage system. Figure 11 visually depicts the community's perception of the primary pollutants affecting the canal. Therefore, interventions to address these issues are essential to restore the ecological balance of the waterway and mitigate pollution effectively

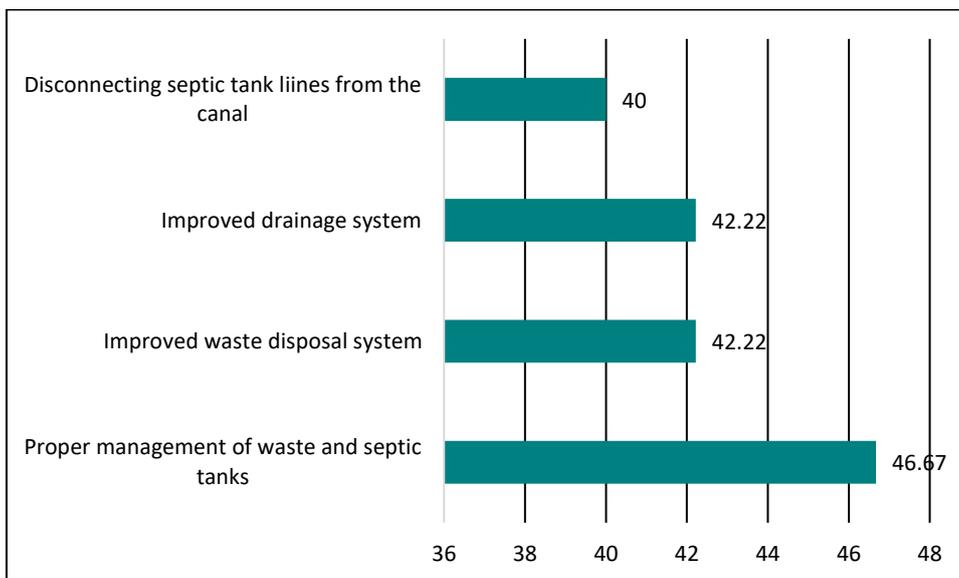
**Figure 11: Major Sources of Pollution**



Source: Community Survey, 2024

**Mitigation:** The regeneration of the canal requires a comprehensive strategy to address the above-mentioned challenges. Primarily, it is important to disconnect all septic tank connections from the canal to prevent further pollution. Public awareness campaigns are essential to educate residents living alongside the canal about the importance of waste disposal practices and to discourage dumping in and around its vicinity. Given that the canal is often used as a dumping site due to its location behind buildings, it is crucial to incorporate strategies to discourage such activities into the design of canal banks.

**Figure 12: Community Feedback on Potential Measures for Improving the Water Quality of the Canal**



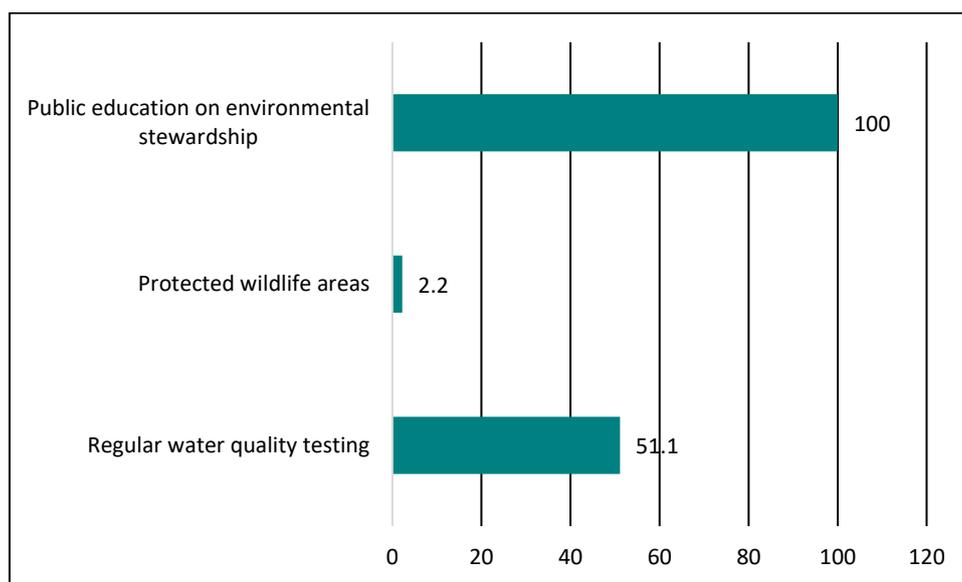
Source: Community Survey, 2024

To achieve the project's objectives comprehensively, the construction design should include water treatment components to purify the water and mitigate pollution. In addition, integrating nature-

based solutions into the design can help restore the ecological balance of the canal and improve water quality. Community feedback suggests several key measures (Figure 12) to address these issues, including proper waste and septic tank management, enhanced waste disposal systems, improved drainage infrastructure, and the disconnection of septic tank lines from the canal.

Moving forward, Singra Pourashava should adopt an integrated and long-term approach to ensure the sustainability of the project. This involves developing comprehensive plans for ongoing maintenance and management of the canal, as well as implementing measures to monitor and mitigate any potential environmental risks. By taking these steps, the project can not only achieve its immediate goals but also secure long-term benefits for the community and the environment. In addition, community input has highlighted key strategies (referenced in Figure 13) such as public education, regular water quality testing, and wildlife protection, which should be prioritised post-regeneration of the canal.

**Figure 13: Expected Long-Term Environmental Protections Should Be in Place Post-Regeneration**



Source: Community Survey, 2024

## 5.2. Climate Resilience

**Impacts:** The City Resilience Strategy for Singra underscores the impact of climate change on urban systems, driven by rising temperatures and shifting rainfall patterns. Key areas affected include water resource management, river plain management, stormwater drainage, solid waste management, and sanitation. These systems exhibit varying levels of risk, with water resource management facing high to extreme risk, river plain management categorised as extreme risk, stormwater drainage posing a high risk, solid waste management presenting a high risk, and sanitation representing a medium risk. The rapid expansion of infrastructure has disrupted wetlands, leading to their fragmentation and alteration, resulting in diminished and disconnected water bodies. Consequently, drainage conditions have worsened, heightening the threat of floods. Wards 3, 4 and 5 emerge as particularly vulnerable zones due to their exposure to multiple sectoral impacts, especially the deterioration of drainage and sanitation systems.

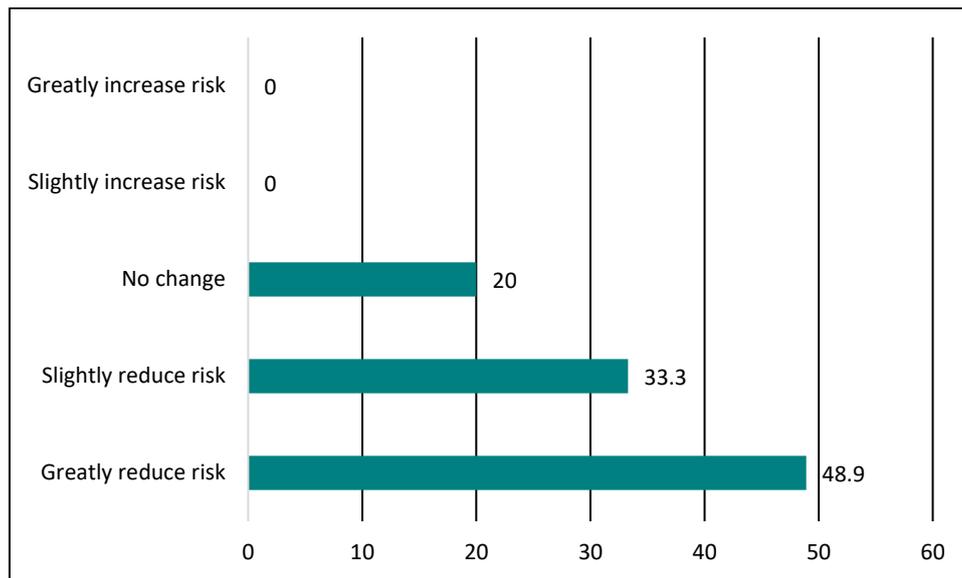
**Mitigation:** The technical design should include a multifaceted approach to mitigate risks and increase the canal's resilience against environmental challenges. This includes extensive plantation along the canal banks to stabilise soil, prevent erosion, and absorb excess water, thereby reducing the risk of waterlogging. In addition, the plan can emphasise the importance of enhancing drainage maintenance

by increasing the frequency of maintenance activities to ensure efficient water flow and minimise waterlogging in adjacent areas. Furthermore, the design incorporates measures to delink drains, aiming to improve drainage efficiency and reduce the risk of inundation during heavy rainfall events.

Proper management of septic tanks using septage suction machines is also prioritised to prevent water contamination and mitigate health hazards associated with poor sanitation practices. Moreover, the integration of natural water treatment facilities can enhance water quality and promote ecological balance, thereby reducing the risk of contamination and safeguarding public health.

Community feedback, as referenced in Figure 14, has been overwhelmingly positive, with residents expressing strong support for the project and providing valuable insights into how it can effectively address the identified risks.

**Figure 14: Community Feedback on Reducing Flood Risk through the Project**



Source: Community Survey, 2024

### 5.3. Disaster Risk Reduction

**Impacts:** As outlined in Section 5.3.

**Mitigation:** As outlined in Section 5.3.

### 5.4. Stakeholder Engagement and Collaboration

Section 3.4 outlines the various types of stakeholders to engage during the project's design and implementation. However, to ensure the project's sustainability and inclusivity, the following actions can be considered based on specific requirements to get several benefits:

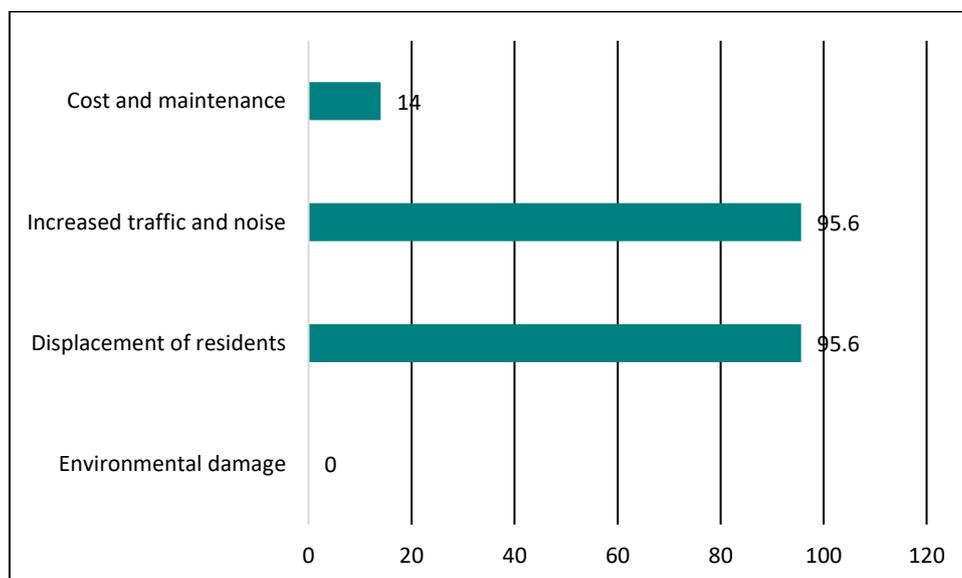
- Involve affected communities in decision-making processes to ensure that project plans and activities are aligned with local needs, priorities, and aspirations.
- Build local capacity for environmental management, disaster preparedness, and climate change adaptation, which empowers communities to take ownership of project outcomes and sustainably manage project interventions over the long term.

- Leveraging local knowledge, expertise, and resources enhances the effectiveness and efficiency of project implementation.
- Incorporate community feedback and local perspectives as much as possible, so that the project can identify and mitigate potential risks and challenges more effectively, reducing the likelihood of conflicts or resistance during implementation.

## 5.5. Resettlement Plan

Based on the survey results, 95.6% of the surveyed community members expressed concerns about the risk of displacement for residents in the surrounding areas. To address this issue, it is advisable to integrate a resettlement plan into the technical design of the project. Informal settlements and illegally occupied structures, including commercial shops, may present challenges during implementation. Therefore, it is recommended to engage in negotiations with these stakeholders prior to commencing the project. In addition, Singra Pourashava can coordinate with the local land administration office and the District Commissioner (DC) office during the implementation phase for further assistance and guidance. The following figure (Figure 15) shows the community feedback on major concerns regarding the project.

**Figure 15: Major Concerns Regarding the Project**



Source: Community Survey, 2024

## 6. Section 6: Cost-Benefit Analysis

### 6.1. Financial Analysis

Based on the financial analysis, the project requires a capital cost of BDT 27,302,800. The analysis spans over a period of 28 years, projecting initial investments and annual revenues. It highlights the incremental financial performance over time, detailing the total costs, net revenues, and their present values at discount rates of 12% and 15%.

At a discount rate of 12%, the project yields a Net Present Value (NPV) of BDT 1,598.76 Lakh, with a Benefit-Cost Ratio (BCR) of 1.501. In addition, the Financial Internal Rate of Return (FIRR) is calculated at 16.45%.

These financial metrics suggest that the project has positive economic viability and promises substantial returns relative to the initial investment. It indicates favourable financial prospects and underscores the potential for long-term sustainable revenue generation.

Furthermore, the financial analysis reflects a robust economic case for implementing the project, with significant positive net present value and attractive internal rate of return, indicative of its potential to deliver considerable economic benefits over the project's lifespan.

The calculations and detailed financial breakdown are presented in the tables (Table 4, and 5) provided.

**Table 6: Capital Cost and Financial Projection for the Project**

Financial Analysis										
Name of the Project		Reducing Waterlogging, Environmental Pollution and Impact of Climate Change and Increasing Civic Facilities and Revenue through the Regeneration of a Canal and Surrounding Areas in Singra Pourashava								
Capital Cost in BDT =		27,302,800								
Year	Initial Investment	Annual revenue	Total Cost	Net Revenue	Present Value at 12%			Present Value at 15%		
					Discount factor	Total Cost	Total Revenue	Discount factor	Total Cost	Total Revenue
1	2	3	4	5 = 3-2	6	4x6 = 7	3x6 = 8	9	4x9 = 10	3x9 = 11
1	5,460,560.00		5,460,560	(5,460,560)	1.000	5,460,560		1.000	5,460,560	-
2	10,921,120.00		10,921,120	(10,921,120)	1.000	10,921,120		1.000	10,921,120	-
3	10,921,120.00		10,921,120	(10,921,120)	1.000	10,921,120		1.000	10,921,120	-
4		10,500,000	8,000,000	10,500,000	1.000	8,000,000	10,500,000	1.000	8,000,000	10,500,000
5		11,760,000	8,800,000	11,760,000	1.000	8,800,000	11,760,000	1.000	8,800,000	11,760,000
6		13,171,200	9,680,000	13,171,200	1.000	9,680,000	13,171,200	1.000	9,680,000	13,171,200
7		14,751,744	10,648,000	14,751,744	1.000	10,648,000	14,751,744	1.000	10,648,000	14,751,744
8		16,521,953	11,712,800	16,521,953	1.000	11,712,800	16,521,953	1.000	11,712,800	16,521,953
9		18,504,588	12,884,080	18,504,588	1.000	12,884,080	18,504,588	1.000	12,884,080	18,504,588
10		20,725,138	14,172,488	20,725,138	1.000	14,172,488	20,725,138	1.000	14,172,488	20,725,138
11		23,212,155	15,589,737	23,212,155	0.893	13,919,408	20,725,138	0.870	13,556,293	20,184,482
12		25,997,613	17,148,710	25,997,613	0.797	13,670,847	20,725,138	0.756	12,966,889	19,657,931
13		29,117,327	18,863,582	29,117,327	0.712	13,426,725	20,725,138	0.658	12,403,111	19,145,115
14		32,611,406	20,749,940	32,611,406	0.636	13,186,962	20,725,138	0.572	11,863,845	18,645,677
15		36,524,775	22,824,934	36,524,775	0.567	12,951,480	20,725,138	0.497	11,348,026	18,159,268
16		40,907,748	25,107,427	40,907,748	0.507	12,720,204	20,725,138	0.432	10,854,634	17,685,548
17		45,816,678	27,618,170	45,816,678	0.452	12,493,057	20,725,138	0.376	10,382,693	17,224,186

Financial Analysis										
18		51,314,679	30,379,987	51,314,679	0.404	12,269,967	20,725,138	0.327	9,931,272	16,774,860
19		57,472,440	33,417,985	57,472,440	0.361	12,050,861	20,725,138	0.284	9,499,477	16,337,255
20		64,369,133	36,759,784	64,369,133	0.322	11,835,667	20,725,138	0.247	9,086,456	15,911,065
21		72,093,429	40,435,762	72,093,429	0.287	11,624,315	20,725,138	0.215	8,691,393	15,495,994
22		80,744,641	44,479,339	80,744,641	0.257	11,416,738	20,725,138	0.187	8,313,506	15,091,751
23		90,433,998	48,927,272	90,433,998	0.229	11,212,868	20,725,138	0.163	7,952,050	14,698,053
24		101,286,077	53,820,000	101,286,077	0.205	11,012,638	20,725,138	0.141	7,606,308	14,314,625
25		113,440,407	59,202,000	113,440,407	0.183	10,815,984	20,725,138	0.123	7,275,599	13,941,200
26		127,053,256	65,122,200	127,053,256	0.163	10,622,841	20,725,138	0.107	6,959,269	13,577,517
27		142,299,646	71,634,419	142,299,646	0.146	10,433,148	20,725,138	0.093	6,656,692	13,223,321
28		159,375,604	78,797,861	159,375,604	0.130	10,246,842	20,725,138	0.081	6,367,271	12,878,365
<b>Total</b>	<b>27,302,800</b>	<b>1,400,005,636</b>	<b>814,079,275</b>	<b>1,372,702,836</b>		<b>319,110,720</b>	<b>478,987,111</b>		<b>274,914,952</b>	<b>398,880,837</b>

**Table 7: Financial Analysis Summary for the Project**

Financial Analysis:				
NPV (BDT in Lakh)				
Present value of cash inflow at 12% discount rate				4,789.87
Less: Present value of Total cost				3,191.11
				1,598.76
<b>BCR</b>	PV of Total Revenue			1.501
	PV of Total Cost			
<b>FIRR</b>		Present value of cash inflow	Present value of total cost	NPV

**Financial Analysis:**

			<b>BDT in Lakh</b>	<b>BDT in Lakh</b>
At a discount factor 12%		4,789.87	3,191.11	1,598.76
At a discount factor 15%		3,988.81	2,749.15	1,239.66
				16.45%

## 6.2. Economic Analysis

The economic analysis of the project "Reducing Waterlogging, Environmental Pollution, and Impact of Climate Change and Increasing Civic Facilities and Revenue through the Regeneration of a Canal and Surrounding Areas in Singra Pourashava" indicates promising outcomes. With a capital cost of BDT 289,969,000, the project aims to generate significant revenue and benefits over its operational lifetime.

- **Net Present Value (NPV):** The NPV of the project, calculated at a discount rate of 12%, is BDT 795.90 Lakh. This indicates that the present value of cash inflows from the project exceeds the present value of total costs, suggesting a positive economic outlook.
- **Benefit-Cost Ratio (BCR):** The Benefit-Cost Ratio (BCR) of the project is calculated as 1.137. This ratio represents the present value of total generated cash flow divided by the present value of total costs. A BCR greater than 1 indicates that the project's benefits outweigh its costs, further supporting its economic viability.
- **Economic Internal Rate of Return (EIRR):** The Economic Internal Rate of Return (EIRR) of the project is determined to be 13.25%. This metric represents the discount rate at which the present value of cash inflows equals the present value of total costs. A higher EIRR indicates a more favourable investment opportunity.

Overall, the economic analysis suggests that the project holds promise in terms of generating revenue, achieving cost-effectiveness, and delivering positive economic returns over its operational lifespan.

The calculations and detailed breakdown are presented in the tables (Tables 6 and 7) provided.

**Table 8: Economic Analysis: Cash Flows and Present Value Analysis**

Economic Analysis												
Name of the Project		Reducing Waterlogging, Environmental Pollution and Impact of Climate Change and Increasing Civic Facilities and Revenue through the Regeneration of a Canal and Surrounding Areas in Singra Pourashava										
Capital Cost in BDT =		289,969,000										
Year	Initial Investment	Annual revenue			Total cost	Net benefit/ revenue	Present Value at 12%			Present Value at 15%		
		Direct	Indirect	Total benefit/ revenue			Discount factor	Total Cost	Total benefit/ revenue	Discount factor	Total Cost	Total benefit/ revenue
1	2	3	4	3+4 = 5	6	5-6 = 7	8	9	5*8 = 10	11	12	5*11 = 13
1	64,766,067				64,766,067	(64,766,067)	1.000	64,766,067	0	1.000	64,766,067	
2	144,542,133				144,542,133	(144,542,133)	1.000	144,542,133	0	1.000	144,542,133	
3	80,660,800				80,660,800	(80,660,800)	1.000	80,660,800	0	1.000	80,660,800	
4		10,500,000	5,000,000	15,500,000	8,000,000	7,500,000	1.000	8,000,000	15500000	1.000	8,000,000	15,500,000
5		11,760,000	5,500,000	17,260,000	8,800,000	8,460,000	1.000	8,800,000	17260000	1.000	8,800,000	17,260,000
6		13,171,200	6,050,000	19,221,200	9,680,000	9,541,200	1.000	9,680,000	19221200	1.000	9,680,000	19,221,200
7		14,751,744	6,655,000	21,406,744	10,648,000	10,758,744	1.000	10,648,000	21406744	1.000	10,648,000	21,406,744
8		16,521,953	7,320,500	23,842,453	11,712,800	12,129,653	1.000	11,712,800	23842453.28	1.000	11,712,800	23,842,453
9		18,504,588	8,052,550	26,557,138	12,884,080	13,673,058	1.000	12,884,080	26557138	1.000	12,884,080	26,557,138
10		20,725,138	8,857,805	29,582,943	14,172,488	15,410,455	1.000	14,172,488	29582943	1.000	14,172,488	29,582,943
11		23,212,155	9,743,586	32,955,740	15,589,737	17,366,003	0.893	13,919,408	29424768	0.870	13,556,293	28,657,165
12		25,997,613	10,717,944	36,715,557	17,148,710	19,566,847	0.797	13,670,847	29269418	0.756	12,966,889	27,762,236
13		29,117,327	11,789,738	40,907,065	18,863,582	22,043,484	0.712	13,426,725	29116841	0.658	12,403,111	26,897,060
14		32,611,406	12,968,712	45,580,118	20,749,940	24,830,179	0.636	13,186,962	28966989	0.572	11,863,845	26,060,581
15		36,524,775	14,265,584	50,790,358	22,824,934	27,965,425	0.567	12,951,480	28819813	0.497	11,348,026	25,251,785

Economic Analysis												
16		40,907,748	15,692,142	56,599,890	25,107,427	31,492,463	0.507	12,720,204	28675266	0.432	10,854,634	24,469,694
17		45,816,678	17,261,356	63,078,034	27,618,170	35,459,864	0.452	12,493,057	28533299	0.376	10,382,693	23,713,369
18		51,314,679	18,987,492	70,302,171	30,379,987	39,922,184	0.404	12,269,967	28393868	0.327	9,931,272	22,981,904
19		57,472,440	20,886,241	78,358,681	33,417,985	44,940,696	0.361	12,050,861	28256926	0.284	9,499,477	22,274,428
20		64,369,133	22,974,865	87,343,998	36,759,784	50,584,214	0.322	11,835,667	28122430	0.247	9,086,456	21,590,101
21		72,093,429	25,272,351	97,365,781	40,435,762	56,930,018	0.287	11,624,315	27990335	0.215	8,691,393	20,928,115
22		80,744,641	27,799,587	108,544,227	44,479,339	64,064,889	0.257	11,416,738	27860600	0.187	8,313,506	20,287,692
23		90,433,998	30,579,545	121,013,543	48,927,272	72,086,271	0.229	11,212,868	27733181	0.163	7,952,050	19,668,084
24		101,286,077	33,637,500	134,923,577	53,820,000	81,103,578	0.205	11,012,638	27608037	0.141	7,606,308	19,068,568
25		113,440,407	37,001,250	150,441,656	59,202,000	91,239,657	0.183	10,815,984	27485128	0.123	7,275,599	18,488,450
26		127,053,256	40,701,375	167,754,630	65,122,200	102,632,431	0.163	10,622,841	27364414	0.107	6,959,269	17,927,060
27		142,299,646	44,771,512	187,071,158	71,634,419	115,436,739	0.146	10,433,148	27245856	0.093	6,656,692	17,383,753
28		159,375,604	49,248,663	208,624,267	78,797,861	129,826,406	0.130	10,246,842	27129414	0.081	6,367,271	16,857,909
<b>Total</b>	<b>289,969,000</b>	<b>1,400,005,636</b>	<b>491,735,297</b>	<b>1,891,740,933</b>	<b>1,076,745,475</b>	<b>814,995,457</b>		<b>581,776,920</b>	<b>661,367,061</b>		<b>537,581,152</b>	<b>553,638,432</b>

**Table 9: Economic Analysis: Economic Performance Metrics**

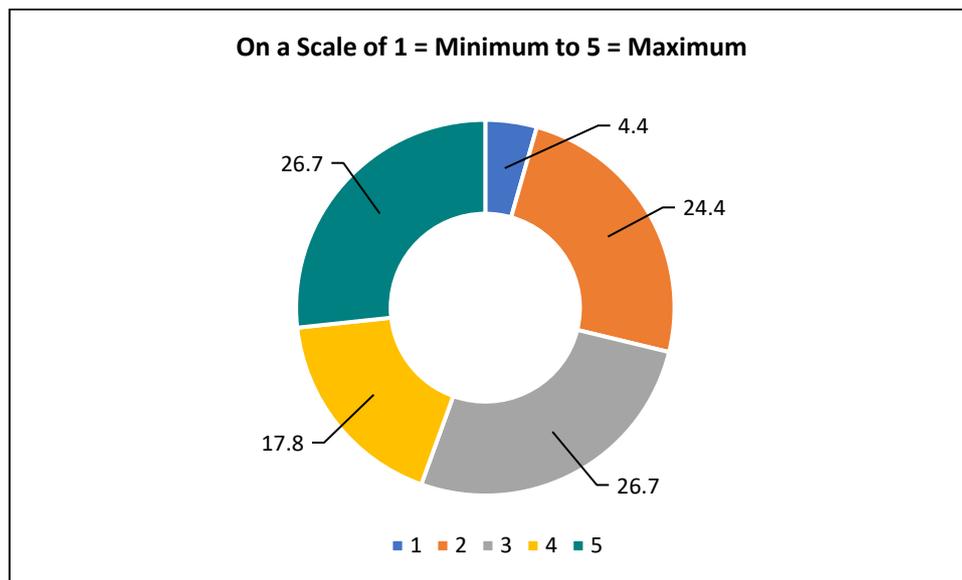
Economic Analysis:			
NPV (BDT in Lakh)			
Present value of generated cash flow at a 12% discount rate			6,613.67
Less: Present value of total cost			5,817.77
		<b>NPV =</b>	795.90

Economic Analysis:				
<b>BCR</b>	PV of Total generated cash		6,613.67	1.137
	PV of Total Cost		5,817.77	
<b>EIRR</b>	Present value of generated cash	Present value of total cost		<b>NPV</b>
	<b>BDT in Lakh</b>	<b>BDT in Lakh</b>		<b>BDT in Lakh</b>
At a discount factor 12%	6,613.67	5,817.77		795.90
At a discount factor 15%	5,536.38	5,375.81		<b>160.57</b>
			<b>EIRR =</b>	13.25%

## 7. Section 7: Social and Community Impact Analysis

Throughout the community-level surveys conducted as part of this project, significant emphasis was placed on determining community awareness, the project's perceived importance, community involvement, and its potential contributions to local culture. Participants were asked to score the importance of the project in their daily lives on a scale from 1 to 5, where 1 indicated minimal importance and 5 indicated maximum importance. The results (Figure 16) revealed that 26.7% of respondents rated the project as highly important, with the majority rating it as either average or highly important. Conversely, a very small percentage (4.4%) rated it as of low importance.

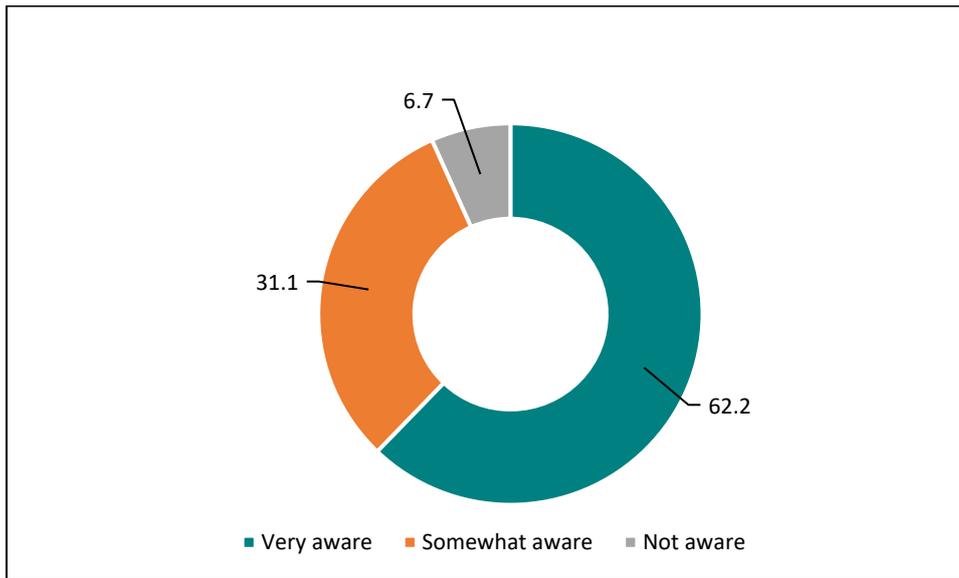
**Figure 16: Importance of the Project to Daily Life**



Source: Community Survey, 2024

The data reveals that a substantial portion, 62.2% of the community members (Figure 17), are already well-informed about the project and are optimistic about its successful execution and positive outcomes. In addition, 31.1% of individuals express some level of awareness regarding the project. This existing awareness augurs well for collecting support and involvement from the community, which is crucial for the project's success. Furthermore, this awareness can facilitate their effective engagement throughout various project phases as needed.

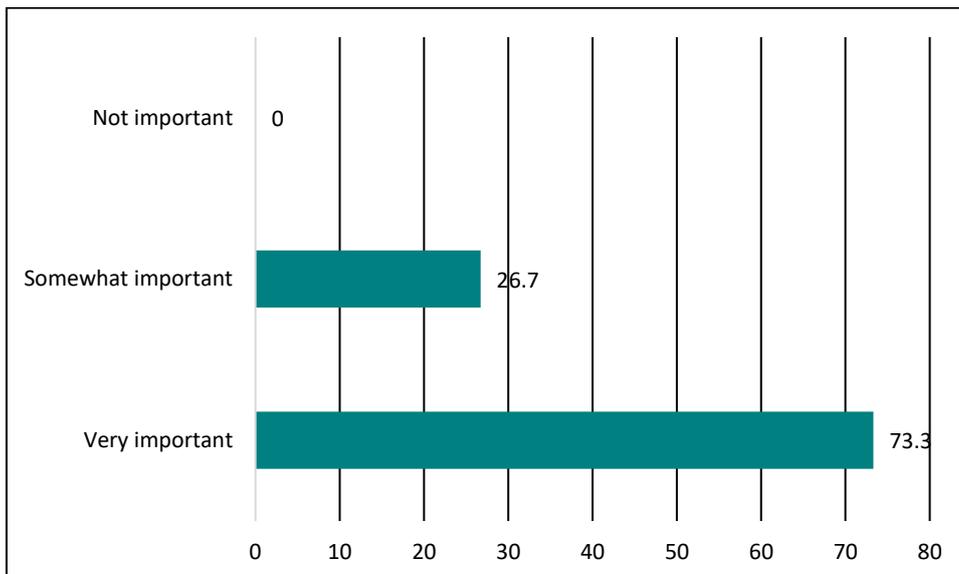
**Figure 17: Public Awareness About the Project**



Source: Community Survey, 2024

In terms of community involvement, the majority, comprising 73.3% of respondents (Figure 18), consider their active participation during both the design and implementation phases to be highly important. Conversely, only 26.7% of individuals view their involvement as somewhat significant. However, there is a potential to increase this level of engagement by adequately informing the community about the project and its benefits. By doing so, it is anticipated that a greater proportion of community members will express interest in participating, thereby enhancing overall project inclusivity and acceptance.

**Figure 18: Importance of the Involvement of Community People**

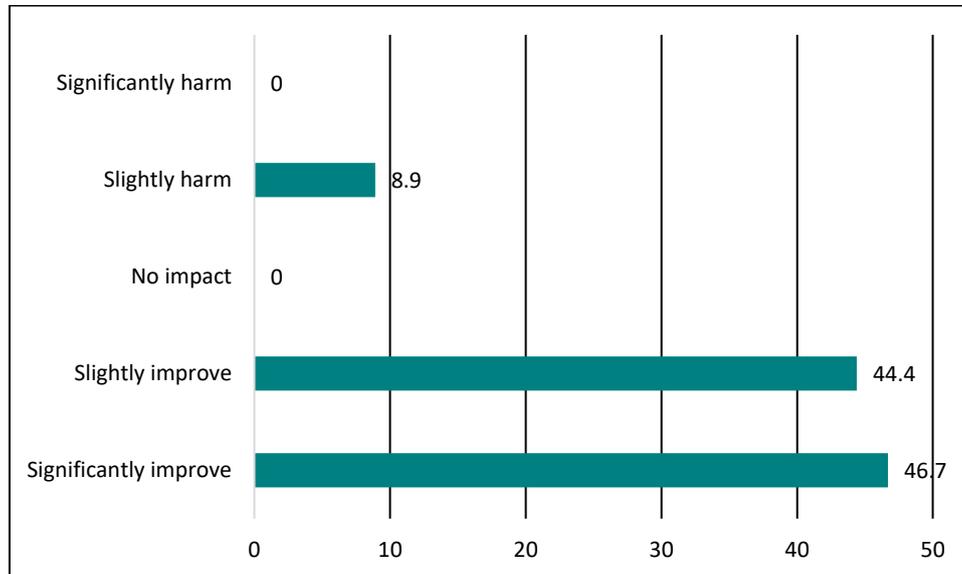


Source: Community Survey, 2024

Regarding the project's impact on the local community and culture, nearly half of the respondents (46.7%) believe that the project will make a significant contribution to their community and culture. In addition, 44.4% (Figure 19) perceive it as having a modest impact. However, a small minority (8.9%)

expresses concerns about the potential negative effects on their local culture, which could be restricted by the prospect of displacement due to the project. This highlights the importance of addressing community concerns and ensuring that the project's benefits outweigh any potential drawbacks, thereby fostering greater community support and acceptance.

**Figure 19: Potential Impact on the Local Community and Culture**



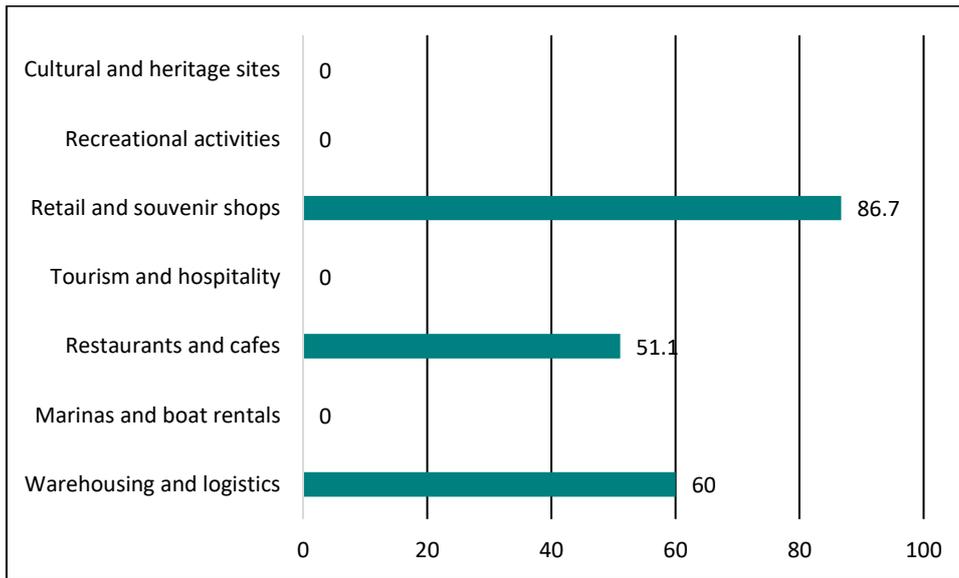
Source: Community Survey, 2024

The findings underscore the importance of community engagement throughout the project lifecycle, with a significant portion of respondents expressing a desire for active participation. In addition, while the majority anticipate positive outcomes from the project, addressing concerns about its potential negative impact on local culture is essential for ensuring widespread community support and acceptance. By prioritising effective communication and community involvement, the project can maximise its benefits while minimising any adverse effects, ultimately fostering a stronger sense of ownership and collaboration within the community.

## 8. Section 8: Economic Impact Analysis

The community survey served as a pivotal tool in understanding the current economic landscape along the canal and its surroundings, providing valuable insights into existing commercial activities. By identifying prevalent economic ventures, such as retail shops, warehouse facilities, and restaurants, at 86.7%, 60%, and 51.1% respectively (Figure 20), the survey lays the foundation for aligning these activities with proposed enhancements, thereby facilitating a seamless transition from existing operations to new opportunities.

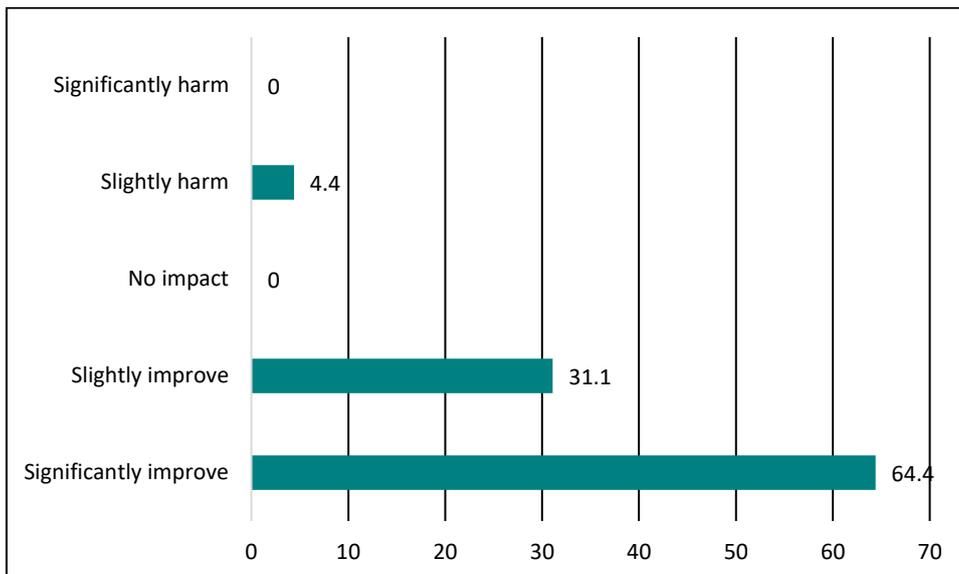
**Figure 20: Existing Businesses Operating Along the Canal**



Source: Community Survey, 2024

Furthermore, the survey explored the potential impact of the proposed project on business and employment opportunities. A substantial majority, comprising 64.4% of respondents, express confidence in the project's ability to significantly enhance and create business prospects, with an additional 31.1% anticipating modest improvements. However, it is crucial to address concerns raised by 4.4% of respondents regarding potential negative impacts on existing businesses (Figure 21), emphasising the need for careful planning and stakeholder engagement during the project's design and implementation phases.

**Figure 21: Potential Project Impact on Local Businesses and Employment Opportunities**

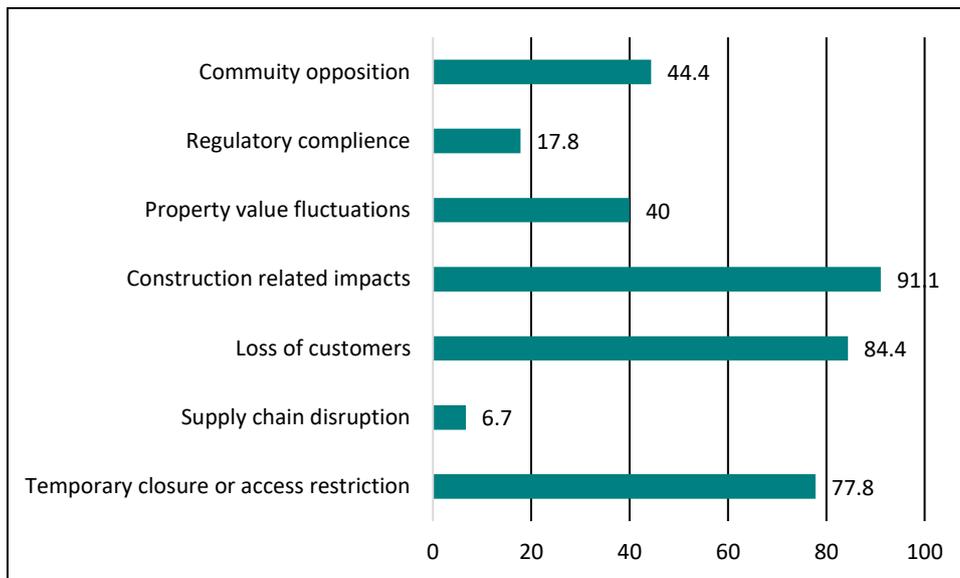


Source: Community Survey, 2024

Concerns regarding negative impacts are also assessed, with a majority of respondents highlighting potential construction-related disruptions, loss of customers, temporary shop closures, access restrictions, and community opposition (Figure 22). Effective communication and community

engagement are important to address these concerns and collect support for the project, particularly in mitigating temporary inconveniences.

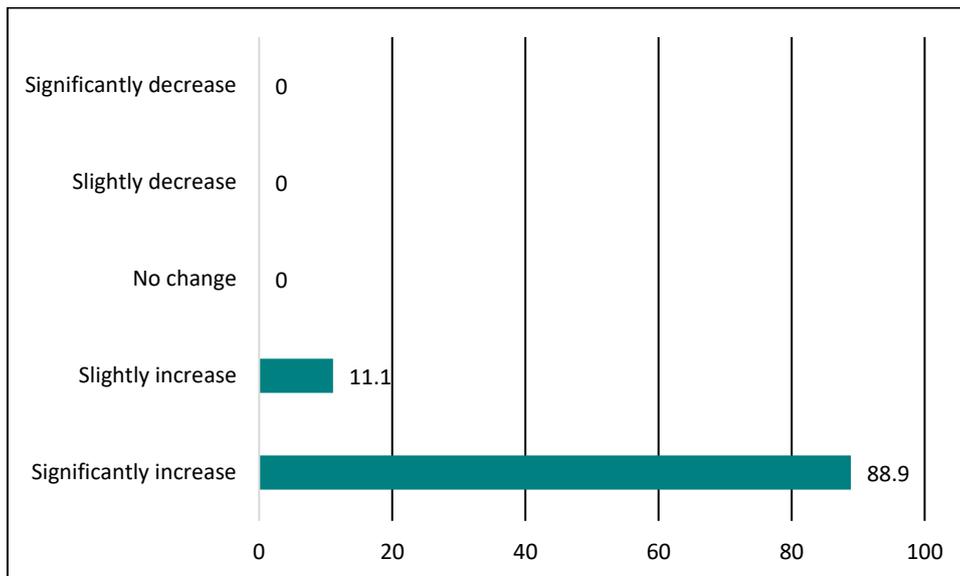
**Figure 22: Potential Disruptions to Existing Business or Economic Activities**



Source: Community Survey, 2024

Moreover, the survey explored perceptions regarding property value fluctuations, with a notable 88.9% of respondents expressing optimism about the project's potential to increase property values in the surrounding areas (Figure 23). This positive sentiment underscores the importance of proactive community involvement and constructive dialogue in fostering community support.

**Figure 23: Potential Impact on Property Values in The Surrounding Area**

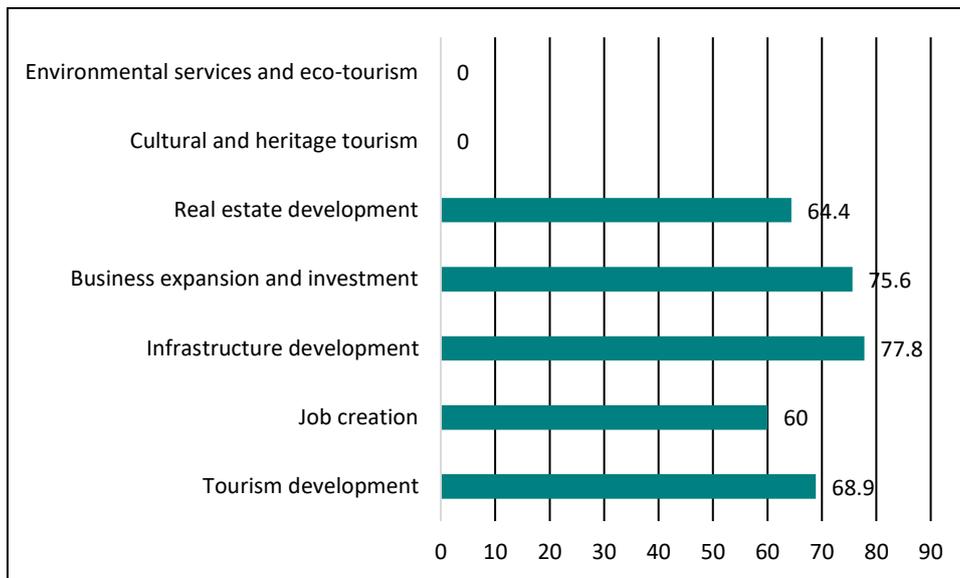


Source: Community Survey, 2024

Lastly, the survey investigated anticipated economic and business opportunities that may be created from the project, with a significant majority of respondents expressing interest in infrastructure development, business expansion, local tourism promotion, real estate development, and job creation

(Figure 24). These findings underscore the project's potential to catalyse socio-economic growth and signify important considerations for its successful execution.

**Figure 24: Potential economic opportunities from the Project**



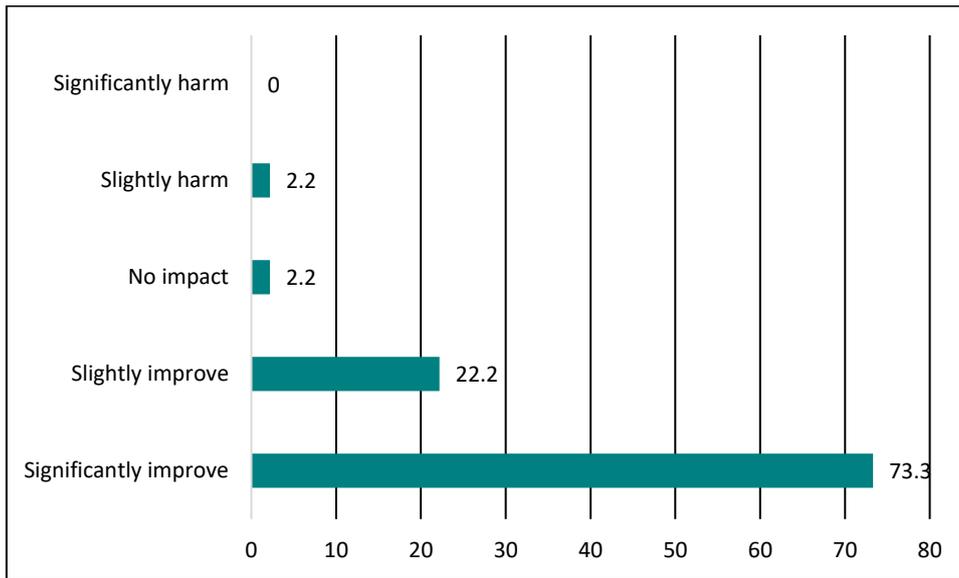
Source: Community Survey, 2024

The community survey not only provided valuable insights into existing economic dynamics and perceptions but also highlighted critical areas for attention and strategic planning. By addressing concerns, leveraging opportunities, and fostering community engagement, the project stands poised to deliver tangible benefits and drive positive change within the community and its surroundings.

## 9. Section 9: Recreation, Health and Wellbeing Impact Analysis

The project's impact on local amenities and services, as perceived by the community, is substantial. A significant majority, comprising 73.3% of respondents, anticipate a significant improvement, with an additional 22.2% expecting a slight improvement. Conversely, a small percentage (2.2%) expressed concerns about potential negative impacts on amenities and associated services (Figure 25).

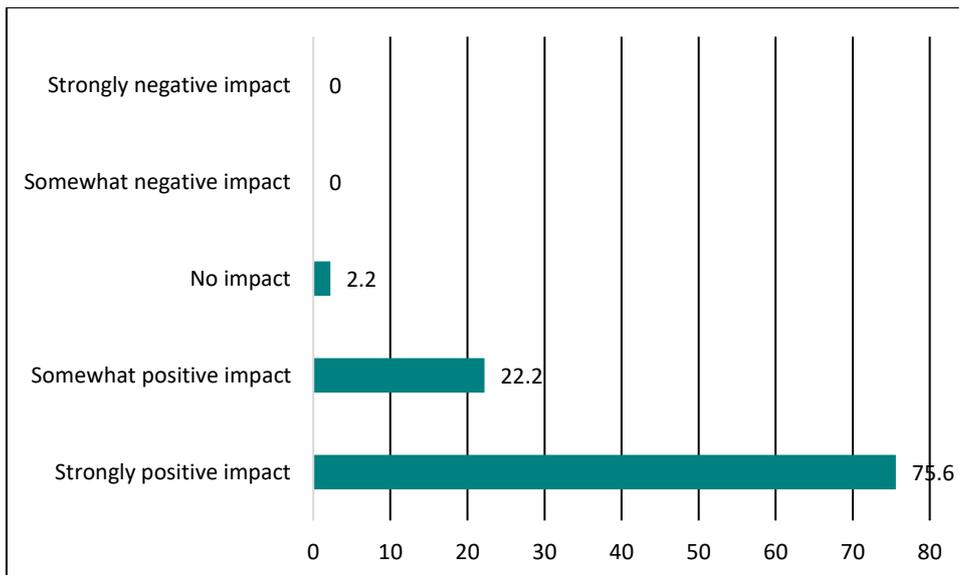
**Figure 25: Potential Impact on Local Amenities and Services**



Source: Community Survey, 2024

In terms of community health and well-being, a noteworthy 75.5% of respondents anticipated a very positive impact, with an additional 22.2% expecting a somewhat positive impact. Interestingly, 2.2% of respondents foresee no impact on health and well-being (Figure 26). Notably, none of the respondents anticipated a negative impact on community health and well-being throughout the project.

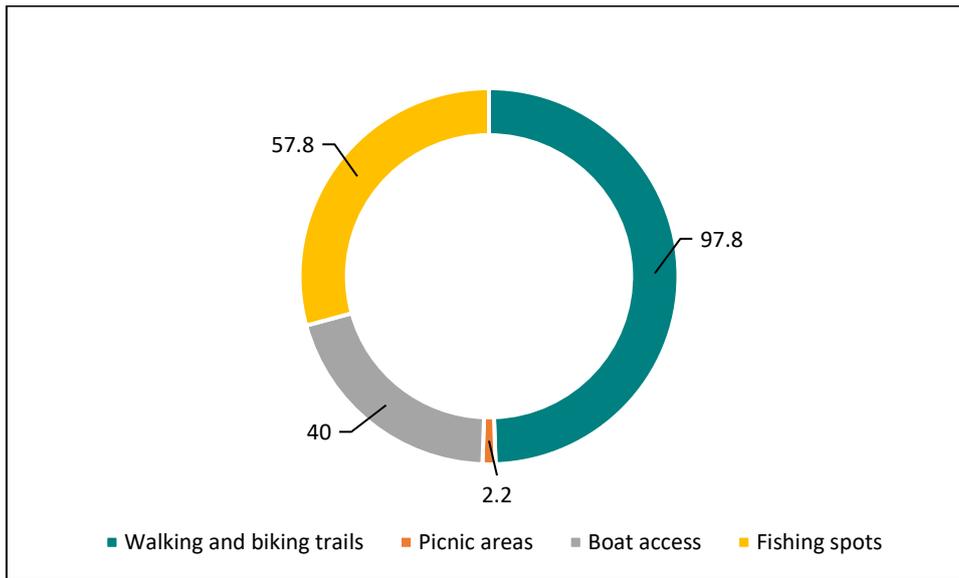
**Figure 26: Potential Impact on Community Health and Well-being**



Source: Community Survey, 2024

In addition, the survey explored preferences regarding recreational facilities to be incorporated into the project. The overwhelming majority (97.8%) expressed a desire for walking and biking facilities alongside the canal. Furthermore, 57.8% expressed interest in fishing spots, while 40% suggested incorporating boating opportunities. A minority (2.2%) envision the area as a potential picnic spot (Figure 26).

**Figure 27: Expected Recreational Facilities and Features Along the Canal**



Source: Community Survey, 2024

These findings underscore the importance of aligning project design with community preferences for recreational amenities. It is important to consider these insights in the technical design phase to ensure that the project meets the desires and expectations of the community, thereby maximising its positive impact.

## 10. Section 10: Human Resources and Administrative Support Analysis

Singra Pourashava, as an autonomous public organisation, should play a pivotal role in supervising and monitoring all technical activities of the project while subcontracting the implementation works. The leadership for overseeing the project's execution should ideally come from an experienced Civil Engineer within the Pourashava's technical staff.

Effective project management will require strong managerial capacities within both the technical and administrative departments of Singra Pourashava. While the existing structure demonstrates capability, it is essential to involve and consider community sentiments during the implementation phase actively.

To ensure efficient coordination, it is recommended that a working committee be established, comprising Pourashava staff, community representatives, and relevant public officials. This committee can oversee the project's progress collaboratively, ensuring alignment with community needs and expectations.

Given the Pourashava's financial constraints, securing funding support from either the relevant ministry or international sources will be crucial for implementing the project. In addition, it is wise to incorporate a contingency period to account for potential natural disruptions such as floods, pandemics, or political changes.

Overall, it seems that Singra Pourashava has the technical expertise and managerial capacity to oversee the project effectively. By actively involving the community, forming a dedicated working

committee, securing adequate funding, and planning for contingencies, the Pourashava can ensure the successful implementation of the project.

## 11. Section 11: Institutional and Legal Analysis

The legal analysis reveals that the project aligns with the legal boundaries of the project entity, ensuring compatibility with its mandate. However, it is recommended to fully utilise the capabilities and physical facilities of the agency to enhance project efficiency.

In terms of policy and institutional setup, the project is in alignment with existing national and local policies, requiring no further adjustments or reforms. Nonetheless, a robust institutional setup is advised to oversee the project and strengthen internal governance.

Before implementation, discussions on applicable resettlement options for displaced individuals or structures may be necessary to address potential adjustments. Fortunately, institutions possess suitable skills and capacity in line with project requirements.

While there are no incentives or penalties in place to ensure timely project delivery and adherence to budget constraints, critical governance issues related to managing community disruptions may arise. These issues include concerns about temporary disruptions to community activities, mobility, and businesses.

Despite these challenges, there are no significant cross-cutting issues that require mitigation strategies, indicating a relatively smooth implementation process ahead.

## 12. Section 12: Risk (Uncertainty) and Sensitivity Analysis

Based on the risk and sensitivity analysis, it is recommended to follow the key strategies as stated below against the associated risks:

- **Major Risks:** Political disruptions, especially from opposition parties, can pose a significant risk as they can mobilise community opposition to the project. In addition, natural disasters could halt project work for certain periods.
- **Project Impact:** In the event of risk materialisation, proactive consultation with opposition parties and community members is crucial. Engaging them positively to understand the project's short and long-term benefits can help mitigate adverse effects.
- **Mitigation Measures:** Consultation remains a pivotal mitigation measure. Engaging opposition parties and community members to get support and understanding of the project's benefits can help mitigate risks effectively.
- **Sensitivity of Assumptions:** The assumptions used in financial and economic models are not significantly sensitive to changes in the environment, indicating a stable foundation for project planning and execution.
- **Legal and Regulatory Risks:** No significant risks related to legal and regulatory obligations are foreseen, especially as the project will be managed by Singra Pourashava. However, continuous monitoring and compliance with relevant regulations will be necessary to ensure smooth implementation.

## 13. Section 13: Recommendations and Conclusion

The Feasibility Study Report provides a comprehensive analysis of various aspects of the proposed project, shedding light on its viability and potential challenges. Through detailed assessments across economic, social, institutional, legal, and risk dimensions, critical insights have been collected to inform decision-making.

Overall, the findings indicate that the project holds promise for addressing pressing community needs while aligning with existing policies and regulations. Despite inherent risks and uncertainties, proactive measures can be taken to mitigate potential obstacles and enhance project success.

### Recommendations:

- **Strengthen Institutional Setup:** It is recommended to establish a robust institutional framework to oversee project implementation and ensure effective governance. This includes appointing experienced personnel and forming a working committee comprising both Pourashava staff and community representatives.
- **Community Engagement:** Given the significance of community acceptance, proactive engagement with local stakeholders is paramount. Continuous dialogue and consultation can help address concerns, garner support, and foster a sense of ownership among community members.
- **Risk Mitigation:** Develop a comprehensive risk management strategy to address potential disruptions, including political opposition and natural disasters. Proactive measures such as positive engagement with stakeholders and contingency planning are essential to mitigate adverse impacts.
- **Financial Planning:** Explore avenues for securing additional funding, either through government sources or international financial sources, to supplement existing resources. This will ensure adequate financial support for project implementation and contingency planning.
- **Continuous Monitoring:** Implement a robust monitoring and evaluation mechanism to track project progress, identify emerging challenges, and make timely adjustments. Regular assessments will facilitate adaptive management and ensure project objectives are met effectively.

While challenges may exist, the Feasibility Study Report underscores the project's potential to deliver meaningful socio-economic benefits to the community. By implementing the recommended strategies and fostering stakeholder collaboration, the project stands poised for success, paving the way for positive transformation and sustainable development in Singra.

## 14. Section 14: Annexes

### 14.1. Annex 1: Questionnaire: Community and Social Impact Assessment

Name:

Age:

Gender:

Occupation:

#### 1. Community Awareness and Engagement

- How long have you lived in this area?
  - Less than a year
  - 1-5 years
  - 6-10 years
  - More than 10 years
  
- How important is the canal to your daily life on a scale of 1 to 5? (1 being not important, 5 being very important)
  - 1
  - 2
  - 3
  - 4
  - 5
  
- In what ways do you interact with or use the canal? (Select all that apply)
  - Irrigation
  - Transportation
  - Recreation
  - None
  - Others, please specify
  
- Have you noticed any negative changes in the canal condition over the past years? (Yes/No)
  - Yes
  - No
  - If yes, please specify
  
- How aware are you of the canal regeneration project?
  - Very aware
  - Somewhat aware
  - Not aware

- What is your overall perception of the canal regeneration project?
  - Very positive
  - Somewhat positive
  - Neutral
  - Somewhat negative
  - Very negative
- How important do you think it is to involve local communities in the canal regeneration project?
  - Very important
  - Somewhat important
  - Not important

## 2. Impact on Local Community and Culture

- What are your main concerns regarding the canal regeneration project? (Select all that apply)
  - Environmental damage
  - Displacement of residents
  - Increased traffic and noise
  - Cost and maintenance
  - Other (please specify)
- What improvements do you hope to see from the canal regeneration project? (Select all that apply)
  - Better water quality
  - Improved wildlife habitat
  - Enhanced recreational areas
  - Increased flood protection
  - Other (Please specify)
- How do you think the canal regeneration project will affect the local community and culture?
  - Significantly improve
  - Slightly improve
  - No impact
  - Slightly harm
  - Significantly harm
  - Other (Please specify)
- What benefits do you expect the canal regeneration to bring to our community? (Select all that apply)
  - Economic benefits
  - Environmental benefits
  - Social and cultural benefits
  - Improved local economy
  - Increased recreational opportunities

- Enhanced local beauty and heritage
- Better flood management
- No benefits
- Other (please specify)

### 3. Employment and Economic Impact

- Economic Activities (Present):
  - What economic activities are dependent on the canal?
    - Transportation and Trade
    - Agriculture and Irrigation
    - Tourism and Recreation
    - Commercial Fisheries and Aquaculture
    - Water Supply and Utilities
    - Other (please specify)
  - Are there any businesses operating along the canal? (Yes/No)
    - Yes
    - No
  - If yes, please specify the types of businesses:
    - Warehousing and Logistics
    - Marinas and Boat Rentals
    - Restaurants and Cafes
    - Tourism and Hospitality
    - Retail and Souvenir Shops
    - Recreational Activities
    - Cultural and Heritage Sites
- Other (please specify) How will the canal regeneration project impact local businesses and employment opportunities?
  - Significantly improve
  - Slightly improve
  - No impact
  - Slightly harm
  - Significantly harm
- Do you believe the canal regeneration project will create new job opportunities for the local community?
  - Yes
  - No
  - Unsure
- Economic Opportunities (Future):
  - What potential economic opportunities do you foresee arising from the canal regeneration project, such as tourism, job creation, or infrastructure development?
    - Tourism Development

- Job Creation
  - Infrastructure Development
  - Business Expansion and Investment
  - Real Estate Development
  - Cultural and Heritage Tourism
  - Environmental Services and Eco-Tourism
- Should the project prioritise hiring local contractors and labour?
    - Yes
    - No
    - Unsure
  - Economic Disruptions:
    - Are there any potential disruptions to existing businesses or economic activities as a result of the regeneration project? If yes, please describe:
      - Temporary Closure or Access Restrictions
      - Supply Chain Disruptions
      - Loss of Customers or Foot Traffic
      - Construction-related Impacts
      - Property Value Fluctuations
      - Permitting and Regulatory Compliance
      - Community Opposition or Public Relations Challenges
    - Are there specific economic sectors (e.g., tourism, agriculture) you believe will be most affected by the canal regeneration? (Open-ended)

#### 4. Access and Recreation

- How will the canal regeneration project affect accessibility to local amenities and services?
  - Significantly improve
  - Slightly improve
  - No impact
  - Slightly harm
  - Significantly harm
- What changes do you anticipate in recreation and leisure activities due to the canal regeneration?
  - Significant increase in activities
  - Slight increase in activities
  - No change
  - Slight decrease in activities
  - Significant decrease in activities
- What types of recreational facilities or features would you like to see along the canal?
  - Walking and biking trails
  - Picnic areas
  - Boat access

- Fishing spots
- Other (please specify)

**5. Community Health and Well-being**

- Do you believe the canal regeneration will have an impact on community health and wellbeing?
  - Strongly positive impact
  - Somewhat positive impact
  - No impact
  - Somewhat negative impact
  - Strongly negative impact

**6. Impact on Local Infrastructure**

- How do you foresee the canal regeneration affecting local infrastructure (e.g., roads, bridges, public transportation)?
  - Significant improvement
  - Slight improvement
  - No impact
  - Slight deterioration
  - Significant deterioration
  - Please specify

**7. Impact on Property Values**

- How do you think the canal regeneration project will affect property values in the surrounding area?
  - Significantly increase
  - Slightly increase
  - No change
  - Slightly decrease
  - Significantly decrease

**8. Historical and Cultural Significance**

- How important is it to preserve and incorporate the canal's historical and cultural aspects into the regeneration project?
  - Very important
  - Somewhat important
  - Not important
  - Please specify any known historical or cultural features of the canal that should be preserved or highlighted

## 14.2. Annex 2: Questionnaire: Environmental Impact Assessment

### Part A: Environmental Impact Assessment (Community Survey)

Name:

Age:

Gender:

Occupation:

#### 1. Pre-Regeneration Conditions

- How would you rate the current water quality of the canal?
  - Very poor
  - Poor
  - Fair
  - Good
  - Excellent
  
- Are you aware of any pollution sources affecting the canal? (Yes/No)
  - Yes
  - No
  - If yes, please specify

#### 2. Biodiversity and Wildlife

- How important is it to protect local wildlife and biodiversity during the canal regeneration?
  - Very important
  - Somewhat important
  - Not important
  
- What impact do you expect the canal regeneration to have on local biodiversity?
  - Significantly improve
  - Slightly improve
  - No impact
  - Slightly harm
  - Significantly harm
  
- Are there any specific wildlife or plants in the area that should be given special consideration? Please specify

#### 3. Water Quality and Management

- How do you anticipate the canal regeneration project will impact water quality and the local ecosystem?
  - Significantly improve
  - Slightly improve

- No impact
- Slightly harm
- Significantly harm

- What measures do you believe are essential to ensure the quality of water during and after regeneration?

#### 4. Sustainability and Environmental Protection

- What long-term environmental protections would you like to see in place post-regeneration?

- Regular water quality testing
- Protected wildlife areas
- Public education on environmental stewardship
- Other (please specify)

#### 5. Water Management and Flood Risk

- Do you think the canal regeneration project will address the issue of flooding?

- Yes
- No
- Unsure

- How will the canal regeneration project impact water management and flood risk in the area?

- Greatly reduce risk
- Slightly reduce risk
- No change
- Slightly increase risk
- Greatly increase risk

#### 6. Potential Environmental Concerns

- What are your main environmental concerns regarding the canal regeneration project? (Select all that apply)

- Water pollution
- Loss of habitats
- Soil erosion
- Increased carbon footprint
- Other (Please specify)

#### 7. Impact on Air Quality

- What impact do you expect the canal regeneration to have on local air quality?

- Significant improvement
- Slight improvement
- No impact
- Slight deterioration
- Significant deterioration

## 8. Long-term Environmental Benefits

- What long-term environmental benefits do you expect from the canal regeneration?
  - Improved biodiversity
  - Enhanced water quality
  - Increased green space
  - Climate resilience
  - Other (Please specify)

## 9. Soil and Land Impact

- Are you concerned about potential soil erosion or land degradation as a result of the canal regeneration?
  - Yes
  - No
  - Unsure
- What soil and land protection measures would you recommend during the regeneration process?

## Part B: Self-Assessment

### Name of the Specific Location of the Canal

#### 1. Canal Characteristics

- Location of the canal:
- Length of the canal:
- Width of the canal:
- Depth of the canal:
- Flow rate of water (if applicable):
- Type of water flow (e.g., natural, controlled):
- Presence of any structures (e.g., bridges, culverts) along the canal
- Land use patterns along the canal (e.g., residential, commercial, industrial)

#### 2. Identification of Environmental Components:

- Key environmental components and ecosystems present in the project area (e.g., water bodies, vegetation, wildlife habitats).
- Any sensitive or protected species or habitats that may be affected by the regeneration activities.

#### 3. Environmental Assessment

- Water Quality:
  - Have water quality tests been conducted in the canal? (Yes/No):
    - Yes
    - No
  - If yes, please specify the parameters tested and their results
    - Temperature
    - Dissolved Oxygen
    - pH
    - Turbidity
    - Macro invertebrates
    - E. coli
    - Nutrients
    - Habitat Assessment
    - Metals
- Habitat Assessment:
  - Are there any natural habitats (e.g. wetlands, riparian zones) adjacent to the canal? (Yes/No)
    - Yes
    - No
  - If yes, please describe the types of habitats and their condition
- Vegetation:

- Describe the vegetation cover along the canal banks:
  - Aquatic Plants
  - Riparian Plants
  - Grasses and Shrubs
  - Trees
  - Human-Introduced Vegetation
- Are there any invasive plant species present? (Yes/No)
  - Yes
  - No
  - If yes, please specify
- Are there any obstructions or blockages impeding the flow of water? (Yes/No)
  - Yes
  - No
- Is there evidence of waste dumping within the canal? (Yes/No)
  - Yes
  - No
- Is there any direct connection to the septic tank? (Yes/No)
  - Yes
  - No

**4. Resettlement Options:**

- Are there any potential resettlement issues or options that need to be considered for the project? (Yes/No)
  - Yes
  - No

**5. Potential Environmental Impacts:**

- Water Quality: Potential impacts of dredging or construction activities on water quality parameters such as turbidity, sedimentation, and nutrient levels.
- Habitat Disturbance: Potential disruption to aquatic and terrestrial habitats caused by regeneration activities.
- Air Quality: Emissions of dust, particulate matter, and other pollutants associated with construction or vegetation management activities.
- Noise Pollution: Potential noise impacts on nearby communities or wildlife due to construction activities.
- Soil Erosion: Areas at risk of soil erosion or destabilisation as a result of construction or vegetation removal.
- Biodiversity Loss: Potential loss of biodiversity or habitat fragmentation resulting from canal regeneration activities.
- Invasive Species: Introduction or spread of invasive species associated with dredging or vegetation management activities.

## 6. Challenges and Opportunities

- What are the main challenges facing the canal and its surrounding environment?
  - Social
  - Environmental
  - Ecological
  - Environmental
  - Others (Specify)

Sustainedge is an impact-focused organisation specialising in social sustainability, ESG and sustainability reporting, gender equality, climate change, and urban development. By integrating assessment, research, policy, advocacy, training, and implementation, we address complex social, environmental and governance challenges holistically. In collaboration with a wide range of stakeholders, we equip individuals, institutions, industries, and communities with the knowledge and tools to drive transformative, long-term sustainability initiatives that foster equity, resilience, and real-world change.