A STUDY ON SAVING THE MAYUR RIVER AND ITS CONNECTED CANALS OF KHULNA

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Submitted To:

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Executive Summary

Mayur is one of the freshwater rivers, which passes through the western part of Khulna City. The river and its connected canals are not functioning properly due to illegal encroachment and pollutants discharged by the city people. As a result, Khulna City faces serious water logging even with minimum rainfall. It is high time to contribute for saving the Mayur River and its connected canals by identifying the problems especially causes and consequences of the encroachments, pollutants discharged in them, governance failure of the organizations that are responsible for the management, protection and conservation of the river and canals. Existing encroachments must be stopped immediately and future provisions must be made so that no encroachments will be taken place for escaping from the serious environmental degradation and upholding the interests of the people in Khulna. BAWIN (Bangladesh Water Integrity Network), coordinated by Transparency International Bangladesh, has taken an initiative to save the Mayur River and its connected canals. They oversaw the initiative, keeping a close contact with the Committee of Concerned Citizens (CCC) and Youth Engagement and Support (YES), Khulna. Department of Urban and Regional Planning, Khulna University of Engineering & Technology (KUET), in this regard, was engaged to do the research. The objectives of this research were to identify major governance risks/deficits that are contributing to the destruction of the Mayur River and generate evidence-based knowledge for advocacy with concerned stakeholders. For generating evidence-based knowledge, time series analysis of encroachment on the river and canals was expected to find out analyzing the high spatial resolution satellite imageries from 2004-2005 to 2015. High spatial resolution satellite imageries of the project area for the period before 2004 are not freely available. In this regard, time span for chronological encroachment analysis is only for ten years. In addition, scarcity of secondary data, especially spatial data were major hurdle for the study.

Mayur and its connected canals play an important role in Khulna City from various aspects. So it is necessary to get them functioning back like in the past. Enforcement of the existing rules and regulations for saving the water bodies could be the best effective option for this. This is why; all relevant national and local regulatory documents followed by the concerned organizations were reviewed to find out their regulatory bindings and limitations. In addition to this, past studies related to Mayur River were also reviewed. For gathering evidence based

knowledge for advocacy with concerned stakeholders, field survey viz. field observations, interview, Focus Group Discussion, questionnaire survey for households and organizations were done. In addition to that, different encroachments in and along the Mayur River and its connected canals were identified based on high resolution satellite imageries for the years of 2005, 2010 and 2015. Cadastral map showing the property boundary, river and canal boundary were collected from the secondary sources and superimposed on satellite images to investigate the past and present scenario i.e. encroachment (amount of encroachment), present land uses, etc. Case studies for different section of Mayur River and canals were developed to get the real scenario.

It is found from the analysis of encroachments based on satellite imageries that river and canal area from their original areas are decreasing with time. On other hand, dumping wastes into the river and canals decrease the navigability of the rivers. The Powerful people are using the poor and the marginalized people in the area to illegally capture land by breaking the law. This is due to the fact that their initial income is not that high so as to support their families. Most of the people are elderly having nowhere else to go and the government will not take such actions like evicting them as there are NGOs and Civil Societies that will rise up to help them break the rule of law. Patuakhali Bagerhat, Jessore and Barsial are the places that most of the people have migrated from and hence more encroachers. All these are making the river and canals dying. So, actions should be taken to maintain the flow and capacity of the Mayur and its connected canals. Otherwise in near future, Khulna city will face enormous problems of water logging, flood, environmental degradation and water scarcity. There are various ways to protect the Mayur River. Enforcement of the existing rules and regulations related to River and canals have to be ensured. Before hand, Existing rules and regulations must be analyzed and finding out the loopholes in stopping the encroachment. Along with this, width of the canal should be maintained properly as required for continuous flow while constructing roads, drains, culverts and bridges. KCC, LGED and KDA should be more careful while constructing roads and culverts over canals so that they do not stop the flow and direction of the canals. Authority must follow effective construction method to maintain the flow. Eviction of the encroachers by concerned organizations namely KCC, District Administrations, KDA and other organizations must be done with proper identification by surveys and investigations. It is found from the study that the total amount of encroachments up to 2014 for the Mayur River and canals is around 73 acres based on satellite imageries. The rate of encroachment is higher for the present years than the past

years. In Mayur River, the encroachment area was highest in the period of 2010 to 2014. at present period, the encroachment rate is increased high. Steps could be taken by KCC and District Administration to open up of the canals from the encroachment and demarcate the boundaries of the canals installing the permanent boundary pillars. Boundary walls can be constructed in some critical points where there are encroachments by constructions. Coordination among the different agencies especially KDA, KCC, BWDB, DoF, DoE, etc. are very important for the management, protection and conservation of the Mayur and its connected canals.

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List of Acronyms and Abbreviations

BAWIN	Bangladesh Water Integrity Network
CCC	Committee of Concerned Citizens
DCR	Duplicate Carbon Receipt
DURP	Department of Urban and Regional Planning
GIS	Geographic Information System
KCC	Khulna City Corporation
KDA	Khulna Development Authority
KUET	Khulna University of Engineering & Technology
KWASA	Khulna Water and Sewerage Authority
LGED	Local Government Engineering Department
NGO	Non-Government Organization
RS	Remote Sensing
TIB	Transparency International Bangladesh
URP	Urban and Regional Planning
YES	Youth Engagement and Support

List of Local and Technical Terms

Beel	Closed larger Water body
Current Jal	Current net
Khal	Drainage channels connecting beels to adjacent rivers
Kutcha	Earthen
Mouza	Revenue village

Pourashava	Municipality
Pucca	Concrete in case of building, bituminous in case of road
Quickbird	One kind of Satellite mission for collecting satellite images
Union	Fourth tier in the administrative unit
Upazila	Third tier in the administrative unit / Thana
Zila	Second tier in the administrative unit District

Chapter 1: Introduction

1.1. Background

The Mayur River, bordering the northwestern boundary of Khulna City Corporation passes through the urban and peri-urban areas of Khulna City. The Mayur and its connected canals have been degrading due to illegal encroachment, and pollutants discharged by the city people which decreases the capacity of the rivers and canals to carry out the surface runoff. As a result, Khulna City suffers from water logging even with minimum rainfall. Over one-third of 1.5 million city dwellers (The Financial Express, 2013) are directly exposed to the water logging problem affecting their normal life and economic activities. About 80 percent of the roads of the city go under knee to waist-deep water when there is moderate to heavy rainfall (The Daily Star, 2011).

On the northbound of KCC there is a vast water body called Beel Pabla from which the River Mayur is originated. It is locally known as the Khuder Khal at the point of origin. From Rayer Mahal or Hamidnagar sluice gate it is known as Mayur. It has run through Chalk Mathurabad and Choto Boyra and has met the Rupsha River at Alutola. The river is about 11.69 km long and varies by width widely at different chains (Akber, Dilip, & Khan, nd). A branch of the Mayur near Alutola is also called Hatia River which is now almost dead. This river is important from numerous points of views: freshwater reservoir, transport, irrigation water, fishing ground and the city's main wastewater route. The Mayur also plays an important role in contributing to ground water table (Abdullah-Al-Masud, Ahmed, Datta, & Khan, nd). In the past, different initiatives were undertaken by the different agencies especially KDA, KCC, KWASA for evicting the encroachments in the river and canal areas. Most of the initiatives were went in vain finally. A fact finding study is conducted by the Department of Urban and Regional Planning, KUET for knowing the situation of illegal encroachment for different time periods of Mayur River and its connecting canals with the help of BAWIN (Bangladesh Water Integrity Network which is coordinated by Transparency International Bangladesh. BAWIN steers and oversees this study, keeping a close contact with the Committee of Concerned Citizens (CCC) and Youth Engagement and Support (YES), Khulna. CCCs and YES groups are created in 45 different districts and sub-districts in

7 divisions of Bangladesh to undertake various local level campaign programs against corruption and to promote integrity in selected sectors and institutions.

1.2. Objectives

This study digs out the potential governance risks and deficits of different stakeholder organizations, which are responsible for protection, maintenance, management and functioning of Mayur and its connected canals of Khulna. The primary objectives of this research are as follows:

- Identify major governance risks/deficits that are contributing to the degradation of the Mayur River.
- Generate evidence-based knowledge for advocacy with concerned stakeholders.

1.3. Rationale of the Research

The Mayur River is important from numerous points of views such as freshwater reservoir, transport, irrigation water, fishing ground and the city's main route for storm and waste water. The Mayur also plays an important role in contributing to ground water table. So, management of the Mayur can be a reasonable supplementary to water resources of the Khulna City Corporation area. Resolving resource use conflicts is essential to ensure the proper management. Flaws of the existing rules and regulations related to Mayur River and Canals are needed to find out as proper enforcement of the existing rules and regulations could be the best effective tool in resolving conflicts of resource use.

Only 5.9% households (Bangladesh Bureau of Statistics 2011, 2012) of KCC area use tap water for drinking. Maximum number of households (93.3%) use tube well water for drinking. Only 0.8% households use water from other sources (pond, river, and canal) for drinking.

Ground water of the southern part of KCC area is subject to water salinity to different degrees. Water quality is much better in its northern part. Water supply is already at stake in the city. Salinity is gradually increasing and moving towards north as river water current dwindles. Moreover, over extraction threatens the ground reserve of water as more water is extracted than the recharge amount. The current daily demand in KWASA area is 24 crore litres (The Daily Star, 16 May 2012), while KWASA can supply only 11 crore litres that is 45.83% of the total demand (KWASA, 2015). Supply will be more critical when population will increase in future. Massive extraction will lower the water level in the aquifer making collection more difficult from ground sources. To mitigate the future water supply problem,

KWASA has undertaken a project to collect surface water from Madhumati River at Mollahat and transport to Khulna after treatment. This is supposed to make city water supply more sustainable (Roy, 2013). On other hand, Mayur River and existing canals may be the alternative surface water source rather than Madhumati River for drinking purpose. At present the entire water supply system in the KCC area is groundwater based with deep tube wells having depths greater than 300 m (Kumar, Khan, Rahman, Mondal, & Huq, 2011). A large number of privately owned tube wells are also present in and around. As a result, the ground water table declines significantly during the dry period (March-May), consequently the wells provide limited or no water during the dry period (Kumar et al., 2011). KWASA has already restricted installation of deep tube wells in KCC area. Among other efforts to resolve the water scarcity, KCC has been trying to transport water from the peri-urban areas which are far from the city. This may restrict future water access and security of the peri-urban people and their traditional livelihood and resources.

River Mayur can play an important role as a fresh water reservoir for Khulna city. It is estimated that Mayur can reserve up to 725,732,265 US gallons of water (Rezaul, Farjana, & Ahmed, 2011). Moreover, this river is now almost a closed water body. Few experts related to water and environment think that this river and the connected canals can be used as a reservoir and by applying treatment facilities sustainable water supply system which can be ensured for KCC. Considering all these discussed above this study is important for saving Mayur and its connected canals to ensure the water integrity of Khulna area.

1.4. Scope of the Research

The major scopes of this research are as follows:

- A fact finding study were conducted for knowing present situation of illegal encroachment of Mayur River and its connecting canals.
- This study has also tried to dig out the potential governance risks which are contributing to the destruction of the river.

1.5. Limitations of the Research

The study had some limitations during carrying out the research. Time series analysis of encroachment on the canals and rivers was expected to find out analyzing the high spatial resolution satellite imageries from 2004-2005 to 2015. High spatial resolution satellite imageries of the project area for the period before 2004 are not freely available. In this regard, time span for chronological encroachment analysis is only for ten years. On the other

hand, secondary spatial data associated with the river and its connected canals were very limited. As land encroachment is a critical issue and land grabbers are very powerful in the society, enumerators of the survey team were always very cautious. Sometimes this constrains the survey works a little bit.

Chapter 2: Methodology

2.1 Introduction:

This chapter deals with the methodology followed in this study. Different steps of the research are narrated in the following figure.

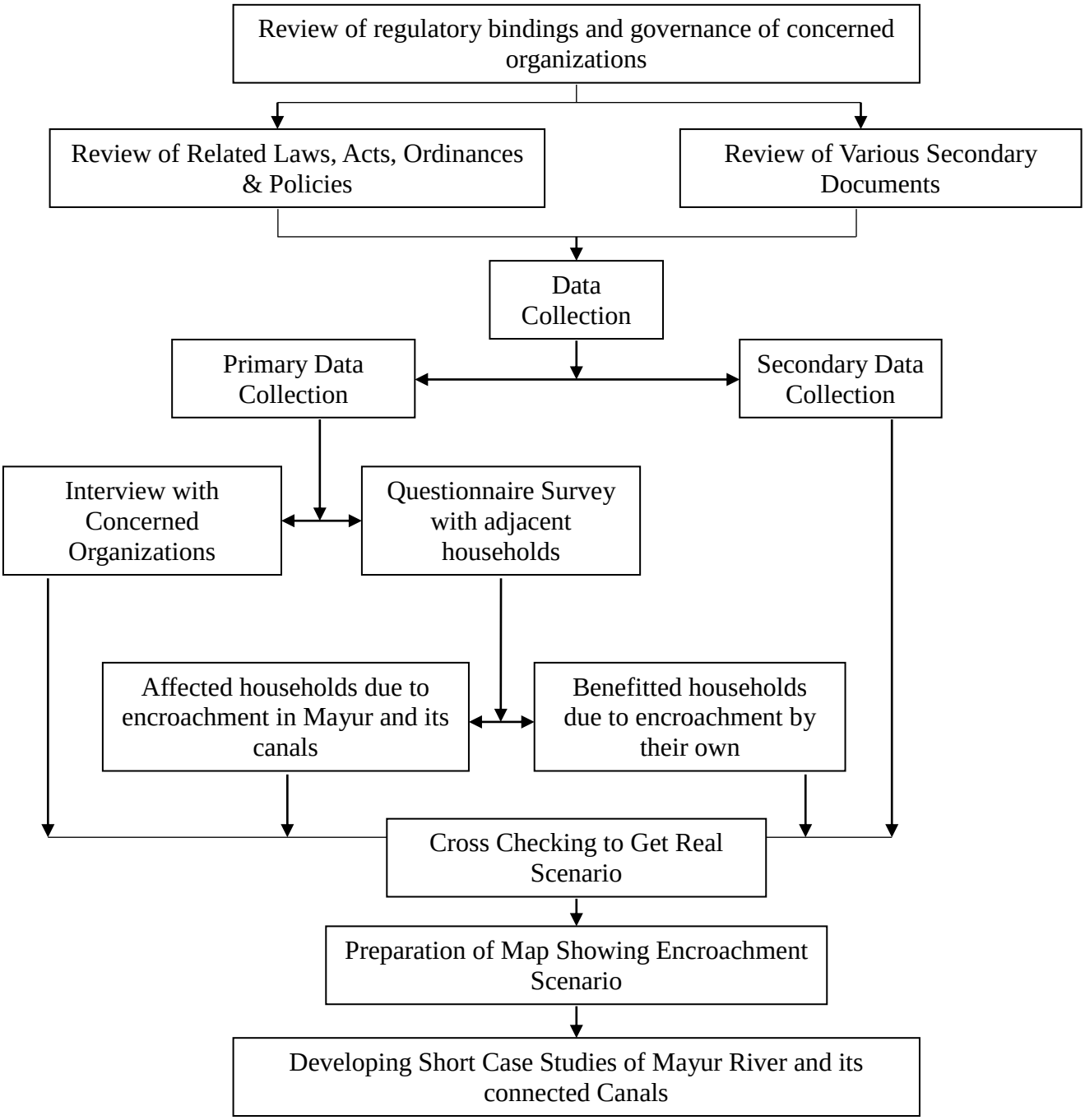


Figure 2.1: Summary of approach and methodology of the research

This is study is based on field survey, questionnaire survey, organizational survey, literature review, review of the existing rules and regulations related to Mayur River and canals and finally satellite image analysis for indentifying the encroachments over the last 10 years. Apart from these, focus group discussion were done and workshop were arranged to share the findings of the study.

2.2. Literature Review

Several studies were conducted in the past by different organizations and institutions though their nature, objective and context were different to one another. These documents were collected and reviewed, which helped a lot for conducting this research. In addition to these, other relevant documents, papers, newspapers, etc. were collected from different sources around the web such as website for Daily Star and reviewed to incorporate to this study.

2.3. Data Collection

Relevant information was collected both from primary and secondary sources.

2.3.1. Primary Data Collection

Questionnaire and checklist are important tools to collect primary data and information. After reconnaissance survey, a household questionnaire was prepared to collect primary data and information. The questionnaire was finalized after pre-testing of draft questionnaire from the field. Two different questionnaires were prepared to collect data from the GO/NGO staffs and the aforementioned households.

Sample Size Determination

Mayur River and 22 canals pass through the different parts of Khulna City. There was a difficulty in sample size determination under questionnaire survey based on population regarding river and canals as population for all wards does not represent directly as stakeholders of the river and canals. This is why, households or settlements which are residing near the river and khals were identified and shown in Table 2.1. It is shown that some khals have more settlements than other khals. A total of 1670 settlements were identified for the studied khals and rivers.

Table 2.1: Number of Settlements near to Khal/River (within 5 meter from the bank)

Sl No.	Name of Khal	Number of Settlements near to Khal/River(within 5 meter from the bank)
1	Arrongghata Khal	57
2	Bagmara Khal	25
3	Baitkamari Khal	23
4	Bastuhara Khal	23
5	Boiti Bunia Khal	2
6	Chori Chora Khal	52
7	Deyana Chowdhury Khal	14
8	Dubir Khal	33
9	Duyani Khal	1
10	Ghora Khal	5
11	Harintana Khal	62
12	Hatia River	150
13	Kaderer Khal	13
14	Kashem Bari Khal	81
15	Khan E Sabur Baganbari Khal	32
16	Kholabaria Khal	2
17	Khtero Khali Khal	39
18	Khudiyar Khal	72
19	Lobonchora 1 No. Sluice Gate Khal	158
20	Lobonchora 2 No. Sluice Gate Khal	55
21	Mandra River	94
22	Mathabhanga Khal	20
23	Mayur River	225
24	Motia Khali Khal	138
25	Narkelbaria Khal	9
26	Nirala Khal	142
27	Prantika Khal	44
28	Purbo Nirala Khal	22
29	Rahangee Mari Khal	34
30	Suri Khal	15
31	Taltala Khal	28
Total		**1670**

Source: KDA, 2015.

Sample size for questionnaire survey was calculated based on the total household near the river and khals using the following formula:

$$\text{Sample Size} = \frac{\frac{z^2 \times p(1-p)}{e^2}}{1+\left(\frac{z^2 \times p(1-p)}{e^2 N}\right)}$$

Where, Population Size = N (1670), Margin of error = e (5.54), z-score = z (at 95% confidence interval)

Various types of information are gathered from the households near the Mayur River and its connected canals. A total of 264 samples (questionnaires) were determined and conducted for Mayur and its 22 connected canals. On an average basis, 8 questionnaires were selected for each of 22 canals and 88 samples were taken at different locations of the Mayur River.

Information about the residents' period of living at current location, land ownership, etc. were collected. Knowledge about the location of their household so as to identify encroachment was perceived as well. Problems occurring due to canal encroachment and benefits from canal encroachment were observed so as to identify the aptitude of the people about the encroachment issue. Any knowledge on the role of the concerned stakeholders and suggestions on improving the condition of the canals were also collected. The task was to get an overall idea of the people whether encroachment can be stopped with the help of the local residents. This is necessary as policy alone will not help to curb the problem of encroachment.

Surveying Affected households for preservation of Mayur and the canals

There were two kinds of people that were encountered from the household survey. One of them is the people that are affected negatively due to the encroachment of the canal and the main river. To get a better understanding of the situation, the way the people are affected were also taken. Their intentions and suggestions were noted.

Surveying Benefitted households due to encroachment by their own

There were two kinds of people that could be encountered from the household survey. One of them is the people who are benefitted due to the encroachment of the canal and the main river. Knowledge about how they are benefitted is also taken so as to get a better understanding of the situation. Their intentions and suggestions were noted.

2.3.2. Secondary Data Collection

Secondary data in the form of mouza map, reports, books, journals, published and unpublished research dissertation and thesis etc. were collected from different sources namely KCC, KDA, DPHE, Environmental Science (ES) Discipline and URP Discipline of Khulna

University, Rupantar, Nagorik Forum and relevant research and development organizations (*See* Annexure D for details).

2.3.3. Interview with Concerned Organizations

The concerned stakeholders were interviewed by a structured questionnaire. The questionnaire seeks to get some of the information such as overall activities of the organization, main activities for the protection of river, canals and water bodies, the legal documents i.e. Acts, Ordinances, Plans etc. that are followed for the protection of river, canals and water bodies. Other information such as initiatives that have been taken, recommendations or suggestions for the organizations and also limitations of the organizations to protect the Mayur and its connected canals have been identified.

2.4. Review of Regulatory Bindings and Governance of Concerned Organizations

Regulations mandated by KCC, KDA, LGED, DoE, and other such government organizations are the implementation artifacts of policy statements. Therefore, the review of such regulatory bindings and governance of such concerned organizations directly and indirectly responsible to save Mayur and its connected canals of Khulna is very important

Therefore the review of such regulatory bindings and governance of concerned organizations were conducted. In order to do so data was collected as is mentioned later. The secondary data are the various policies, acts, laws etc. given by concerned stakeholders. A variety of concerned Laws, Acts, Policies, etc., were reviewed in order to identify the following:

- Definitions of related terms and their jurisdiction in the Laws, Acts, Policies, etc.
- Punishment ordeals set for offenders.
- Detailed knowledge of the Laws, Acts, Policies, etc.
- Loopholes in the Laws, Acts, Policies, etc.
- Limitations and governance deficiency of the Laws, Acts, Policies, etc.

2.5. Review of Related Laws, Acts, Ordinances & Policies

The following documents were reviewed:

- Bangladesh Environment Protection Act, 1995
- The Bangladesh Environment Conservation Act, 1995
- The Protection and Conservation of Fish Act, 1950
- The Protection and Conservation of Fish (Amendment) Act, 1995

- The Environment Court Act, 2000
- Government Jalmahal Management Policy, 2009
- Bangladesh Water Act 2013
- Natural Wetland Protection and Preservation of Open space, Park and Playground Act, 2000
- River Conservation Act 2013
- National Fisheries Policy, 1998
- Canal Act, 1864
- Local Government Pourashava Act, 2009
- Local Government: City Corporation Act, 2009 (amended)
- Local Government: Union Parishad Act, 2009
- River Research Act, 1990
- The Ground Water Management Ordinance, 1985
- The Water Resources Planning Act, 1992
- National Policy for Safe Water Supply & Sanitation, 1998
- National Water Policy, 1999

2.6. Validation through Cross Checking

The relevancy and accuracy of questionnaires were checked with field tests. Encroachments found on satellite imageries were checked through field survey. Maximum mapping scale was around 1: 27000 for Arronghata Khal and scale for other maps are far less than the maximum. A useful rule of thumb is that positions measured from maps are accurate to about 0.5 mm on the map. Multiplying this by the scale of the map gives the corresponding distance on the ground. This type of errors was disregarded by measuring encroachment on real scale in GIS technology. Encroachments which are less than 1 meter in dimension are not identified on the satellite imageries as the spatial resolution was 0.50 meter. A rule of thumb is that feature of interest which will be identified on the image; its minimum dimension must be double the spatial resolution. Positional accuracy for satellite imageries of three times were measured in terms of RMSE (Root Mean Square Error) and this error was less than 1 for three cases. It is quite good as the spatial resolution is nearer to RMS error.

2.7. Preparation of Map Showing Encroachment Scenario

One of the major tasks of this research is to identify the different encroachments in and along the Mayur River and its connected canals. Encroachments are identified based on high

resolution satellite imageries for the years of 2005, 2010 and 2015. High resolution Quickbird satellite imageries for 2005 and 2010 and Google Earth imageries for 2015 were used. Spatial resolution for all three years was 0.50 meters. Cadastral map showing the property boundary, river and canal boundary were collected from the secondary sources and superimposed on satellite images to investigate the past and present scenario i.e. encroachment (amount of encroachment), present land uses, etc. Encroachments were digitized based on domain knowledge and field observations and then verified in the field. The encroachments in form of settlements, roads, fish culture, land filling, etc. that were identified by field survey and visible on the satellite imageries were traced.

2.8. Developing Short Case Studies on Mayur River and its Connected Canals

Case studies of Mayur and its connected canals contain information derived from primary and secondary sources. Contents of the case studies include location, present condition, past condition, uses of the canals, restriction of the uses of the canal due to the present condition, encroachment scenario, major problems that has led to the present demeaning condition and suggestions given by the survey respondents for saving, managing and making functional of Mayur and its connected canals.

2.9. Conducting Workshop for sharing Findings with the concerned Stakeholders

After the completion of the study, key findings along with other issues viz. study methodology, review of the existing rules and regulations were shared with the stakeholders organizations and citizens through workshop. Feedback from the workshop were further investigated and incorporated in the study.

Chapter 3: Review of Existing Regulatory Documents

3.1. Review of Regulatory Bindings and Governance of Concerned Organizations

Regulations mandated by KCC, KDA, LGED, DoE, and other such government organizations are the implementation artifacts of policy statements. Therefore, the review of such regulatory bindings and governance of such concerned organizations directly and indirectly responsible to save Mayur and its connected canals of Khulna is very important. A variety of concerned Acts, Ordinances, Policies, Rules etc. are reviewed in order to identify the followings:

- Regulatory frameworks and work provisions of the organizations
- Punishment or deals set for offenders
- Detailed knowledge of the Acts, Ordinances, Policies and Rules etc.
- Loopholes, limitations and governance deficiency of the Acts, Ordinances, Policies and Rules etc.

Bangladesh is a land of river/canals and large sources of drinking water. Apart from natural water bodies, this country has innumerous artificially created water resources like, ponds, lakes and canals. In order to eliminate the shortage of drinking water a large number of artificial reservoirs had been created here. But in course of time, the natural and artificial water reservoirs had been subjected to pollution, forceful possession and filling up.

In the recent years, the level of incidence of forceful possession of water bodies has grown in great numbers. The water bodies in this country are being forcefully possessed, filled up and polluted both by Govt. and Non-Govt. agencies. Although there is no clear cut legislation towards protection of water bodies under private ownership, there are laws to protect the natural reservoirs. But due to lack of coordination among the responsible departments, weak enforcement of laws, limitation of proper planning and monitoring, and lack of planning and foresight many such reservoirs in this land have been destroyed.

In Bangladesh there are several national and local policies, Acts and legislations to guide, control and maintain the water bodies and preserve the environmental quality. The related instructions and directives in the sections, sub-sections and clauses are given below:

Table 3.1: Existing regulatory documents on protection of rivers and canals in Bangladesh

Sl.	Act/Ordinance /Policy/Plan	Executing Agency	Details of regulatory provisions	Limitations regarding enforcement
1.	Bangladesh Environment Protection Act, 1995	MoEF (Ministry of Environment and Forest)	-An Act to provide for conservation of the environment, improvement of environmental standards and control and mitigation of environmental pollution. -An authorized personal appointed by the Director General can collect from any factory, premises or other place any sample of air, water, soil or other substance for analysis in the manner prescribed by rules,. -Environmental Clearance Certificate from the Director General necessary for establishing or undertaking any industrial unit or Project. Penalties.- -Imprisonment not exceeding 10 years or fine not exceeding 10 lac taka or both for not doing things in the manner that is already prescribed by the Bangladesh Environment Protection Act 1995. -A fine not exceeding taka 5 (five) thousand; in case of second offence, a fine not exceeding taka 10 (ten) thousand; in case of each subsequent offence, an imprisonment not exceeding 1 year or a fine not exceeding taka 10 (ten) thousand or both.	-No civil or criminal case or other legal proceeding can be made against the Government on the basis of this Act, Director General, or any other person of the Department for any action which caused or is likely to cause injury to any person, if such action is taken in good faith under this Act or rules.
2.	The Protection and Conservation of Fish Act, 1950	Government of Bangladesh	-An Act to provide for the protection and conservation of fish in Bangladesh. **Can prohibit the use of:** • Fixed engines • Weirs, dams, bunds, embankments and other structures • Current Jal (Current Net) • Killing fishes by weapons i.e. dynamite. • Poisoning water -Can size, remove and forfeit any of the above if finds necessary. **Penalties:** -The breach of any rule or any prohibition notified shall be punishable with rigorous imprisonment for a team which shall not be less than one year and may extend to two years, or with fine which may extend to five thousand taka or with both. -Arrest without warrant for offence under the Act.	-Only report or complain from a fishery officer or a police officer not below the rank of Sub-inspector is granted to make an offence. -No court other than a Metropolitan Magistrate or Magistrate of the first class shall try an offence under this act.
3.	The Protection and Conservation of Fish	Government of Bangladesh	-An Act made to further amend the Protection and Conservation of Fish Act, 1950. -'Fishery' means any water body, natural or artificial, open or closed, flowing or stagnant (such as river, haor,	Same limitations mentioned under the

Sl.	Act/Ordinance /Policy/Plan	Executing Agency	Details of regulatory provisions	Limitations regarding enforcement
	(Amendment) Act, 1995		baor, beel, floodplain, canal, etc.) where activities for growing fish, or for conservation, development, demonstration, breeding, exploitation or disposal of fish or of living organisms related to such activities are undertaken, but does not include an artificial aquarium of fish used as a decorative article, pond or tank'." -No new addition of law just of the punishment and legal proceedings.	above "The Protection and Conservation of Fish Act, 1950".
4.	The Environment Court Act, 2000	DoE (Department of Environment)	An Act to provide for the establishment of environment courts and matters incidental thereto. Whereas it is expedient and necessary to provide for the establishment of Environment Courts for the trial of offences relating to environmental pollution and matters incidental thereto; **Penalty for violating court's order.-** If a person continues to repeat the offence for which he has been sentenced, he shall be liable to be sentenced with the penalty prescribed for that offence. **Conversion of fines to compensation** (1) The Environment Court can convert fines imposed by it as compensation to be paid to persons affected as a result of offence under an environmental law. (2) If a claim for compensation is related to an offence then the Environment Court shall try the offence first and, then if the compensation to be awarded is not equal with the fine imposed as a penalty of the offence, then the application for compensation can be considered separately.	-Absent of provision of using compensation for pollution abatement of the water bodies i.e. river or canal. -Absence of making penalty for government organization i.e. KCC for polluting Mayur by waste disposal -Absent or lack of joint initiative with KCC, KDA, LGED, Department of Fisheries, BWDB etc. for protecting the Mayur and its connecting canals -Little or no initiative to fine to the building owners who are polluting water by discharging sewage from their latrines -Absence of using realized money as fines for pollution abatement etc.
5.	Government Jalmahal	i. National Jalmahal	**Definition of Jalmahal:** Jalmahal means such water bodies which are submerged	The penalties are absent if

Sl.	Act/Ordinance /Policy/Plan	Executing Agency	Details of regulatory provisions	Limitations regarding enforcement
	Management Policy,2009	Management Committee ii. Ministry of Land iii. Zilla Jalmahal Management Committee iv. Upazilla Jalmahal Management Committee	under water for whole year or a certain period of a year and which are known as Haor, Baor, Beel, Jheel, Pond, Doba, Lake, Dighi, Canal, River, Sea etc. Jalmahal can be open or closed. In the case of closed Jalmahal, it will have a defined boundary and in the case of open Jalmahal, it will not have any well-defined boundary. *[Section 2(C)]* **Handed Over Jalmahal to Various Ministry through Memorandum of Understanding (MoU):** Through MOU, Jalmahals can be handed over to various ministries i.e. Ministry of Fisheries and Livestock, *Ministry of Local Government, Rural Development* and Co-operatives, Ministry of Environment and Forest etc. and the ministries will manage the Jalmahal according to the MOU. After the expiration of MOU, the management of Jalmahals will be transferred to Ministry of Land. *[Section 3(A)]* **Participation of Actual Fishermen Co-operative Association:** Related Ministries/ Divisions/ Departments/ Offices will take necessary steps to create participation of Actual Fishermen Co-operative Associations in Jalmahal management. *[Section 3(B)]* **Jalmahal Management according to Khas Collection:** If any Jalmahal can not be settled, then the District Commissioner will manage the Jalmahal according to Khas Collection. *[Section 5(4)(K)]* **Natural Flow of Water:** No interruptions will be made to any Jalmahal which will hamper the natural flow of water. *[Section 21]* **Social Afforestation:** Tendered Association will be covenanted to increase the forest resources through social afforestation in the banks of the Jalmahals. *[Section 23]*	the associations found guilty are not fisherman associations..
6.	Bangladesh Water Act, 2013	Executive Committee of the National Water Resources Council (ECNWRC) Water Resources Planning organization (WARPO) will act as the secretariat of the ECNWRC	**"Water Resource Development Project"** means any activity, program or initiative taken for the development of any water resources, such as; any hydraulic infrastructure for irrigation, flood control management and drainage, protection of river bank, dredging or any other similar activity, program or initiative; **5. Functions of the Council**--For the purposes of this Act and subject to its provisions, the Council shall be the highest decision making body, and in this behalf, the Council shall have the following functions, namely:- (a) to make policies, and give instructions for integrated development of proper use of, and safe abstraction of, proper distribution of, proper protection of, and proper conservation of, water resources; (b) to give instructions in respect of making National Water Resource Plan, for ensuring integrated development of water Resources; (c) to approve the National Water Resources Plan, and ensure implementation thereof; and (d) to perform such other functions as may be determined by the Council. **Duties and responsibilities of the Executive**	-The Council seems not functional for preservation and conservation of important water bodies in and around the cities such as Mayur and its connection canals of Khulna through development of Water Resource Development Project under National Water

Sl.	Act/Ordinance /Policy/Plan	Executing Agency	Details of regulatory provisions	Limitations regarding enforcement
			Committee (c) to take initiatives with regard to any planning, management of and inter-sector coordination on water resources; (d) to keep the Council periodically informed with regard to the issues on water resource management, and give advice thereto; (e) to coordinate among the appropriate authorities, to formulate policies regarding inter-sector disputes, and to resolve the disputes thereof and to issue instructions, if necessary; 13. Power to issue removal order.-(1) In violation of any provision of this Act or of any prohibition and condition of any protection order or of any clearance certificate, if any person or appropriate authority makes any construction or carries on land filling activities on water resources which creates impediments in the normal water course or changes the direction of such water course: the Executive Committee or any officer authorized by it in this behalf, notwithstanding anything contained contrary in any other law for the time being in force, may, to keep such water course natural, issue a removal order to such person or authority for removing the infrastructure. or land filling materials or elements thereof, within the time specified in such order.	Resource Plan - Absence of a monitoring mechanism which can handle absence or failure of initiatives, provide cooperative strategies to formulate projects, plans, policies and strategies regarding inter-sectoral deals, disputes, and to resolve the disputes thereof and to issue instructions, if necessary
7.	Natural Wetland Protection and Preservation of Open space, Park and Playground Act, 2000	Government of Bangladesh	Natural Wetland meaning those water bodies marked in the master plan as rivers, canals, Ponds, fountains, haors, baors etc which are noted as flood plains by gazette notification. **Legislations on the conversion of Open space, Parks and Playgrounds** The places under this class cannot be converted to other uses and cannot be leased or rented or handed over for other use purposes. Under this act any change in the vegetation type of an oasis will be considered as the changing the class. **Penalties.-** Imprisonment not exceeding 5 years or fine not exceeding 50 thousands taka or both.	-Powers can be misused to provide lease and there is no check to this power.
8.	River Conservation Act, 2013	National River Commission	**According to the laws' of 29 in 2013** "Illegal ownership of river areas, water and environment pollution, river pollution due to industrial wastes, and protecting from illegal building and many others unlawful activities and keeping general trend of river and proper conservation of river and creating available place for boats and multi-purpose uses of rivers there has been formed a commission " and it has following chapter and activities **Chapter 02: Establishment of National river protection Commission** a. After enforcement of the law there has been established a commission called national river protection commission in order to fulfill its aims and objectives. b. The commission is a parliamentary institution and has	-In some cases there exists conflict between local authorities and river commission because of overlapping powers. So the process of making free the encroached lands becomes difficult..

Sl.	Act/Ordinance /Policy/Plan	Executing Agency	Details of regulatory provisions	Limitations regarding enforcement
			a permanent continuity and has a official seal and according to the law the commission has the power to conservation, protection, monitoring all type of legal and illegal wealth and hand over them and can case against them and any one also can case against the commission. c. The chairman is the head of the commission and has supreme power. **Chapter 03: Activities of the Commission** a. In order to creating link to all activities with all ministry or division related to river the commission will notice the government. b. To protect river from encroaching and re-encroaching the commission will recommend to the government. c. To recommend the government for the removal of illegal establishment on the bank of river. d. To recommend the government for the protection of river water from pollution e. To recommend the government for digging river which are being death. f. To recommend the government for the development of information about the river. g. Any development related to the river need to recommend the government. h. To protect the biodiversity of the river need to recommend the government. i. . To protect the river need to recommend the government to take short term and long term plan. j. To provide suggestion to the government for the improvement mass awareness about the river. k. Regularly monitoring and provide recommend about the development activities related to the river. l. The laws related to the protection and conservation of river need to monitor and need to amended according to the situation and recommend to the government m. In order to protect the encroachment and pollution of Khal, water bodies and coastal areas of Bangladesh need to notice the government.	
9.	The Bangladesh Environment Conservation Act, 1995	Department of Environment (DoE)	-An Act to provide for conservation of the environment, improvement of environmental standards and control and mitigation of environmental pollution. -"Conservation of environment "means improvement of the qualitative and quantitative characteristics of different components of environment as well as prevention of degradation of those components; -Determination of the standards of air, water, sound, soil and other components of the environment in relation to different areas for different purposes: a) Provided that the Government may, by notification in the official Gazette, for a specified period suspend the application of such standard, generally or individually, in respect of industries or projects existing at the time of commencement of this Act; b) Regulation of the establishment of industries	

Sl.	Act/Ordinance /Policy/Plan	Executing Agency	Details of regulatory provisions	Limitations regarding enforcement
			and other development activities for conservation of environment; c) Determination of safe procedures for the use, storage and transportation of hazardous substances; d) Determination of safety and remedial measures for prevention of accidents which may cause pollution of the environment; e) Determination of the standards for effluent and discharge; f) procedures for assessment of the environmental impact of various projects and activities, and procedures for their review and approval; (g) Procedures for protection of the environment and ecosystem; (h) Determination of fees for obtaining environmental clearance certificates and other services. **Penalties:** • Imprisonment not exceeding 10 years or fine not exceeding 10 lac taka or both. • An imprisonment not exceeding 1 year or a fine not exceeding taka 10 (ten) thousand or both. • Imprisonment not exceeding 6 months or fine not exceeding 10 thousand taka or both.	
10.	National Fisheries Policy, 1998	Ministry of Fisheries and Livestock	**Objectives of the National Fisheries Policy** a) Enhancement of the fisheries resources and production; b) Poverty alleviation through creating self-employment and improvement of socio-economic conditions of the fishers; c) Meet the demand for animal protein, d) Achieve economic growth and earn foreign currency by exporting fish and fisheries products; e) Maintain ecological balance, conserve biodiversity and improve public health. **Policy for Conservation, Management and Exploitation of fish from the Inland open water bodies** a. Rivers, canals, beels, haors, and floodplains are the main source of fish production in the inland open water bodies. Areas of inland open waters are about 4.047 million ha. b. Damage done to fish and fish habitats during the implementation of all development activities such as flood control, irrigation and drainage (FCD/I) projects, agriculture, industries, road and urban projects, shall be kept at a minimal level and programs for mitigation of such loss shall be undertaken. c. To increase production and to conserve biodiversity, part or the whole water bodies/jalmohals shall be	

Sl.	Act/Ordinance /Policy/Plan	Executing Agency	Details of regulatory provisions	Limitations regarding enforcement
			converted into fish sanctuaries. d. Department of Fisheries will be liable for the operation and management of the declared fish sanctuaries with the help of fishers' societies and local government. e. Integrated rice cum fish culture shall be extended through the release of fish and shrimp fry in the beels, haors and other floodplains, especially in the areas encircled by dams in flood control and irrigation projects. f. Priority will be given to fish culture in the low-lying lands of the country where 50 cm or more of water is retained or can be retained during rainy season for more than three months. g. Water bodies are damaged and the environment is polluted due to the unplanned discharge of wastage. Therefore, discharge of harmful municipal and industrial wastes directly into the water bodies will be considered a punishable crime and measures will be taken to control and limit the use of harmful chemical fertilizers, insecticides and other agrochemicals in the agricultural fields. h. In addition to the existing enforcement agencies, the local government council in cooperation with the fishermen organizations shall be vested with the responsibility of implementing the Fish Acts. Steps will be taken to create awareness of the Fish Acts at the village level. i. Water bodies such as haor, baor and beel will be renovated and declared as areas for fish culture and these water bodies will not be reduced in sizes.	
11.	The Canal Act, 1864		An Act to amend and consolidate the law relating to the collection of tolls on canals and other lines of navigation, and for the construction and improvement of lines of navigation in Bangladesh. **It is enacted as follows:-** **a)** Any ship, barge, boat, raft, timber, bamboos or floating materials, propelled in any manner. **b)** Any navigable channel subject to the provisions of this Act. **c)** According to the Act Channel shall include any river, canal, khal, nala or waterway, whether natural of artificial. **d)** According to the Act person shall include any company, association or body of persons, whether incorporated or not. **e)** The Government may take possession, as for a public purpose, of any land that may be necessary for the execution of any of the above-mentioned works, under the provisions of any Act in force for the taking possession of land for public purposes.	

Sl.	Act/Ordinance /Policy/Plan	Executing Agency	Details of regulatory provisions	Limitations regarding enforcement
			f) No action or suit shall be brought against the Government in respect of any injury or damage caused by, or resulting from, any act done under the last preceding section. **g)** Tools, at such rate as shall be fixed in manner hereinafter mentioned, shall be paid in respect of all vessels entering upon, or passing along, any of the lines of navigation subject to the provisions of this Act. h) The Government may fix, and from time to time alter, the rates at which such tolls shall be levied. **i)** The Government may appoint such person as it may think fit to collect tolls under this Act, and it shall be lawful for any person, so appointed to farm the collection of tolls to any other person, with the sanction of the Government or to employ any other person in such collection. **j)** Any person who shall refuse or evade, any toll due under this Act shall be conviction before a Magistrate, with a fine which fifty taka, or with simple imprisonment in lieu may extend to one month.	
12.	Local Govt. Pourashava Act, 2009	Pourashava or municipality	In second schedule section 50-71 under detail functions of municipality area there is "Public Water Sources" and according to it- (1) A Municipality may, with the previous sanction of the Prescribed Authority, declare any source of water, spring, river, tank, pond, or public stream, or any part thereof within the municipality, which is not private property, to be a public water-course. (2) A Municipality may, in respect of any public water-course, provide such amenities, make such arrangements for life saving, execute such works, and, subject to the provisions of any law for the time being in force relating to irrigation, drainage and navigation, regulate the use thereof, as the by-laws may provide. (3) To keep public water source free from pollution, if anybody or bodies try to pollute or polluted or involved in pollution, then municipality may take attempts to punish them. (4) On which cases the source of pollution is out of municipality, on those cases municipality may take legal procedures. Offences about water supply, private water services and drainage under this ordinance (4^{th} schedule, section 108)- • Without the permission of the municipality, causing or knowingly or negligently allowing the contents of any sink, sewer, drain, or cess-pool or any other offensive matter to flow, or drain to be put upon any street, or public place, or into any irrigation channel or any sewer or drain not set apart for the purpose. • Doing any act by which water for drinking is rendered unfit for such use. • Watering cattle or animals, or bathing or washing at or near a well or other source of drinking water for the public.	-Political influence -Lack of man power -No defined offences and penalties

Sl.	Act/Ordinance /Policy/Plan	Executing Agency	Details of regulatory provisions	Limitations regarding enforcement
13.	Local Govt. City Corporation Act, 2009 (amended)	City corporations	According to this Act, in 3rd schedule section 41 there are some directions about water supply, drainage and private sources of water- • Without permission of city corporation sources of water that are not in private ownership like well, river, ponds, public streams etc. will be declared as Govt. water sources. • People can use these water sources for recreation and lifesaving uses and can use for water pumping, water clearance and boat diving. • Corporation will be responsible for the maintenance of these water sources. According to 5th schedule section 92 offences related to water under this ordinance are- • Without the permission of the corporation, causing or knowingly or negligently allowing the contents of any sink, sewer, drain, or cess-pool or any other offensive matter to flow, or drain to be put upon any street, or public place, or into any irrigation channel or any sewer or drain not set apart for the purpose. • Doing any act by which water for drinking is rendered unfit for such use. • Watering cattle or animals, or bathing or washing at or near a well or other source of drinking water for the public.	-Conflict among local authorities -Political influences -Lack of proper monitoring system
14.	Local Govt. Union Parishad Act, 2009	Union Parishad	According to 5th schedule section 89 offences about water supply and water sources under this ordinance- • Without the permission of the corporation, causing or knowingly or negligently allowing the contents of any sink, sewer, drain, or cess-pool or any other offensive matter to flow, or drain to be put upon any street, or public place, or into any irrigation channel or any sewer or drain not set apart for the purpose. • Doing any act by which water for drinking is rendered unfit for such use. • Watering cattle or animals, or bathing or washing at or near a well or other source of drinking water for the public.	-Lack of man power and monitoring system -Political influences
15	River Research Act, 1990	River Research	**Duties of the institute:** The Institute shall have the following duties, namely:-	

Sl.	Act/Ordinance /Policy/Plan	Executing Agency	Details of regulatory provisions	Limitations regarding enforcement
		Institute	**a**) To control, by means of g geographical models, the preparation of maps required for river regulation, prevention of embankment breaks, flood control and irrigation and drainage, and to control, by means of geographical models, river mechanics, measures to counter the silting up of rivers and researches on estuaries and tidings of rivers; especially the ratio of saltiness and the quality of water; **b)** To examine the equipment used in constructions made for the purpose of river regulation, prevention of embankment breaks, flood control, and irrigation and drainage.	
16.	The Ground Water Management Ordinance, 1985	Upazila Irrigation Committe e under each Upazila	**An Ordinance to manage the ground water resources for agricultural production.** Whereas it is expedient to manage the ground water resources for agricultural production and for matters connected therewith. Actions taken by the committee under The Ground Water Management Ordinance, 1985- • **License for tube well** (No tube well shall be installed in any place without a license granted by the Upazila Parishad.) • **License of existing tube wells (**Provided that no enquiry by the Committee shall be necessary for granting a license under this section.**)** • **Suspension and revocation of license (**The Committee may, if it is satisfied that the conditions of a license are being violated, by order in writing specifying the reasons therefore, suspend the license of a tube well and report the matter forthwith to the Upazila Parishad.**)** • **Cancellation of license (**A license granted under this Ordinance may be cancelled by the Upazila Parishad if, on a report from the Committee, it is satisfied that,- (a) the licensee has violated the terms and conditions of the license; or (b) the license was suspended for more than three times during one year preceding the order Provided that no license shall be cancelled unless the licensee is given a reasonable opportunity of being heard.**)** • **Supply of tube wells by corporation etc. (**Notwithstanding anything contained in any other law for the time being in force, neither the Bangladesh Agricultural Development Corporation established under the Agricultural Development Corporation Ordinance, 1961 (E.P. Ord. XXXVII of 1961), nor any other authority or person dealing with tube wells shall supply tube wells to any person unless he has a license for installation of a tube well granted under this Ordinance.**)**	-Punishment is not defined according to individual offence. -Lack of skilled man power.

Sl.	Act/Ordinance /Policy/Plan	Executing Agency	Details of regulatory provisions	Limitations regarding enforcement
			• **Offences (**Whoever contravenes any provision of this Ordinance or rules made thereafter shall be punishable with fine which may extend to two thousand taka.**)**	
17.	The Water Resources Planning Act, 1992	Water Resources Planning Institution	**An Act made to ensure the development and balanced use of water resources.** **Functions of the Institution:** The Institution shall have the following functions, namely:- **a)** to conduct the general planning of environmentally balanced water resources for the purpose of developing water resources; **b)** to determine the national means and methods for the scientific utilization and preservation of water resources; **c)** to give advice to other institutions involved in the development, utilization and preservation of water resources; **d)** to co-operate in the investigation of any organization appointed to the development, utilization and preservation of water resources, and to conduct, if necessary, special investigations on any matter relating thereto; **e)** to evaluate and review any matter which has arisen from measures taken by any organization appointed to the development, utilization and preservation of water resources;	
18.	National Policy for Safe Water Supply & Sanitation 1998	Local Government Division (Ministry of Local Government, Rural Development and Cooperatives**)**	**Objectives:** The objectives of the 'National Policy for Safe Water Supply and Sanitation' are to improve the standard of public health and to ensure improved environment. For achieving these objectives, steps will be taken for: **a)** Facilitating access of all citizens to basic level of services in water supply and sanitation; **b)** Bringing about behavioral changes regarding use of water and sanitation; **c)** Reducing incidence of water borne diseases; **d)**Building capacity in local governments and communities to be effectively with problems relating to water supply and sanitation; **e)** Promoting sustainable water and sanitation services; **f)** Ensuring proper storage, management and use of surface water and preventing its contamination; **g)** Taking necessary measures for storage and use of rain water; **h)** Ensuring storm-water drainage in urban areas. **Strategy:** The strategy of the National Drinking Water Policy will be developed on the following principles: **a)** All sector development activities shall be planned, coordinated and monitored on the basis of a sector development framework which will be prepared after the formulation of the Policy; **b)** Participation of users in planning, development,	-Lack of proper planning and coordination. -Less private partners. -Improper execution of regulations.

Sl.	Act/Ordinance /Policy/Plan	Executing Agency	Details of regulatory provisions	Limitations regarding enforcement
			operation and maintenance through local government and community based organizations of the stakeholders; **c)** Development of water supply and sanitation sector through local bodies, public-private sector, NGOs, CBOs and women groups involving local women particularly elected members (of the local bodies in the sector development activities).; **d)** Gradual community cost-sharing and introduction of economic pricing for services; **e)** Assigning priority to under-served and un-served areas; **f)** Adoption of water supply and sanitation technology options appropriate to specific regions, geological situations and social groups; **g)**Local Government institutions/Paurashavas to bear increasing share of capital cost; **h)** Improvement of the existing technologies and conduct of continuous research and development activities to develop new technologies; **i)** Close linkages between research organizations and extension agents/implementing agencies; **j)** Social mobilization through publicity campaign and motivational activities using mass media among other means to ensure behavioral development and change in sanitation and hygiene; **k)** Capacity building at the local/community level to deal effectively with local water and sanitation problems; **l)** Mobilization of resources from users, GOB and development partners for implementation of activities of the sector in a coordinated manner based on targeted plan of action; **m)** Providing credit facilities of an sanitation service; **n)** Regular qualitative and quantitative monitoring and evaluation to review progress of activities and revision of the strategy based on experiences; **o)** Wherever feasible safe water from surface water sources shall be given precedence over other sources; and **p)** With a view to controlling and preventing contamination of drinking water, regular and coordinated water quality surveillance by Department of Public Health Engineering (DPHE), National Institute for Preventive & Social Medicine (NIPSOM), Atomic Energy Commission and Department of Environment (DOE) and random testing of quality of drinking water (including bottled water) by DPHE, Bangladesh Standard Testing Institute (BSTI) and DOE to determine the level of contamination; **q)** Adoption of necessary measures in urban areas to prevent contamination of ground and surface water by solid and liquid wastes. **Policy Principles:** Based on local and international experiences, the following principles have been adopted as the basis for policy formulation:	

Sl.	Act/Ordinance /Policy/Plan	Executing Agency	Details of regulatory provisions	Limitations regarding enforcement
			Basic needs (It is necessary to expand and improve the water supply and sanitation services in order to satisfy the basic needs of the people.) **The value of water** (Water has an organic, social and concurrently an economic value. To ensure that service provision is viable, the price of water should reflect its economic value, with the eventual objective of covering the cost of supply.) **Participation of users** (Users are at the center of all development activities.) **Role of Women** (Since women play a crucial role in water management and hygiene education at the household level, recognition of women's role will contribute to the overall development of the sector.) **Technology Options** (Promotion of various technology options will be sustainable for both water supply and sanitation keeping the needs of specific areas and socio-economic groups of people.) **Investment** (Investment in the sector should focus on facilitating water and sanitation services, leading to improvement of public health, wellbeing of the people and economic development.) **Integrated development** (Isolated initiatives for development of water and sanitation services generally lead to waste of resources.) **Capacity building** (The capacity of the sector should be expanded in order to improve and broaden the reach of services it provides.) **Private sector** (Many functions of the water supply and sanitation sector can be undertaken by private organizations.) **Environmental integrity** (It is desirable that all development activities related to water supply and sanitation are considered within broader environmental considerations.) **Emergency responses** (All government and non-government bodies should be prepared to take necessary measures for immediate response before and after natural disaster.) **Holistic approach** (Drinking water supply and sanitation is a sub-sector and as such should be coordinated into the overall National Health Policy, National Water Policy, National Education Policy and National Environment Policy.) **Policies:** In general, the urban and rural water supply and sanitation issues appear similar, but they do differ in institutional aspects, and in content and magnitude. As such, policies for rural and urban areas are presented separately. **Policies:** In general, the urban and rural water supply and sanitation issues appear similar, but they do differ in institutional aspects, and in content and magnitude. As such, policies for rural and urban areas are presented separately. **Urban Water Supply:**	

Sl.	Act/Ordinance /Policy/Plan	Executing Agency	Details of regulatory provisions	Limitations regarding enforcement
			• In order to make the water supply system sustainable water would be supplied at cost. • In the near future water tariff shall be determined on the basis of the cost of water production, operation and maintenance, administration and depreciation. • Water Supply, Sewerage Authorities (WASAs) shall be responsible for sustainable water supply in the metropolitan areas where WASAs exist. Whereas in other urban areas the Paurasabhas with the help of DPHE shall be responsible for the service. • In order to promote operational efficiencies the government's development grant to the Paurasabhas shall take into account the following : a) water supply coverage in terms of area and population; b) amount of un-accounted for water; c) Increase in revenue income. • During natural disaster WASAs and relevant agencies shall take appropriate measures for providing safe drinking water. • Monitoring of water quality for the purpose of ensuring an acceptable standard will be the responsibility of DPHE, DOE, BSTI, Atomic Energy Commission (AEC) and CBOs and they will send their report to the water quality control committee in the Local Government Division. • WASAs and relevant agencies shall support and promote any collective initiative in slums and squatters in accessing water supply services on payment. **Urban Sanitation:** • The sanitation system shall have to be self-sufficient and self- sustaining. Sanitary latrine in every household will be promoted. • The City Corporations or Paurasabhas shall be responsible for solid waste collection, disposal and their management. These organizations may transfer, where feasible, the responsibility of collection, removal and management of solid waste to the private sector. Where WASAs exists, they shall be responsible for sewerage and storm water drainage systems. • The City Corporations and Paurasabhas shall be empowered to set tariffs, by-laws, appointment of staffs, etc. according to their needs and in accordance with the guidelines laid down by the government. • The role of women in the process of planning, decision making and management shall be promoted through their increased representation in management committees/boards (Paurasabha/WASA).	

Sl.	Act/Ordinance /Policy/Plan	Executing Agency	Details of regulatory provisions	Limitations regarding enforcement
			• Private sector and NGO participation in sanitation will be encouraged. • Behavioral development and changes in user communities shall be brought about through social mobilization and hygiene education in alliance with the Ministries of Health, Education, Social Welfare, Information, Women & Children Affairs, DPHE, NGOs, CBOs, local government bodies and other related agencies.	
20.	National Water Policy, 1999	The National Water Resources Council (NWRC), The Executive Committee of the National Water Resources Council (ECNWRC), WARPO	The policy under its heading "Institutional Policy" states that the governance and management of the national water resources require a great deal of coordination of existing institutions and in some cases reform and creation of new community-based institutions. Water resources management extends across many water using sectors as well as political jurisdictions and geographically and hydrologically diverse areas. Properly functioning institutions are essential for effective implementation and administration of the countryís water and related environmental resource management policies and directives. Under this policy the NWRC is directed to guide water management institutions at the national, regional and local levels in the formulation and implementation of policies and plans for improved water management and investment. Under the point "Stakeholder Participation" the policy has a direction that there should be a complete reorientation of the institutions for increasing the role of stakeholders and the civil society in decision making and implementation of water projects. The Government has to be at the core of the effort to help build the local institutions and to impart a precise awareness of the issues and an unambiguous understanding of their role in water management.	No specific plans have been developed and implemented for protection of Mayur and its connected canals by the ECNWRC or its guidance. Initiatives of the institutions for increasing the role of stakeholders and the civil society in decision making and implementation of water projects centering Mayur and its connected canals of Khulna are found almost absent.

Chapter 4: Encroachment Scenario of Mayur River and Connected Canals over the Years

4.1 Changes of River Boundary Area and Encroachment Area

In the study area the Mayur River actually bears two names, one is Mayur and another is Hatia River. The Mayur River is originated from Rayer Mahal and has been ended at Gollamari. From the end point which is Gollamari, the Hatia River is originated. It ends its course meeting with the Kajibacha River. The River flow of entire Mayur is controlled by the Alutala 10 vent Sluice Gate at the intersection of the Hatia River and the Kajibacha River.

Table 4.1: Changes of River Boundary Area and Encroachment Area

Sl.	River Name	River Area (acre)				Change of Encroachment Area (acre)		
		RS Map	2004	2010	2014	RS Map to 2004	2004-10	2010-14
1	Mayur River	58.77	55.76	53.70	51.46	-3.01	-2.06	-2.24
2	Hatia River	138.12	136.47	135.89	129.01	-1.65	-0.57	-6.88

*The (-ve) sign indicates decreasing of canal area by encroachment.
Source: Data generated from satellite imageries by the researchers, 2015

Table 4.2: Encroachment Rate of Rivers

Sl.	River Name	Change of River Area (%)			Change of Encroachment Area (%)	
		RS Map to 2004	2004-10	2010-14	2004-10	2010-14
1	Mayur River	-5.1	-3.7	-4.2	-32	9
2	Hatia River	-1.2	-0.4	-5.1	-65	1097

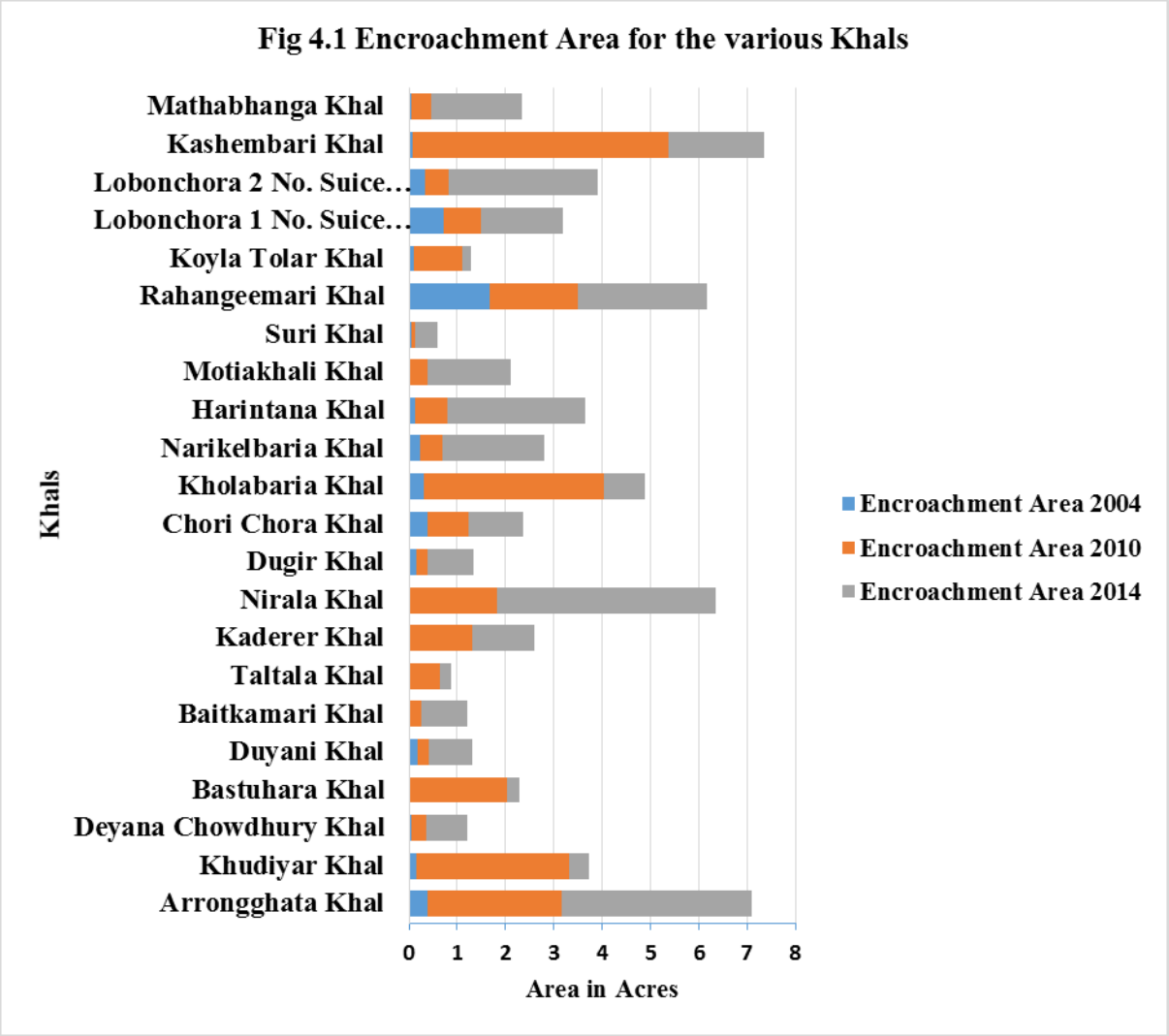
*The (-ve) sign indicates decreasing of encroachment.
Source: Data generated from satellite imageries by the researchers, 2015

The above table has negative values that signify there has been a decrease in the availability of water body areas. The calculations have been done in a manner that emphasized on the previous known encroachment. For example the encroachment level of 2014 was brought to light by comparing it with the encroachment of 2010. Therefore if the level of encroachment is ‘x’ in 2010 and ‘3x’ in 2014, the encroachment percentage is increased as ((3x-x)/x*100). The percentage change of the area of Hatia River was much larger from the Mayur River for the period from 2010 to 2014 (Table 4.1). The area in that period was reduced at the largest

percentage than the any other periods because of the increase of water hyacinth in the river. The local people have selected the Putimari 10 No. Sluice Gate as the main reasons acting behind the increase of water hyacinth. The large number of water hyacinth has been storing near the bank line of the river and the river area is continuously reducing due to this cause. This condition also encouraged local people to encroach the river from the bank line for developing both structures and crop lands. Though the encroachment area of Hatia River is lesser than the area of encroachment of Mayur River, the percentage rate for Hatia River (9%) is larger than Mayur River (1097%) in 2010 to 2014. This was due to the great amount of change of the amount of water hyacinth in Hatia River. On other hand, encroachment rate over 2004 to 2010 for Mayur and Hatia River is decreased. In Mayur River, the encroachment area was highest in the period of 2004 to 2010 (32%). But in the present period, the encroachment rate is reduced a little bit (9%). But it does not mean that the condition is better. Because it is evident from the field observation that encroachment is continuously going on.

4.2 Changes of Canal Boundary Area and Encroachment Area

Canal area adjacent to Mayur River and the encroachment area are dynamically changing with the passage of time. But behind these changes, no fixed or constant reasons are found. The factors behind these changes and the rates of these changes are different because of their locational causes. Table 4.3 and Table 4.4 shows the percentage of changes of canal boundary area along with encroachment area from RS Map to 2004, from 2004 to 2010 and from 2010 to 2014. It also represents the change of percentage of encroachment area from 2004 to 2010 and from 2010 to 2014.



Source: Data generated from satellite imageries by the researchers, 2015

Table 4.3: Changes of Canal Boundary Area and Encroachment Area

Sl.	Canal Name	Canal Area (acre)				Encroachment Area (acre)		
		RS Map	2004	2010	2014	RS Map to 2004	2004-10	2010-14
1	Arrongghata Khal	31.00	30.60	27.84	23.90	-0.39	-2.77	-3.94
2	Khudiyar Khal	28.06	27.91	24.74	25.15	-0.15	-3.17	0.41
3	Deyana Chowdhury Khal	2.81	2.77	2.47	1.61	-0.05	-0.30	-0.85
4	Bastuhara Khal	7.49	7.51	5.51	5.25	0.02	-2.00	-0.25
5	Duyani Khal	5.19	5.01	4.78	3.87	-0.18	-0.23	-0.90
6	Baitkamari Khal	1.64	1.67	1.43	0.48	0.02	-0.23	-0.95
7	Taltala Khal	2.44	2.43	1.80	1.57	-0.01	-0.64	-0.23
8	Kaderer Khal	10.39	10.36	9.08	10.36	-0.03	-1.28	1.28
9	Nirala Khal	24.67	24.64	22.85	18.32	-0.03	-1.79	-4.53
10	Dubir Khal	6.64	6.49	6.25	5.31	-0.15	-0.25	-0.93
11	Chori Chora Khal	4.36	3.98	3.14	2.01	-0.38	-0.85	-1.13
12	Kholabaria Khal	8.37	8.05	4.34	3.47	-0.32	-3.71	-0.87

13	Narikelbaria Khal	12.08	11.86	11.39	9.28	-0.22	-0.46	-2.11
14	Harintana Khal	9.03	8.89	8.23	5.39	-0.14	-0.65	-2.85
15	Motiakhali Khal	5.55	5.53	5.16	3.45	-0.02	-0.36	-1.71
16	Suri Khal	0.88	0.82	0.88	0.40	-0.06	0.06	-0.47
17	Rahangeemari Khal	14.00	15.67	13.86	11.17	1.67	-1.81	-2.69
18	Koyla Tolar Khal	5.03	4.94	3.92	3.75	-0.10	-1.02	-0.17
19	Lobonchora 1 No. Suice Gate Khal	6.65	7.38	6.62	4.92	0.73	-0.76	-1.70
20	Lobonchora 2 No. Suice Gate Khal	15.55	15.22	14.74	11.65	-0.33	-0.48	-3.09
21	Kashembari Khal	23.78	23.69	18.41	20.39	-0.08	-5.28	1.98
22	Mathabhanga Khal	8.70	8.66	8.24	6.37	-0.05	-0.41	-1.87
Total		**234.31**	**234.07**	**205.66**	**178.09**	**-0.24**	**-28.41**	**-27.58**

*The (-ve) sign indicates decreasing of canal area by encroachment.
Source: Data generated from satellite imageries by the researchers, 2015

From the table it is seen that, the boundary area from RS Map to 2004 for most of the canals area have been decreased. Among the canals, Chori Chora Khal had been shifted in a large percentage (-8.69%). In the period of 2004 to 2010, the Suri Khal resulted a positive shift towards the change of boundary area, which means the canal area was increased. According to the local people, Suri Khal was excavated and the boundary area was increased due to the requirement of irrigation water for adjacent crop fields. It was a great source of water because of its direct connection with Narkelbaria Khal. The boundary area was reduced for all other canals at that period. Kholabaria Khal was shifted highest from 2004 to 2010 (-46.07%). It occurred because a large portion of the canal was dried out and lost the water course with the main canal in a certain place. It is happening due to the shifting of the water courses of the orinal sources of water, Pabla Beel. On the other hand, on the period of 2010 to 2014, Kaderer Khal, Kashembari Khal and Khudiyar Khal showed the increment of their canal boundary area. The areas were increased due to excavation and extension of those canals. Other canal areas were decreased in that period. Among them, Baitkamari Khal area was reduced most because of the development of the canal into drain. Because of the construction of a narrow drainage over the canal, the area was reduced.

Table 4.4: Encroachment rate of Canals

Sl.	Canal Name	Canal Area (acre)				Encroachment Area (acre)			Change of Canal Area (%)			Change of Encroachment Area (%)	
		RS Map	2004	2010	2014	RS Map to 2004	2004-10	2010-14	RS Map to 2004	2004-10	2010-14	2004-10	2010-14
1	Arrongghata Khal	31.00	30.60	27.84	23.90	-0.39	-2.77	-3.94	-1	-9	-14	606	42
2	Khudiyar Khal	28.06	27.91	24.74	25.15	-0.15	-3.17	0.41	-1	-11	2	2054	-113
3	Deyana Chowdhury Khal	2.81	2.77	2.47	1.61	-0.05	-0.30	-0.85	-2	-11	-35	573	181
4	Bastuhara Khal	7.49	7.51	5.51	5.25	0.02	-2.00	-0.25	0	-27	-5	-9274	-87
5	Duyani Khal	5.19	5.01	4.78	3.87	-0.18	-0.23	-0.90	-4	-5	-19	26	294
6	Baitkamari Khal	1.64	1.67	1.43	0.48	0.02	-0.23	-0.95	1	-14	-67	-1151	313
7	Taltala Khal	2.44	2.43	1.80	1.57	-0.01	-0.64	-0.23	0	-26	-13	6849	-64
8	Kaderer Khal	10.39	10.36	9.08	10.36	-0.03	-1.28	1.28	0	-12	14	4488	-200
9	Nirala Khal	24.67	24.64	22.85	18.32	-0.03	-1.79	-4.53	0	-7	-20	5116	153
10	Dubir Khal	6.64	6.49	6.25	5.31	-0.15	-0.25	-0.93	-2	-4	-15	66	279
11	Chori Chora Khal	4.36	3.98	3.14	2.01	-0.38	-0.85	-1.13	-9	-21	-36	123	33
12	Kholabaria Khal	8.37	8.05	4.34	3.47	-0.32	-3.71	-0.87	-4	-46	-20	1075	-77
13	Narikelbaria Khal	12.08	11.86	11.39	9.28	-0.22	-0.46	-2.11	-2	-4	-19	109	357
14	Harintana Khal	9.03	8.89	8.23	5.39	-0.14	-0.65	-2.85	-2	-7	-35	368	335
15	Motiakhali Khal	5.55	5.53	5.16	3.45	-0.02	-0.36	-1.71	0	-7	-33	1517	371
16	Suri Khal	0.88	0.82	0.88	0.40	-0.06	0.06	-0.47	-7	7	-54	-202	-892
17	Rahangeemari Khal	14.00	15.67	13.86	11.17	1.67	-1.81	-2.69	12	-12	-19	-209	48

18	Koyla Tolar Khal	5.03	4.94	3.92	3.75	-0.10	-1.02	-0.17	-2	-21	-4	938	-83
19	Lobonchora 1 No. Suice Gate Khal	6.65	7.38	6.62	4.92	0.73	-0.76	-1.70	11	-10	-26	-204	125
20	Lobonchora 2 No. Suice Gate Khal	15.55	15.22	14.74	11.65	-0.33	-0.48	-3.09	-2	-3	-21	48	537
21	Kashembari Khal	23.78	23.69	18.41	20.39	-0.08	-5.28	1.98	0	-22	11	6119	-137
22	Mathabhanga Khal	8.70	8.66	8.24	6.37	-0.05	-0.41	-1.87	-1	-5	-23	784	353

*The (-ve) sign indicates decreasing of canal area by encroachment.
Source: Data generated from satellite imageries by the researchers, 2015

In the period of 2004 to 2010, the highest increase of encroached area was found for Koyla Tolar Khal (750.49%). This was due to unplanned development of *kutcha* road over the canal. Most of the canal encroachment is done by unplanned development of *kutcha* road. Mathabhanga Khal had been encroached most in the period of 2010 to 2014. Here the main reason was also development of *kutcha* roads.

Chapter 5: Causes and Consequences of Encroachment

This chapter focuses on identifying the causes and consequences of encroachment and its associated problems located in and along the rivers and canals. Various causes behind the encroachment in the Mayur and Hatia River and its connected canals are found. The consequences of these problems are also discussed.

5.1 Causes of Encroachment:

5.1.1 Level of Education of the Respondents:

Table 5.1: Education Level of the Respondents

Education Level of the Respondents		
Education Level	**Frequency**	**Percent**
Below SSC	181	68.6
SSC	49	18.6
HSC	17	6.4
Degree	9	3.4
Higher Degree	8	3
Total	264	100

Source: Field Survey, 2015.

The survey found that the majority of the people living adjacent to the river and canal are not very educated. This may not seem like such a problem and is understandable but it associates itself with no respect for the rule of law. People are aware that encroachment is illegal and has dire consequences associated but are not fully aware of those consequences. For example, a person may occupy land illegally and then sublet it to another person who is not aware or educated enough to know the land regulations rules or their consequences. The person that the land has been given to will not question the legality of the land if they do not know so.

Lack of knowledge is not entirely related to education but it goes a pretty long way. People who are educated should not fall prey to such Ponzi schemes. The same goes for the rule of law. Its understanding may not be a hundred percent justified by education but people who are educated will not take such decisions lightly and hence will not fall victims to such illegal

land schemes. Residents who have education lower than SSC are 68.6% while only 3% are educated to a Higher Degree.

5.1.2 Age of the Respondents:

According to the field survey conducted majority of the respondents are about the age of 41-50. This reason had not been primarily looked into until one of the respondents gave a little insight into their mind. According to one Mr. Ramij Uddin, age 75, encroachment is not a big problem as the government will not take steps to vacate people from the illegally occupied land. The reason being that most of the people are elderly having nowhere else to go and the government will not take such actions as there are NGOs and Civil Societies that will rise up to help them break the rule of law.

Table 5.2: Age Range of the Respondents

Age Range	Frequency	Percent
15-30	43	16.29
31-45	140	53.03
46-60	62	23.48
Greater than 60	19	7.20
Total	264	100

Source: Field Survey, 2015.

There are special regulations for the elderly and the senior citizens. These regulations even if not observed very strictly in our country are very much maintained in the other countries. Taking advantage of these loopholes (flaws in the existing rules and regulations and lack of enforcement of those laws.) provide people a way to encourage encroachment. Additionally Mr. Ramij Uddin goes on to mention that he had seen such previous cases. The local government does not want such heat on their watch and would not take any action to begin with. If one person could think it up, others would be equally knowledgeable about this topic. This is the reason this point was put forth in this chapter to understand the attitude of the encroachers.

5.1.3 Occupation and Monthly Income:

Table 5.3: Monthly income of the respondents according to their occupation

Occupation	Monthly Income					Total
	15000-20000	20001-25000	25001-30000	30001-35000	35001-40000	
Farmer and Fisherman	30	1	0	0	0	34

Driver	15	4	0	0	0	36
Businessman	23	12	8	1	0	101
Labor	31	1	0	0	0	33
NGO Service Holder	12	4	6	0	0	36
Government Service Holder	3	7	0	0	0	10
Household Maid and Chef	11	3	0	0	1	15
Total	**162**	**40**	**10**	**6**	**4**	**264**

Source: Field Survey, 2015.

Majority of the people residing are businessmen. The businessman's income ranges primarily between tk.15000 to tk.20000. There are various expenditures over the month and this small salary cannot simply avail land without a loan. According to the survey there are people who side with the muscleman of the political leaders in the area to illegally capture land. People are afraid to mention the actual names and designations of the perpetrators involved.

5.1.4 Migration and Period of Living

People have been living at the study area for very long time, although there are inconsistencies. For the past 15 years a number of people have been migrating to the said region. The migrations are mainly concentrated to about 6 to 10 years, where 64 out of a total 264 respondents migrated. New areas have sprung up which is the main reason for which people have come to settle here. These new regions are the products of illegal land grabbing and encroachment of land by various entities.

People have been migrating from all over the districts to settle here in search of a better life and living. They are not wrong to do so but they have been entrenched into a land encroaching scheme where these people are now living as tenants. The places people have migrated from have also been analyzed along with the reason they migrated to the study area.

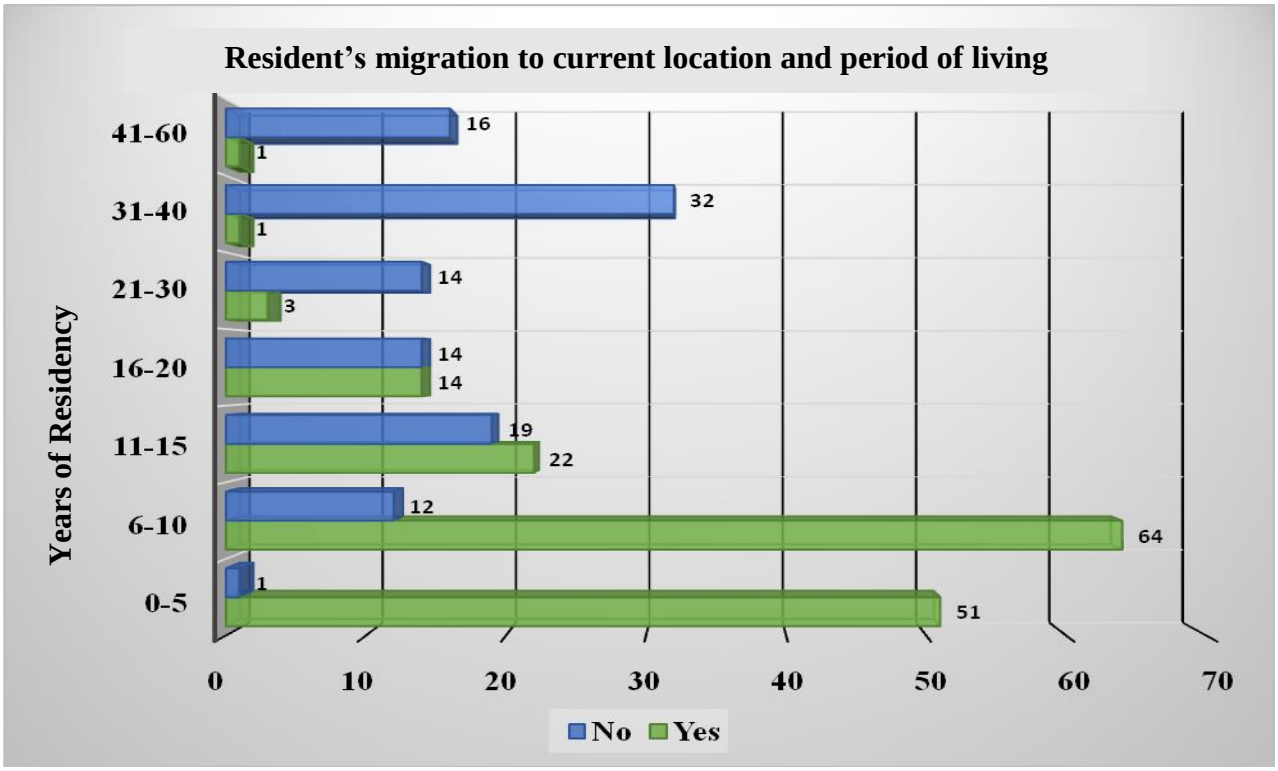


Figure 5.1: Resident's migration to current location and period oftheir residence in the present location.

Source: Field Survey, 2015

Table 5.4: Origin District of the Respondents

District Name	Frequency	Percent
Patuakhali	106	40.2
Bagerhat	27	10.2
Barguna	1	0.4
Barisal	12	4.5
Bogra	3	1.1
Chittagong	1	0.4
Faridpur	2	0.8
Fenny	1	0.4
Jessore	17	6.4
Jenidah	1	0.4
Khulna	50	18.9
Kustia	1	0.4
Magura	1	0.4
Meherpur	1	0.4
Noakhali	1	0.4
Nowabganj	1	0.4
Perojpur	5	1.9
Shatkhira	33	12.5
Total	264	100

Source: Field Survey, 2015.

Table 5.5: Reasons of Migration

Reasons for Migration	Frequency	Percent
In Search of Better Job and Income	157	59.47
Forced Migration due to Natural Disaster	22	8.33
Better Housing Facilities	12	4.55
Business Purpose	7	2.65
Family and Personal Reasons	36	13.64
For Children Education Purpose	7	2.65
For land	5	1.89
High Rent of previous land	18	6.82
Total	**264**	**100**

Source: Field Survey, 2015.

Table 5.5 shows the reasons for the people migrating and also their original homes location. The quantification of these reasons into a statistically relevant series will not be feasible for the study. According to the data available most of the people have migrated from Patuakhali. Analysis shows that there have been problems in the district such as their work force and health care. Mahasen Cyclone had hit there and laid waste and caused suffering too because of which many people were forced to move.

High rent of land, search for work to increase income source, decreasing house rent, improving security, natural disaster, flood, no living place, occupation, personal reasons(land problems with brothers), poverty, profession, religious purpose, social reasons are just some of the more prominent reasons for migration.

5.1.5 Land Ownership:

Table 5.6: Land Ownership Type of the Respondents

Land Ownership Type	Frequency	Percent
Own	142	53.8
Leased	14	5.3
Rented	101	38.3
Leased by someone else and rented out	3	1.1
Others	4	1.6
Total	264	100.0

Source: Field Survey, 2015.

As already mentioned that majority of the people who have migrated have not stayed there for more than 15 years. In fact, they have stayed for less than 5 years. People who have migrated in the city for a better living, some significant amount of people who reside on the river side invest themselves directly for grabbing the real estate. The majority of the homes is rented out or is under direct ownership. People who own the land give up staying there and set up a caretaker for the land.

Many are staying by paying rent on encroached, illegally occupied land. The people are also concerned about leased lands. One of the respondents mentioned that the main reason of encroachment is leasing of land. Greed is inherent to all and these people are also subject to it. They lease the land and end up occupying more than the deal was made for the lease. Those leased lands which are increased by encroachment are then given out to migrants who act as care takers and also pay rent for it. They may be allowed to stay or given a notice to move when the time seems right for the owner. The same situation is quantified below.

Table 5.7: willingness to leave the place if they have made bound

Bound to leave the place at some time		
	Frequency	**Percent**
Yes	98	19.7
No	166	33.7
Total	264	100.0

Source: Field Survey, 2015.

Land use decisions typically occur at the local level and are based on local standards. Proposed encroachments are routinely permitted, even in areas prone to flood damages and even if those developments exacerbate the vulnerability of flooding at adjacent properties. Encroachments into river corridors and riverine or lakeshore floodplains often result in landowners seeking to protect those properties using structural measures and other channelization or hardening practices. Structures located in wetlands often have ongoing drainage issues that result in landowners seeking to further alter the hydrology of an area. Larger developments that are poorly planned, designed without consideration of natural process or public safety, or located in areas with no real planning can have cumulative and ongoing impacts to lakes, floodplains, wetlands and the functions they provide.

Apart from the data findings, other identified causes of river encroachment in the study area include; negative user perception; relatively high population against scarcity of land; limited

awareness of space standards and requirements of land uses; the need to locate appropriately/competitively; low level awareness of environmental and land use standards and poor management and co-ordination of existing land use policy guidelines.

In the study area, land users perceive the river zone to be either idle or free land which they therefore use for construction, doing business or dumping of waste. Others perceive it to be government land thus free for all and the evidence for this can be found in table 5.5, which are the reasons for migration.

5.2 Consequences of Encroachment:

Encroachment increases impervious cover adjacent to lakes, rivers and wetlands, thereby increasing the rate and volume of runoff, loading of sediment and other pollutants, and temperature of the receiving water. The cumulative loss of wetlands that provide water quality protection to adjacent surface waters can result in ongoing reduction in water quality. The extent of encroachment, the cumulative effects of impervious cover, and the degree to which natural infiltration has been compromised can also contribute to the instability of the stream channel.

5.2.1 Environmental Consequences

Land users indiscriminately dispose solid waste, release raw sewage and untreated waste water into the river while garage operators spill waste oil indiscriminately. The solid waste chokes the river, reducing it to narrow channels along with the encroachment by filling land while the oil spill and raw sewage affect the water quality.

There is no proper waste disposal system in the bank of the river. Different types of waste like human waste, Residential waste, unused products, fertilizer, Bags, oil etc. is thrown into river. There is also many hanging latrine in the bank of the river. While using the toilet, the filth goes to the river and pollutes water. Again the people of the area bath in the river though the latrine is situated beside the bath and swimming places. This is very harmful for their health.

Chapter 6: Present Scenario of Mayur River and its Adjacent Canals

There are approximately a number of 28 canals connected with Mayur River in Khulna. In this research project the Mayur River and its adjacent canals were observed visually by the surveyors and a number of case studies of those canals and river have been done.

6.1. Case Studies on Mayur River

The Mayur River is situated at the back swamp of the Bhairab-Rupsha River. Khulna City Corporation (KCC) is situated on the bank of this river basin and the Mayur River borders the westbound of the city. On the northbound of KCC there is a vast water body called Beel Pabla from which the River Mayur is originated. It is locally known as the Khuder Khal at the point of origin. From Rayer Mahal or Hamidnagar sluice gate it is known as Mayur. It has run through Chalk Mathurabad and Choto Boyra and has met the Rupsha River at Alutola.The River is about 11.69 km long and varies by width widely at different chains. A branch of the Mayur near Alutola is also called Hatia River which is now almost dead.

6.1.1. Ramzaner Moor, Mujgunni.

There is a concrete bridge over Mayur River at Ramzaner Moor, Rayer Mahal Khulna. But at present considering the condition of the river, it's quite impossible to realize why the bridge is built. The river has completely lost its flow and due to water hyacinths water is hardly seen (Figure – 6.1). According to the local people, this logged water is responsible for high breeding of mosquitos. The water has completely lost its quality using for drinking purpose. Mainly there is farming land adjacent to the canal at this area but there are some kutcha and semi-pucca houses too.

Encroachment on the river is not seen. The reasons are

- Existence of agricultural land
- Absence of congested housing
- Incapability of encroaching river bank

People living in this area are mostly engaged in agricultural and fishing cultivation activities. The suggestions made by the local resident for the improvement of the canal are -

- Removing water hyacinth on regular basis
- Dredging of canal
- Opening of sluice gate for certain period of time to maintain water flow

Courtesy: Sk. Tahsin Hossain, March, 2015

Figure 6.1: Scenario of Mayur River Ramzaner Moor.

The figure shows that there is no water on the Mayur River in Ramzaner Moor Area. The river is full of water hyacinths. There is no initiative to take off these hyacinths from the river. Water logging is the main reason of this high breeding of hyacinths. During the financial year 2013-14, Khulna City Corporation took initiatives of dredging the canals for bringing back the water flow on the river. But this initiative was failed due to political influence and complexity.

6.1.2. Rayer Mohal

Mayur River is 60-70 feet wide at Rayer mohal area. This river is very significant for the people living there as most of the people area farmers or engaged in fish and shrimp cultivation. The water is thus very important for them. According to a farmer named Karim Gazi, "the river water was useable even 8 to 10 years back, but now the river has only 2.5 feet depth and lack of flow caused heavy breeding of water hyacinth which is now creating problems for the people living in the area." The local farmers also claimed that they have informed their need to the Khulna City Corporation and other government bodies for re-digging the canal and opening Alu-Tala sluice gate but there was no such attempt taken. Shrimp farming is very popular in Khulna Region. There are some shrimp farmers in this area too, but due to lack of water farmers are being engaged in alternative employment option.

Courtesy: Sk. Tahsin Hossain, March, 2015

Figure 6.2: Canal information were collected through interview at tea stall

Encroachment on the river is hardly seen is this part of the river as this river is very important for the people living in this region. The local people want to see the flow of the river again which will benefit not only but them but also overall ecosystem of the area.

The farmers of Ryer mohal buy water for cultivation purpose from other farmers who have shallow tube-well. An hour of water to the land cost Tk.40. This is not a good sign as the water is taken from the ground and if this process continues for next 10-20 years, ground water level will be reduced at an alarming rate.

6.1.3. Arafat Residential Area Project

This area is on the outer side of Khulna City Corporation area but adjacent to the Mayur River. The river was 80-90 feet wide at this portion of the river. At present the average width is in between 60-70feet. There is no water flow in the river and the river is full of water hyacinths. According to local resident, "There was boat on the river in 15 years back but at present water is rarely seen due to water hyacinth." Encroachment is very common in this part of the river. There are lots of housing adjacent to the river bank. Some say they have bought this land from person some say they have their legal papers. But nobody could answer the question how river can belong one person. The width of the river has not changed according to the people living adjacent to the river. But survey found the clear evidence of filling up river area and making boundary line or creating fence on the river. Especially every household has their toilet on the river or on the encroached area of the river.

Due to the encroachment and filling up of river, the land value has increased. According to a landlord Aysha Khatun, "we have bought one of our land for Tk.50,000 per katha but couple of months back we have sold it to Tk.3,50,000 per katha." Another landlord claimed that he bought his land for only Tk.10,000 per katha 10 years back. The local people also added that there was lots of fishes on the river which they often caught. Fish like "koi", "shing", "lailontika", "magur", "rui", "katla" etc. But due to the intrusion of waste water of the Khulna city, the fish breeding was reduced in high amount.

Courtesy: Sk. Tahsin Hossain, March, 2015

Figure 6.3: Encroachment in the Mayur River by nearby residents

The Mayur River adjacent to Arafat Residential Area has been encroached by almost every household. Above figures show that people have placed fence on the river with their name on the board claiming their own land. It is also shown that some of the land has already been blocked and other places area being encroached gradually.

6.2. Case Studies on Connected Canals of Mayur River

6.2.1. Hatia Khal

Hatia Khal is one of the oldest and largest canals of Khulna city. The canal is originated from the Kazi Bacha Khal and run along the south of the Nirala Residential Area, Khulna. The canal had continuous water flow even in late 90's. But due to the extension of residential area along Nirala, the canal has completely lost its water flow. The canal was connected to the ditch of the Nirala Residential Area named as "Nirala Dighi" but at present the canal has

no such connection due to the filling up of the canal for structural development by the resident. This canal still has a width of 80-90 feet1 at places but there is no water flow due to the water hyacinths. Several canals and drains are connected or originated from this canal.

As stated earlier the canal is situated at the south of Nirala Residential area. So people living adjacent to the canal has extended their land by encroachment of the canal. Flow less water creating a lot of environmental impact such as polluting air by its rotten water hyacinth and logged waste water of Nirala Residential Area. Once the canal had water flow, boats carrying paddy, soil or other agricultural tools were often seen. Figure - : shows the water hyacinths over the canal and encroachment on the river.

Courtesy: Sk. Tahsin Hossain, March, 2015

Figure 6.4: Hatia Khal

The problem stated by the resident of the area is –

- Breeding of mosquitos in logged water
- Odor of rotten water hyacinths
- Breeding of poisonous snakes
- Air pollution
- Water pollution

Considering existing condition of the khal, the resident adjacent to khal suggested some of the initiatives that might be taken. Such as

- Filling up the canal for structural development as re-digging or re-rescuing is difficult
- Making a large covered drain for the disposal of domestic wastage instead of canal

- Constructing pucca road alongside the river for smooth transportation between Gollamari to Nirala to Bagmara.

6.2.2. Mayur River Bypass Khal

This was one of the oldest canals of the south-western part of Khulna City. This Canal is originated from Hatia canal. According to the local people, this canal was 30-40 feet wide during 1980's. But at present the canal is completely filled up and construction of 10 feet opened concrete drain has been completed during 2013-2014 time period (Figure - :). This drain carries waste water of Nirala Residential Area and adjacent areas which is dumped into the Hatia Canal. The drain has cover on it at places showing in Figure - which is used as the road network between distinctive areas in and around Nirala. The canal is also known as Hazi Mohasin Lane canal which is situated at "prantika" area adjacent to Nirala Residential Area.

Courtesy: Sk. Tahsin Hossain, March, 2015

Figure 6.5: Pucca Drain in the place of Mayur River Bypass Khal

The local people living adjacent to this area are happy as there is no water logging problem exists in this area. The people also suggested for establishment of a pucca road alongside the drain which will ease the transportation between "prantika" area to Sher-e-Bangla main road.

6.2.3. Bagmara Canal or Dhonai Ali Canal

Bagmara Canal, earlier known as Dhonai Ali Canal has passed through the Bagmara Area of Khulna City. This canal is originated from Hatia Canal and run off to Khetra Khali Canal through the edge of Ward No. 24, 27 and 28. According to local resident, this canal had water flow during 1980's. But water is hardly seen due to rapidly grown water hyacinths. On an average this canal is 25-30 feet wide but at places width of the canals has been reduced to 10-

15 feet for illegal filling up of canal. A local resident named Abdul Gafur said that the river had water flow even a couple of decades back and soil for leveling Nirala residential area graveyard was carried by boat through this canal from Rupsha River.

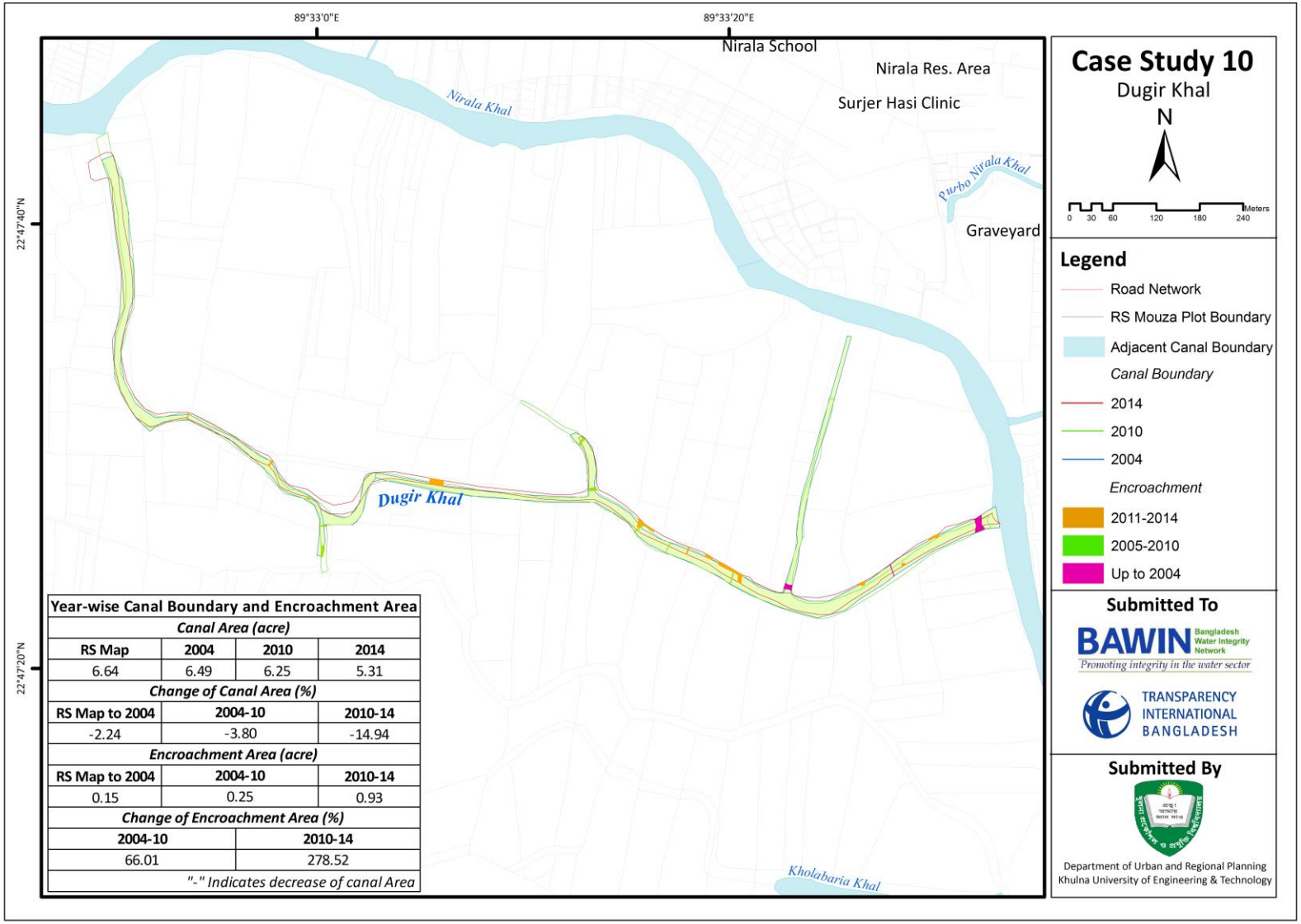
Figure 6.6: Bagmara Canal or Dhonai Ali Canal

6.2.4. Dubir Khal

This is a dying canal originated from Dhonai Ali Khal. At present canal is almost lost due to illegal capture of canal. Even people at places have made kutcha road by blocking the water to cross easily from one side to others. So, this canal is nothing less than a breeding ground for mosquitos at present. The local people want to this canal to be completely filled up considering existing condition.

Courtesy: Sk. Tahsin Hossain, March, 2015

Figure 6.7: Dubir Khal



Year-wise Canal Boundary and Encroachment Area			
Canal Area (acre)			
RS Map	2004	2010	2014
6.64	6.49	6.25	5.31
Change of Canal Area (%)			
RS Map to 2004	2004-10		2010-14
-2.24	-3.80		-14.94
Encroachment Area (acre)			
RS Map to 2004	2004-10		2010-14
0.15	0.25		0.93
Change of Encroachment Area (%)			
2004-10		2010-14	
66.01		278.52	
"-" Indicates decrease of canal Area			

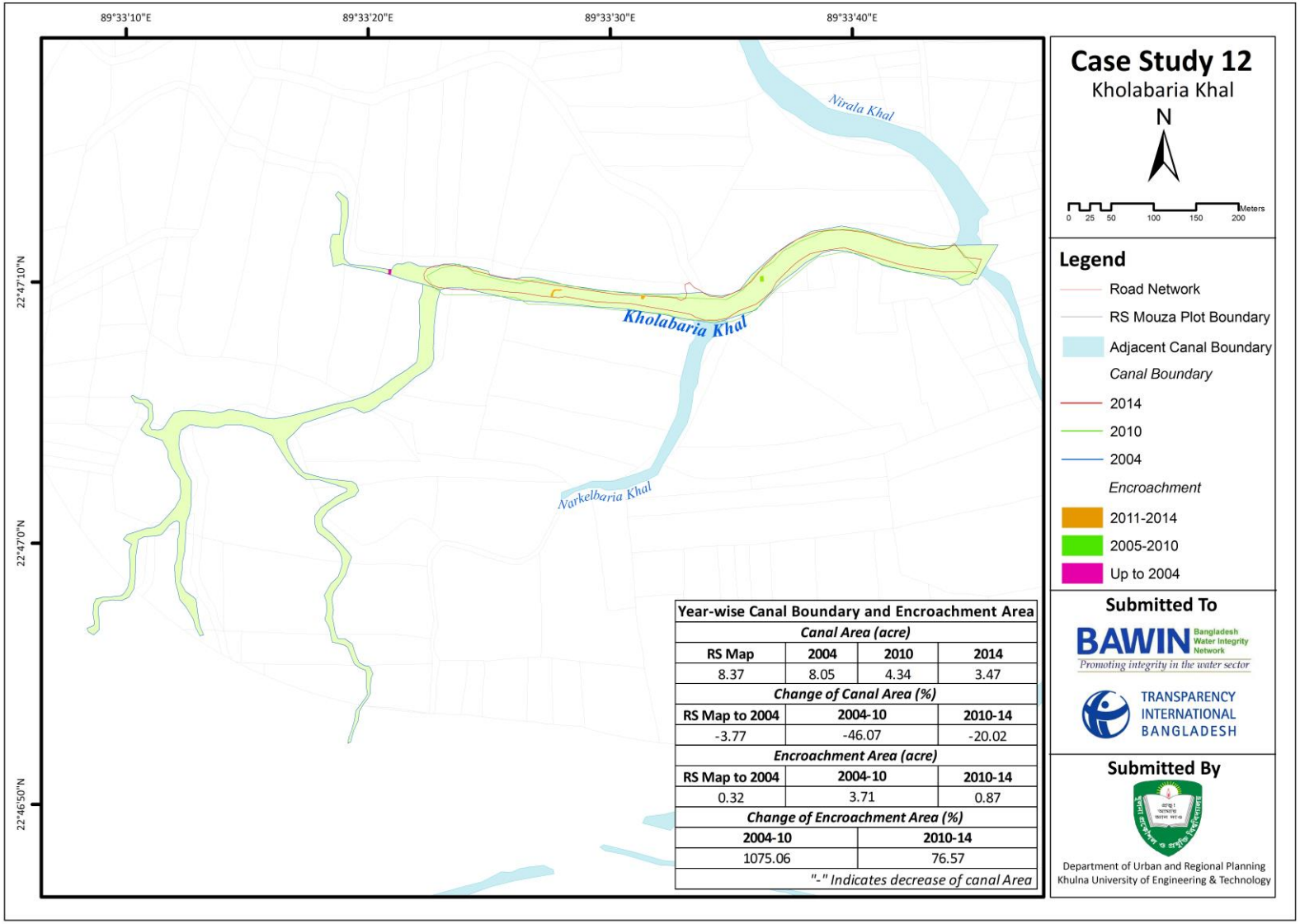
Figure 6.8: Encroachment Scenario of Dubir Khal

6.2.5. Kholabaria Canal

The canal Kholabaria is originated from HatiaKhal at Maddha Para, Bagmara area. The canal was 50 feet wide during early 90's according to the local people. At present the canal has a width of 35-40 feet but the water is rarely seen due to water hyacinths. There is no encroachment seen adjacent to the canal as most of the land is used for farming purposes. The farmers used to water their land from this canal but at present this water cannot be used as the water has lost its quality due to long time logged into the canal. The farmers of the area suggested for dredging the canal so that they get water for their farming purposes. At present the farmers are picking up water form deep tube-well by electric motor. The canal has ended up with Horintana Khal which is near to the Rupsha Rivers.

Courtesy: Sk. Tahsin Hossain, March, 2015

Figure 6.9: Kholabaria Canal



Year-wise Canal Boundary and Encroachment Area			
Canal Area (acre)			
RS Map	2004	2010	2014
8.37	8.05	4.34	3.47
Change of Canal Area (%)			
RS Map to 2004	2004-10		2010-14
-3.77	-46.07		-20.02
Encroachment Area (acre)			
RS Map to 2004	2004-10		2010-14
0.32	3.71		0.87
Change of Encroachment Area (%)			
2004-10		2010-14	
1075.06		76.57	
"-" Indicates decrease of canal Area			

Figure 6.10: Encroachment Scenario of Kholabaria Khal

6.2.6. Narkelbaria Khal

Narkelbaria canal has its origin at the intersection point of Kholabaria, Hatia, Babur Jhola and Amgacher Jhola canal. This area is known as Hindupara of Maddha Para area. During 1980-90's, this canal was connected with Horintana canal and continuous water flow was there too. But at present, the canal has been completely filled up for structural development and thus the canal has no connection with Horintana canal anymore. This is an alarming situation for the farm land adjacent to the Narkelbaria canal. The farm land is reducing at high rate and construction work is taking place on the canal. There are some politically influenced people who created embankment to preserve water for fish farming. This is creating employment opportunity for some people but the flow of the canal this is quite contradictory. Encroachment along the Narkelbaria khal is commonly seen. Concrete structure is rare in this area as the resident of this area are mainly lower income people. There is a political influenced person named as Hazi Jafar who has encroached some of the canal side and extended his construction material business on that land..Local people suggested dredging of the canal and removing all the structure on the canal to bring back the flow of water which will benefit them for cultivation and agricultural purpose.

Courtesy: Sk. Tahsin Hossain, March, 2015

Figure 6.11: Narkelbaria Khal

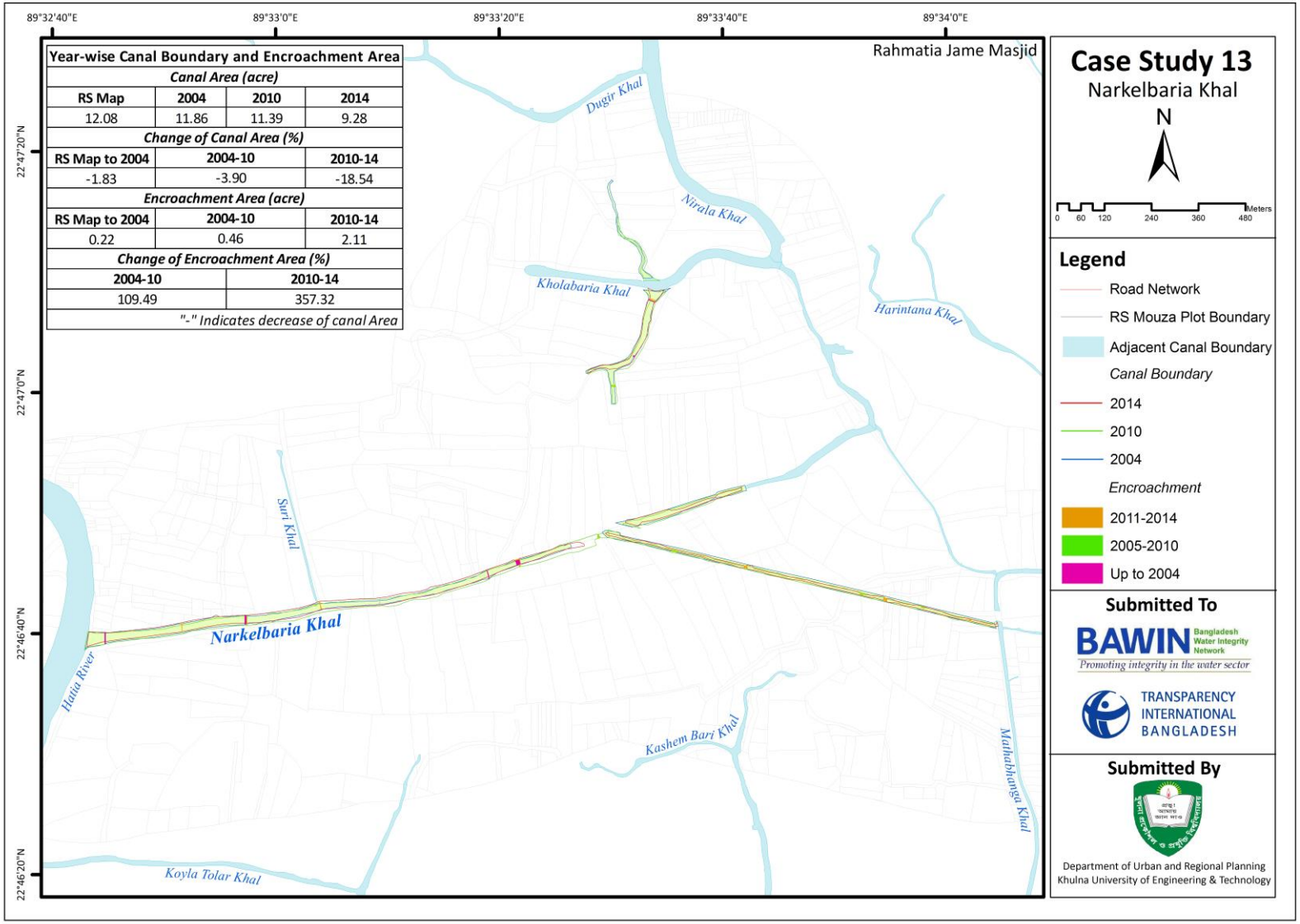


Figure 6.12: Encroachment Scenario of NarkelbariaKhal

6.2.7. Babur Jhola Khal

Babur Jhola canal has now a history as it has been completely filled up by a political influenced person named Hazi Jafar of famous political family known as Hazi Bari situating at Ward No. 24. Though he does not live in there but there are several families living on his land as tenants. This land is comparatively higher than adjacent area and that's why he get extra rent from his tenants. According to the local people, he has sold some of this land on Babur Jhola canal during his capture. The Figure - : shows that there is no existence of canal rather than just an empty land.

Courtesy: Sk. Tahsin Hossain, March, 2015

Figure 6.13: Babur Jhola

6.2.8. Motaherer Khal or Motia Khal

This canal was originated from Babur Jhola. But Babur Jhola is completely encroached and Motaherer canal also known as Motia canal is connected with Khetra Khali canal. This canal has an average width of 20-25 feet but at places, this width has reduced to 10-12 feet due to encroachment by the people. This canal was ended up with Rupsha River even couple decades earlier. But now there is no such connection to Rupsha River.

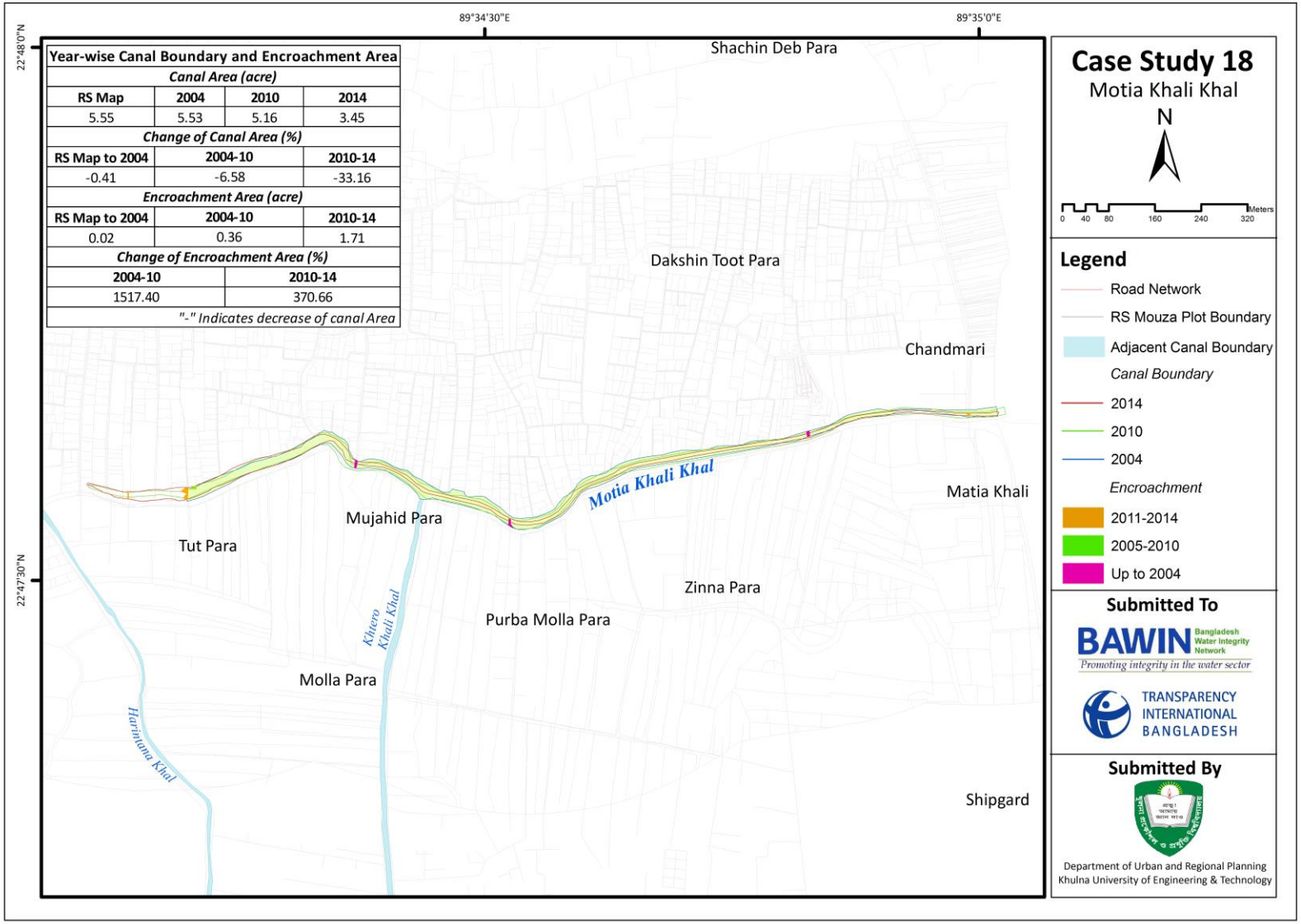
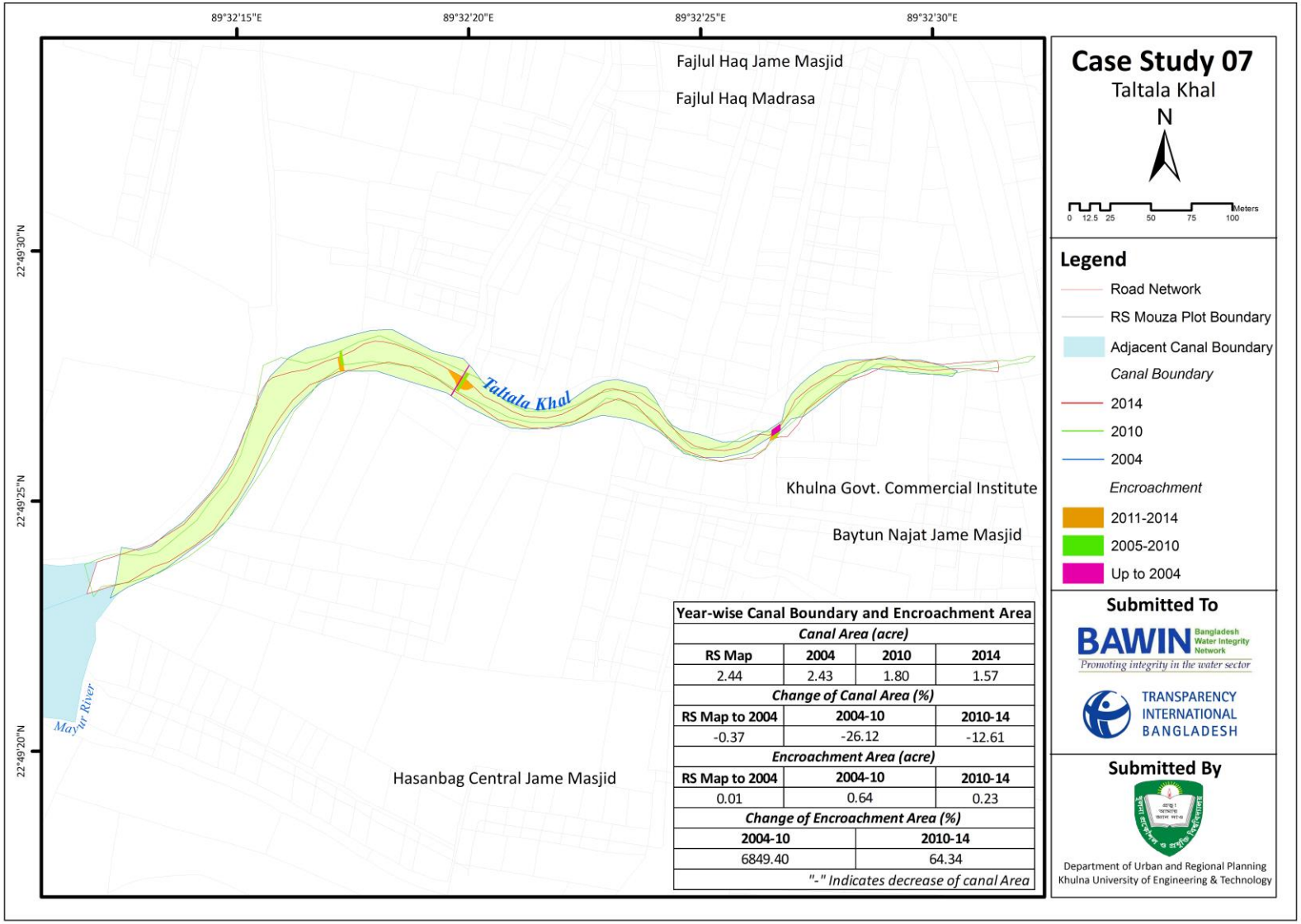


Figure 6.14: Encroachment Scenario of Motia Khali Khal

6.2.9. Taltala Khal

Taltala Khal is an old and small canal originated directly from Mayur River in the Madrasha Road area of Khulna University Bypass road. The khal was cut for bringing water flow to the nearest distance from agricultural land of Madrasha Road area but at present there is no such agricultural land use except some vegetable cultivation. The canal was 40-50 feet wide with irregular curve. At present the canal is full of water hyacinths. Encroachment on the river is not commonly seen but at present some of the landlord has extended their land by filling up the canal. The people living in the area suggested completely filling up of the canal as the canal is no more suitable for use.

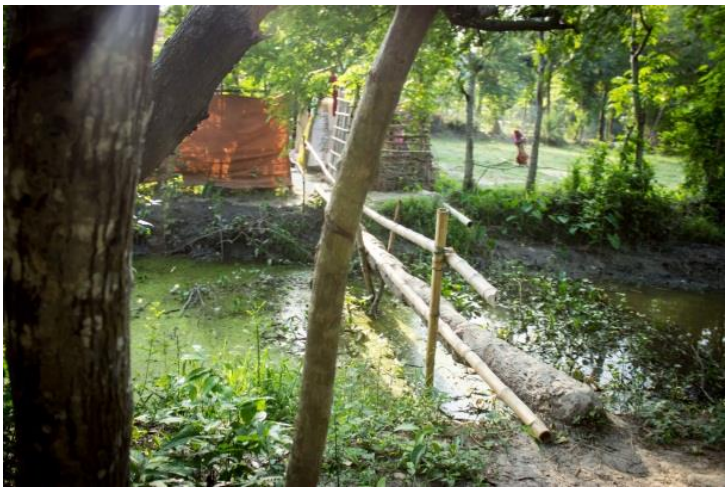


Year-wise Canal Boundary and Encroachment Area			
Canal Area (acre)			
RS Map	2004	2010	2014
2.44	2.43	1.80	1.57
Change of Canal Area (%)			
RS Map to 2004	2004-10		2010-14
-0.37	-26.12		-12.61
Encroachment Area (acre)			
RS Map to 2004	2004-10		2010-14
0.01	0.64		0.23
Change of Encroachment Area (%)			
2004-10		2010-14	
6849.40		64.34	
"-" Indicates decrease of canal Area			

Figure 6.15: Encroachment Scenario of Taltala Khal

6.2.10. Doyane Khal

Doyane Khal is a narrow and shallow canal which was cut for free flow of water to agricultural land for the concerned area. The canal was directly connected to comparatively large canal named as Batkemari khal but a kutcha road has been built recently where a big tunnel is placed underneath to maintain the water flow. The average width of the canal is 12-15 feet but at places it has reduced to less than 10 feet. The canal has no more water flow but according to the local people the canal get water hyacinth free during rainy season.



Courtesy: Sk. Tahsin Hossain, March, 2015

Figure 6.16: Doyane Khal

There is no encroachment seen on the canal side as most of the land adjacent to the canal is used for agricultural purposes. Besides, people of this area are mainly engaged in agricultural works who suggested further digging of the Mayur river to bring back the water flow on Doyane khal which will eventually benefit them for their agricultural works. Though there is no encroachment is seen on the river but continuous dumping of wastage can gradually reduce the canal width as well as environmental threat.

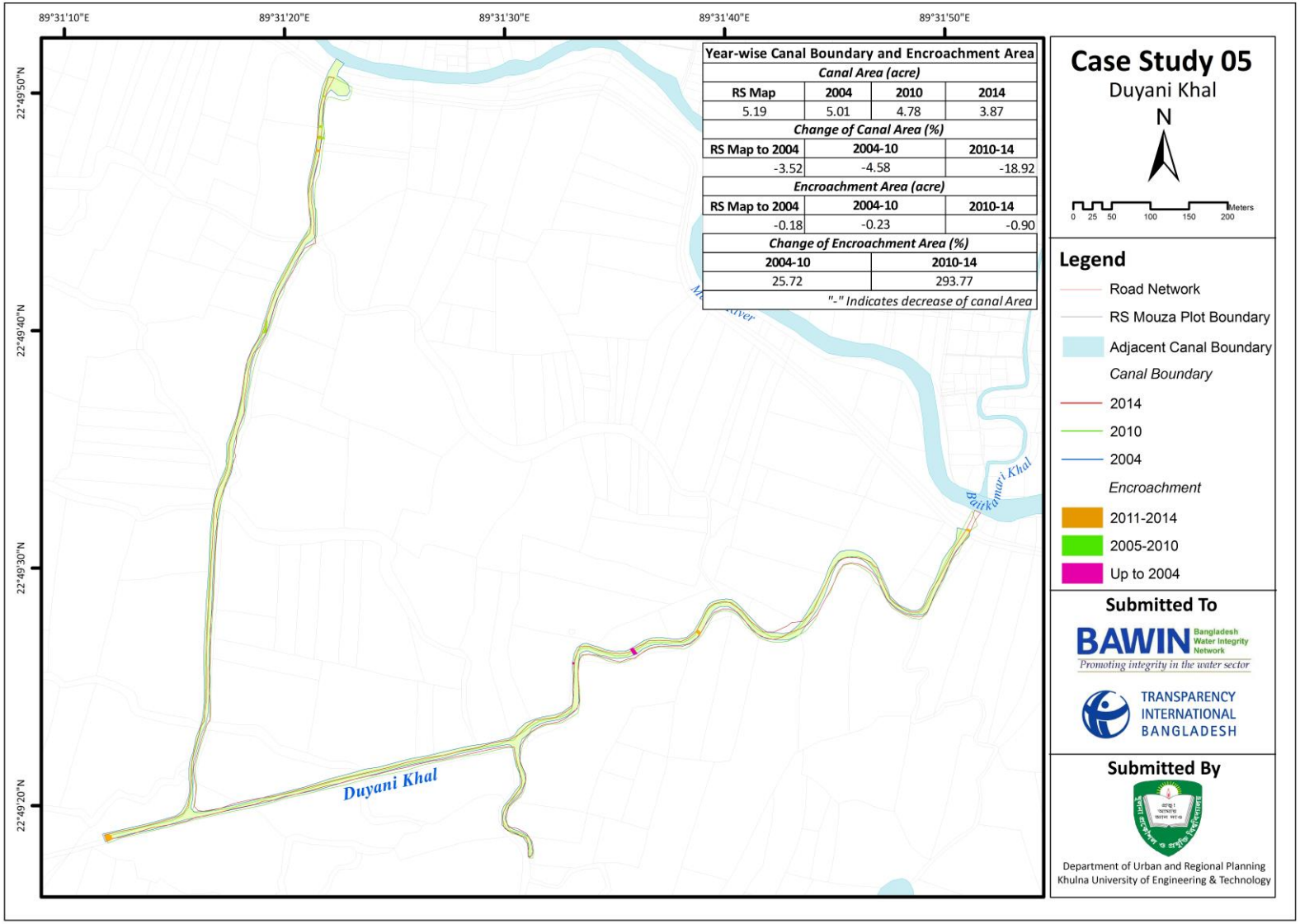


Figure 6.17: Encroachment Scenario of Duyani Khal

6.2.11. Batkemari Khal

Batkemari Khal also known as Khulir Khal is originated from Shwashanghat khal of Anderghat Bridge area. The canal was 50-60 feet wide during early 90's. There was continuous water flow where small boats carrying goods were often seen. But at present there is no water flow, instead only water hyacinths are found. A Local woman named Shumi Akhter said that there was water flow even 15 years ago but due to encroachment by the people, the canal has lost its free flow. Clear evidence of encroachment was seen on the canal. A mosque has been built on the canal by filling up half of the canal.

Courtesy: Sk. Tahsin Hossain, March, 2015

Figure 6.18: Batkemari Khal

Khulna City Corporation took the initiative during the financial year 2013-14 but their initiatives were gone in vain because of political problems. Encroachment on the river is found in almost every house. The people living in the area has extended their land by filling up the canal. The local people suggested dredging in the canal to ensure the free flow of water throughout the year. Otherwise, waste coming from the city will gradually impact overall environment of the area.

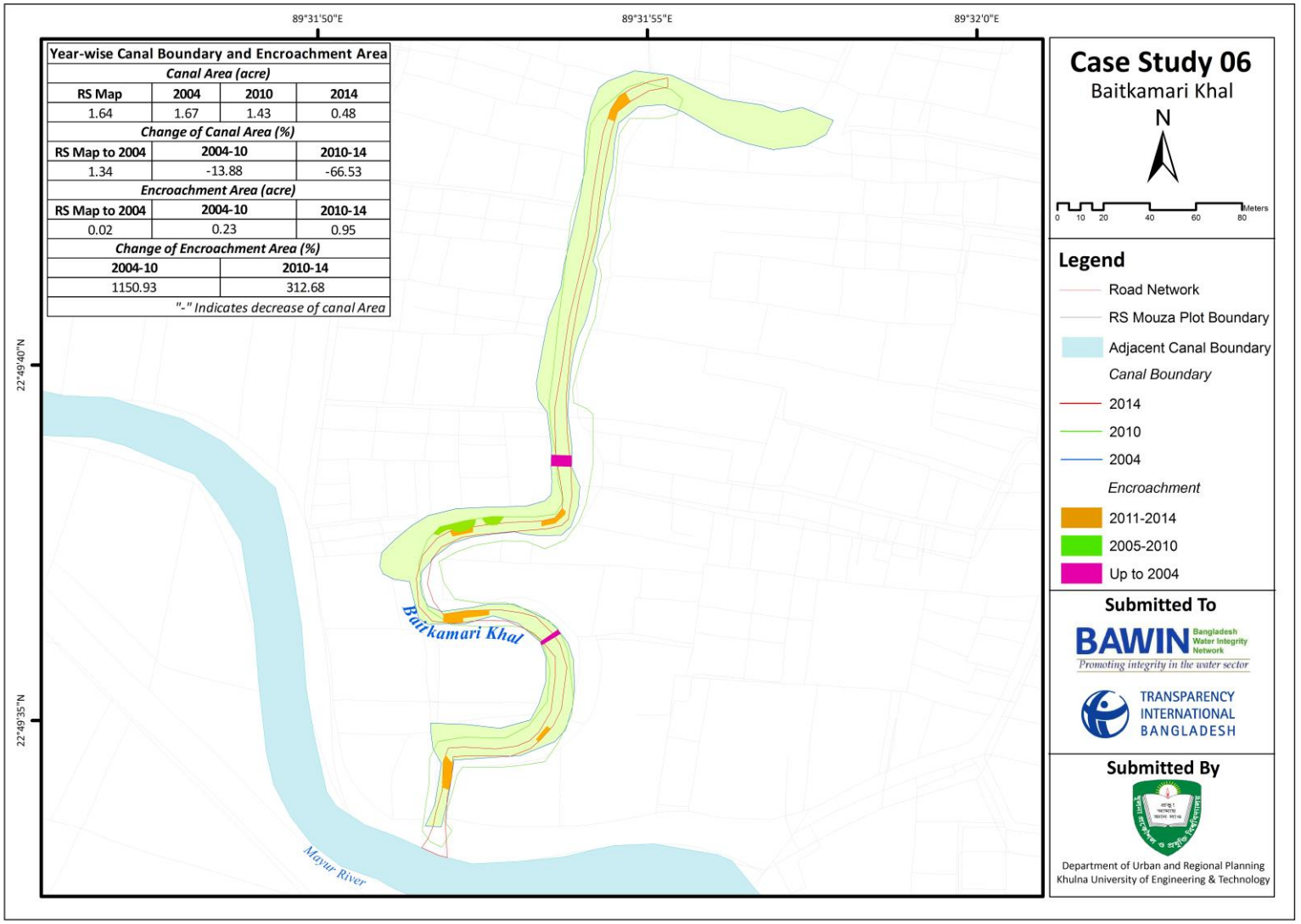


Figure 6.19: Encroachment Scenario of Baitkamari Khal

6.2.12. Shashan Ghat Khal

Shashan Ghat Khal is more of a waste dumping canal rather than normal canal. City wastage dumping outlet of Boyra area is directly connected to this canal. So, the water is completely polluted as well as the air. The Figure shows the opening of city wastage outlet. This canal was cut off for carrying the domestic wastage of Boyra area off the city area. But absence of water flow have made serious complexion of water and air pollution. According to the local people, the situation gets little better during rainy season but with heavy rainfall water get into the inland and create more problems for them.

Courtesy: Sk. Tahsin Hossain, March, 2015

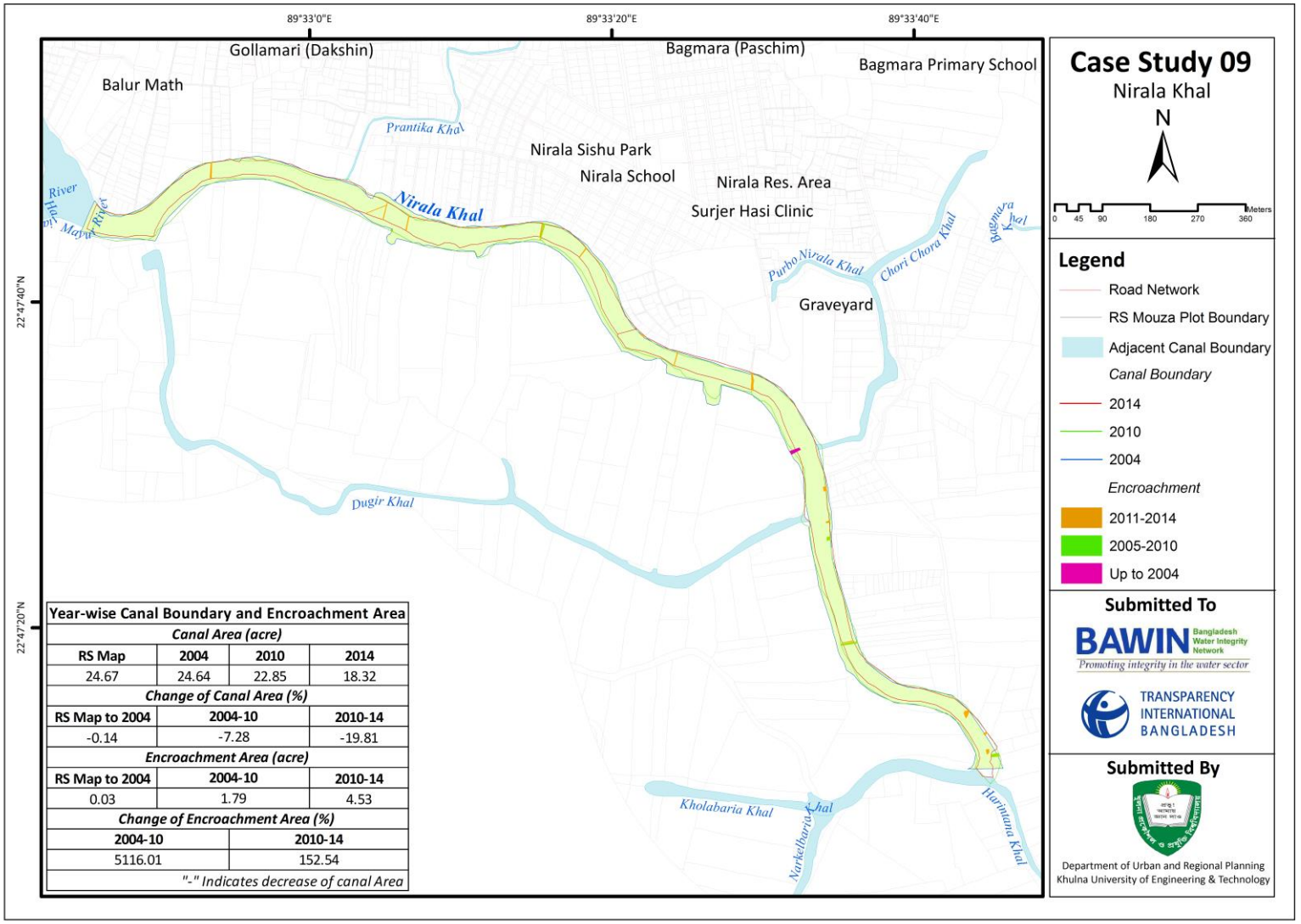
Figure 6.20: Shashan Ghat Khal

6.2.13. Kaderer Khal

Dakerer Khali is originated from Mayur River which is passed along the Fazlar Rahman Road. The width of the river varies from 12 to 25 feet at places. There is a residential area along the side of this canal named as Uzan Residential Area. There is a domestic waste outlet connected to Kaderer Khal which brings all the domestic wastage from Khulna City. Most of the land adjacent to this canal is uses as agricultural land. This canal was the main water source for concerned area. But at present the water flow has reduced. There is no such encroachment seen on the canal. The farmers suggested dredging of the canal to bring back water flow on the canal. Besides, the farmers also suggested to open the sluice gate of "Alutala" for a certain period of time to keep the continuous flow of water as well as environmental balance.

Courtesy: Sk. Tahsin Hossain, March, 2015

Figure 6.21: Kaderer Khal



Year-wise Canal Boundary and Encroachment Area			
Canal Area (acre)			
RS Map	2004	2010	2014
24.67	24.64	22.85	18.32
Change of Canal Area (%)			
RS Map to 2004	2004-10		2010-14
-0.14	-7.28		-19.81
Encroachment Area (acre)			
RS Map to 2004	2004-10		2010-14
0.03	1.79		4.53
Change of Encroachment Area (%)			
2004-10		2010-14	
5116.01		152.54	
"-" Indicates decrease of canal Area			

Figure 6.22: Encroachment Scenario of Nirala Khal

6.2.14. Bedbunia Khal

Bedbunia khal ends to the Khulna city by pass road. Width of the khal is 30' at starting point. But there is no continuation of the khal because of land filling. Landless people live here by DCR (Duplicate Carbon Receipt). There are 6 sluice gates on the canal. There is housing on two of them but other 4 gates are used for controlling water entry for fishing purposes. The Figure They build their home over the canal and even the toilet is over the canal. The people living here have encroached the canal

Courtesy: Sk. Tahsin Hossain, March, 2015

Figure 6.23: Bedbunia Khal

Chapter 7: Governance Risks and Deficits

Khulna, the most flourishing city in the southern part of Bangladesh, is suffering from many environmental problems including flooding, water logging, salinity and other related problems. Khulna is located at the western bank of Bhairab and Rupsha River. A lot of canals are generated and connected with Mayur River which passes along the western part of Khulna City. So the water bodies play important roles on the natural environment and drainage system of the city. These canals were used as the transportation medium until 80's. Besides, domestic waste water of Khulna city passes through these canals as all the major drains are connected to these canals. But gradually these canals have been encroached by several persons or land owners. Due to various natural and human induced reasons, the wetlands of the City have been shrinking with the passage of time. Many of the canals have already been disappeared and banks of the surrounding rivers are encroached or grabbed. Various government (autonomous) organizations like KCC, District Administration, KDA, LGED, BWDB, KWASA, Department of Environment, Department of Fisheries etc. have taken several steps to bring back the flow of water by removing all the encroached areas. But most of the steps have gone in vain due to influence of political or leader level persons. Several NGOs such as Nobolok, Rupayon, Rupantor, Nagorik Forum also have taken initiatives to convince the government bodies for taking action against canal and river encroachment. But it is unfortunate that their activities are very much limited due to shortage of financial and lack human resources. According to them the major causes of canal disappearance are unplanned urbanization, encroachment by influential persons, lack of co-ordination between government agencies, lack of law enforcement etc.

Khulna City Corporation has the main liability for taking care of water flow of these canals and river. But due to lacking in maintenance and law enforcement, the canals have lost their width and water flow. In an interview with Chief Planning Officer Mr. Abirul Jabbar, "Protection and conservation of canals is the major challenge for Khulna City Corporation. The Mayur is supposed to have a positive impact on potential environmental sustainability. Instead, present condition of the canals creating a great threat to the overall environment of Khluna City." KCC has taken several initiatives for removing water hyacinths over the water and dredging. But due to lack of water flow, their initiatives have never seen a fruitful result.

Currently, a dredging project for 15 kilometer of the canal is running. But how much it will be successful unless the river gains its flow back is a great questionable matter.

7.1 Governance Risk:

The resilience of nations is manifest in their ability to anticipate and prepare for shocks, which, in turn, depends on the technical capacities of organizations and institutions at the frontlines of crisis response, the overall functioning of country systems, and the governance structures that 'set the rules of the game'. The notion "Governance Risk" refers to an integrated concept on so-called complex, ambiguous and uncertain risks in particular, which hamper the process of proper governance. (UNDP, 2011)

7.1.1 Internal Risk Factors:

Institutional Capacities The people are always blaming the institutions' capabilities to work things out but these allegations are not always true. Sadly, in this case they are. This is not a direct testimony on the work capability of the institutions but their ability to see the work through all the way. There are allegations of limited manpower and even lesser resources. The institutions are more than capable of handling dredging projects but completing the task is a different story altogether. Resource under-development, untrained manpower, improper management, loss of efficiency and faulty work done are the risks that are born, creating more problems than they were meant to solve.

Accountability and Rule of Law: There have been many incidents where these concepts are absent. Participation hinges on effective accountability and rule of law. Empirical research has substantiated this more.

Procurement: Public procurement accounts for most of government budgets. The performance of procurement systems is especially important for aid-dependent countries that seek to develop countercyclical measures. In spite of strict vigilance, cases of sporadic corrupt/fraudulent practices by the procuring entities are reported during the filed survey of 2015. Every incident is dealt with on its merit. Incidentally, quite a few officers were punished for their dishonest practices in procurement. At the same time, contractors are being debarred for corrupt and fraudulent practices.

Variability: refers to different vulnerability of specific targets such as the dredging of the river may cause effects in the hydrometrics of the river to unforeseen cases. Special investigations are absent and dredging is the answer to all the problems- always.

Integrity: Political consideration as well as influence-peddling in the protection of the river continue to take place. Absence of effective grievance mechanism for management is another cause of mismanagement. Affected local people and stakeholders are unaware of their role in curbing anomalies in fund utilization. No specific safe-guard exists to ensure integrity in the protection of the river.

Ignorance: The lack of knowledge about the probability of occurrence of a damaging event and about its possible consequences.

Disclosure of Documents/Transparency: Provision exists but information is unavailable in the public domain. Unavailability of specific information is another case. People are saying that work took place but they have no idea by who and why. They cannot answer or participate if they are not provided with the information to do so. Trained officials who can provide such information are missing. They do not provide information and are often oblivious to the right of information.

7.1.2 External Risk Factors:

Monitoring and Evaluation: Biasness is a very real issue in most of the monitoring and evaluation work done. Such biases are often introduced at the monitoring and evaluation design stage, and include a lack of relevant and appropriate control groups, biases on the part of 'independent evaluators' (who often have a stake in seeing positive outcomes), and biases on the part of those evaluated (who may understandably seek to show that they have made good use of investments). The opportunities for such biases (which are usually positive biases) are especially acute where there is a great reliance on self-reported data. Also there appears to be a lack of institutional and human resource capacity to carry out such evaluations by local groups

Participation and Inclusion: In the various works taken to protect the river, the participation of civil society in the formulation and adoption of crisis responses is virtually non-existent. The people are not aware of the situation as it stands and cannot do anything to help. Participation and inclusion include empowerment through representation in government and through other (e.g., administrative and local) mechanisms facilitating free, active and meaningful participation in decision-making processes. Shared power fosters a climate of innovation and entrepreneurship, reflective policy-making, and thus steady growth; openness promotes the exchange of information and ideas, and greater efficiency (e.g., in the allocation and use of resources); and adaptability (i.e., the flow of ideas among public, private and civic

sectors) promotes greater versatility, timeliness and flexibility in the adoption and implementation of the various work undertaken.

Socio-Political Ambiguity: Abuse of power for personal gain and denying all knowledge of it. Abuse of power referred to here can be in the form of musclemen of political leaders trying to encroach on the land by filling it up; it can be in the bribing of officials to produce land certificates; it can be the use of forceful means to sell illegal land etc. The effect of corruption has many dimensions- political, economic, social and environmental. In the political sphere, corruption impedes democracy and the rule of law. According to the people surveyed this is exactly what is happening.

Civic Engagement: Public participation and engagement is not as it should be. Advocacy at the local level is carried out through civic engagement, with the aim of sensitizing citizens and concerned authorities on their rights/duties, help change their attitudes towards corruption and capacitate them to challenge/address corruption.

Coordination with other relevant Institutions: Institutions surveyed (*See* Annexure D for details) pointed this out as definitive limitations in their workings. The institutions need to be in synchronous with each other to foster greater development.

Division" that observes the overall scenario of the canal encroachment. The organizations that were surveyed regarding the protection and preservation of Mayur and its connected canals are as follows:

- Khulna City Corporation (KCC)
- Khulna WASA
- Department of Environment
- Bangladesh Water Development Board
- Nagorik Forum, Khulna.
- Rupantar (NGO)
- Rupayon (NGO)
- Department of Fisheries

Following are the major governance risks and deficits of the concerned organizations responsible for the protection and preservation of Mayur and its connected canals:

Sl.	Governance risks	Authority/Organizations
01	**Lack of skilled and technical manpower** (Planners, Civil Engineers, Environmentalists and associated different professionals in the organizations)	KCC, Khulna WASA, KDA, LGED, BWDB, District Administration
02	**Insufficient application of modern technology** (Use of different modern tools and techniques like satellite images, digital data, GIS etc. on related research and development projects)	KCC, Khulna WASA, KDA, LGED, BWDB, District Administration, RUPAYAN, RUPANTAR, Citizen Forum
03	**Internal corruption** (Corruption of some staffs/officers of the organizations during implementation of the related projects/programs)	KCC, KDA, LGED, District Administration, BWDB
04	**Lack of security for the staffs/officers** (The staffs/officers engaged in activities like eviction of the encroachers from river/canals are threatened by miscreants)	KCC, KDA, LGED, BWDB, District Administration
05	**Lack of knowledge of staffs on regulatory bindings** (Staffs have lack of knowledge on the directives mentioned in associated laws, rules, regulations, plans etc. documents)	KCC, Khulna WASA, KDA, LGED, BWDB, District Administration, RUPAYAN, RUPANTAR, Citizen Forum
06	**Unexpected interference of so called influential and corrupt politicians**	KCC, KDA, LGED, BWDB, District Administration
07	**Absence and sluggishness of activities for eviction of the encroachers, imposing fines**	DoE, KCC, KDA

	etc.	
08	**Insufficient legal basis/advocacy for eviction of the encroachers**	KCC, KDA, LGED, BWDB, DoE
09	**Absence and lack of awareness raising activities** (The awareness is mainly on causes, consequences and remedies of disappearance of Mayur and its connected canals)	KCC, Khulna WASA, KDA, LGED, WDB, District Administration, DoE
10	**Lack of cooperation of Government organizations and local people to NGOs and CBOs**	RUPANTAR, RUPAYAN, Citizen Forum
11	**Unwillingness to voluntary works related to preservation and conservation of Mayur and its connected canals**	KCC, KDA, LGED, WDB, District Administration, RUPANTAR, RUPAYAN, Citizen Forum
12	**Negative views of people on Government organizations**	KCC, Khulna WASA, KDA, LGED, BWDB, District Administration

Chapter 8: Recommendation

8.1 Recommendation

Some recommendations have been made for saving, managing and making functional of Mayur and its connected canals of Khulna. The recommendations for the short, medium and long term regarding their implementation are enumerated below:

Some recommendations have been made for saving, managing and making functional of Mayur and its connected canals of Khulna. The recommendations for the short, medium and long term regarding their implementation are enumerated below:

Serial No.	Recommendations for Short Term	Implementing Authority/Organization
01	Removal of cross dams used for fish culture, transport and communication etc. from the canals	District Administration, KCC, KDA
02	Re-excavation of the silted up canals	KCC, District Administration, LGED, BWDB, Upazila Parishad, Union Parishad, NGOs, CBOs and community people
03	Eviction of the encroachers with proper identification by survey and investigation	KCC, District Administrations, KDA and other organizations
04	The law enforcing agencies should take punitive steps against the encroachers.	KCC, District Administrations, KDA and Law Enforcement Agencies
05	Dumping of solid wastes into the canals must be stopped.	KCC

06	All damaged and inactive sluice gates should be repaired to make them active and to maintain water flow in the canals.	KCC and LGED
07	Illegal roads and diversions, barricades and blockages made by local people and elites should be demolished and eliminated as early as possible and in future punishment should be enforced for such occurrences.	KCC, District Administrations, KDA and Law Enforcement Agencies
08	There should be an integrated monitoring committee made by representatives and experts of all concerned organizations to frequently monitor the encroachment situation in the canals and to take necessary actions against the encroachment.	KCC, KDA and District Administrations
09	Sluice gates and culverts on the canals can be constructed maintaining their width for rapid and smooth flow of rain and storm water	BWDB, KCC, LGED

Serial No.	**Recommendations for Long Term**	**Implementing Authority/Organization**
01	The concerned organizations should modify the existing rules and regulations for checking the encroachment along with strict enforcement of them for punishment of the encroachers.	All concerned organizations.
02	Social and community facilities like mosques, temples and clubs etc. should not be constructed over canals.	Local people, KCC, KDA and District Administration
03	Width of the canal should be maintained properly as required for continuous water flow while constructing roads, drains, culverts and bridges.	BWDB, KCC, KDA

04	Concerned organizations should be more careful while constructing roads and culverts over canals so that they do not stop the flow and direction of the canals. Authority must follow effective construction method to maintain the flow.	KCC, LGED and KDA
05	There should be detailed guideline and strategy in the development plans of KDA and KCC about preservation of Mayur and its connected canals.	KDA, KCC
06	Steps can be taken to conduct such research project covering major aspects and issues of saving Mayur and its connected canals with provisions of longer time period and funds, so that all concerned stakeholder organizations and persons can be associated with the research project in the form of workshop, round table discussions, awareness raising on research issues etc.	KCC, KDA, Universities, NGOs

Serial No.	**Other Recommendations**	**Implementing Authority/Organization**
01	Steps can be taken to convert the dead and silted up canals into wide pucca drains after recovering from the encroachers to protect them from further enchroachments.	KCC, LGED and KDA
02	Establishment of walkway and jogging track along both sides of the wide canals with landscaping and beautification.	KCC, Department of Forest, LGED, BWDB, NGOs, CBOs
03	Direct connection of household sanitation system i.e. latrines and septic tanks with canals should be removed.	KCC, DoE
04	District Administration should not lease out the canals	District Administration

	to public. The canals should be preserved uninterrupted and free flowing at any cost.	
05	All ongoing and future settlement surveys should keep the records of all existing canals. There should be no missing of canals in the maps.	KCC, KDA, KWASA, District Administration
06	The concerned organizations should be provided with training and orientation on their respective regulatory documents so that they can play active role in preserving the Mayur and its connected canals	Concerned Organizations.
07	Concerned organizations can raise awareness of the stakeholders i.e. from the policy makers to community people on causes, consequences and remedies of encroachment of Mayur and its connected canals	KCC, KDA, KWASA, District Administration, Department of Forest, LGED, BWDB, NGOs, CBOs
08	KDA should be more careful while issuing land use clearance certificates of No Objection Certificates (NOCs) and passing building plan permissions to the residents beside the Mayur and its connected canals	KDA
09	The organizations should be brought under the local, regional and national level advocacy programs on saving the Mayur and its connected canals. At that time they should be provided with the regulatory documents for preservation in their respective offices for project/program/plan development, implementation and research	International, National and Local NGOs and Government Organizations that work on advocacy campaign
10	KCC should take step not to discharge the waste of its slaughter houses directly to Mayur and its connected drains and canals	KCC
11	Hanging bridges instead of RCC bridges, culverts and sluice gates can be constructed on Mayur at its different	KCC, KDA, BWDB,

	junction points so that they would maintain the actual width and natural flow of Mayur	LGED, KWASA, NGOs
12	Steps can be taken for effective coordination among the urban planning, urban development control and urban service providing agencies in Khulna City	KCC, KDA and other concerned organizations
13	Water recharging options to be kept in design of the drains and it to be strictly followed in construction of the drains.	KCC, KDA, BWDB, LGED, KWASA
14	Local level committees and other organizations should pursue the issue of protecting the Mayur and its connected canals to City Mayor and Heads of other concerned agencies. There would have options of regular meetings between CCC and the agency Heads with follow up of implementation of progress of the meetings	KCC, CCC, KDA and concerned organizations
15	CS maps (1888-1940) instead of RS maps (1960- 1980) can be taken into consideration by the Deputy Commissioner (DC) for restoration of the canals	District Administration
16	At present, a Commission or Body can be formed by the concerned organizations for coordination of the activities of preservation of Mayur and its connected canals.	KCC, KDA, District Administration, Zilla Parishad,
17	Zilla Parishad can be the top coordinating or controlling authority of all activities for protection and conservation of Mayur and its connected canals	
18	In Future, City Government System can be introduced to bring all the urban service providing agencies under a common umbrella for better coordination and enforcement of the activities for protection and conservation of Mayur and its connected canals.	

19	A Core Group under the leadership of Mayor of KCC with the representatives of KCC, KDA, District Administration, Zilla Parishad, BWDB, LGED, KWASA, DPHE, RHD, NGOs (Rupayan, Rupantar, BELA), CBOs (Nagorik Forum) can be formed for protection and conservation of Mayur and its connected canals	KCC, KDA, District Administration, Zilla Parishad, BWDB, LGED, KWASA, DPHE, RHD, NGOs (Rupayan, Rupantar, BELA), CBOs (Nagorik Forum)

8.2 Conclusion

Mayur River and its connected canals are the arteries of drainage and water flow in Khulna city. But, various types of unauthorized encroachments tend the Mayur and its connected canals towards extinction. So, immediate actions should be taken to evict the encroachment to maintain the flow and capacity of the Mayur and its connected canals. Otherwise in near future, Khulna city will face enormous problems of water logging, flood, environmental degradation and water scarcity.

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Annexure A: Questionnaire for Households

Department of Urban and Regional Planning
Khulna University of Engineering & Technology

BAWIN Bangladesh Water Integrity Network
Promoting integrity in the water sector

TRANSPARENCY INTERNATIONAL BANGLADESH
Social movement against corruption

Khulna University of Engineering and Technology
Department of Urban and Regional Planning

"A STUDY FOR SAVING THE MAYUR RIVER AND ITS CONNECTED CANALS OF KHULNA"

Questionnaire for Households

(For research purpose only)

1.Residents Information:

- Name: _____
- Occupation: _____
- Monthly Income: _____

2. Period of living at current location (years): _____

3. Has the resident migrated to current location from elsewhere?

- ☐ Yes
- ☐ No

If yes answer the following:

Origin Upazila:_____Origin District: _____

Reasons behind migration: _____

4. Land Ownership:

- ☐ Own
- ☐ Leased
- ☐ Rented
- ☐ Leased by someone else and rented out

Other forms if available please specify: _____

5. If ownership of land is other than personal:

- Terms and condition for living in this place: _____
- Rent (taka): _____
- Are you bound the leave the place at some time:
  □ Yes □ No

6. Area of the land (in Katha): _____

7. House type:

□ Kutcha
□ Pucca
□ Semi-Pucca

8. Location of the house:

□ On the river or canal
□ On the embankment
□ Adjacent to the embankment
□ Others please specify: _____

9. Is any form of income or household chores taking place in said canal?

□ Yes □ No

If yes mention the activities taking place: _____

10. Any knowledge on the pattern of past flow of the canal:

□ Yes □ No

If yes please mention: _____

11. Does the canal being filled up bother you?

□ Yes □ No

12. According to you is it right to fill up the canal:

□ Yes □ No

13. Knowledge about the encroachment of the canal:

- Past condition of the canal: _____

- People responsible for the encroachment of the canal: _____
- Reasons behind encroachment: _____
- Origin of the encroacher: _____

14. Are wastes being dumped in the canal to fill it up?

☐ Yes ☐ No

15. Problems occurring due to canal encroachment:

_____

_____

_____

_____

_____

16. Benefits from canal encroachment:

_____

_____

_____

17. Hasany one taken any steps to prevent the encroachment?

☐ Yes ☐ No

If yes:

- Who: _____
- How:_____ _____
- Effectiveness: _____

18. Any knowledge on the Role of the concerned stakeholders (UP, KCC, LGED etc.) about this problem?

☐ Yes
☐ No

19. Mention benefits from restoration or preservation or protection of canals:

_____

_____

_____

_____

20. Suggestions on improving the condition of the canals:

_____

_____

_____

_____

Annexure B: Questionnaire for Organizational Staff

Department of Urban and Regional Planning
Khulna University of Engineering & Technology

BAWIN Bangladesh Water Integrity Network
Promoting integrity in the water sector

TRANSPARENCY INTERNATIONAL BANGLADESH
Social movement against corruption

Khulna University of Engineering and Technology
Department of Urban and Regional Planning

"A STUDY FOR SAVING THE MAYUR RIVER AND ITS CONNECTED CANALS OF KHULNA"

Questionnaire for Organizational Staff

(For professional research purpose only)

1. Name of the Organization:

_____

2. Name of the Respondent:

_____

3. Designation of the Respondent:

_____

4. What are the major activities of the Organization?

5. What are the main activities of the organization for the protection of rivers, canals and water bodies?

6. What are the legal documents, laws, ordinances or Acts that are followed by your organization for the protection of rivers, canals and water bodies?

7. What are the initiatives that have been taken earlier to protect or save the rivers, canals and water bodies?

8. Did the initiatives support that law/ordinance/act you took or applied earlier?

□ Yes □ No

9. What are the results of those initiatives, you already have taken?

10. What are the further initiatives going to be taken by the organization?

11. What are the limitations of your organization for protection of rivers, canals and water bodies?

12. What problems of your organization had/have to face to protect the rivers, canals and water bodies?

13. Do you have any recommendations or suggestions to overcome the limitations and to solve the problems?

14. For solving or minimizing these, do you need any support or help?

☐ Yes ☐ No

15. If yes, please specify and explain the supports and possible sources?

Annexure C: Other canal Case Study Maps

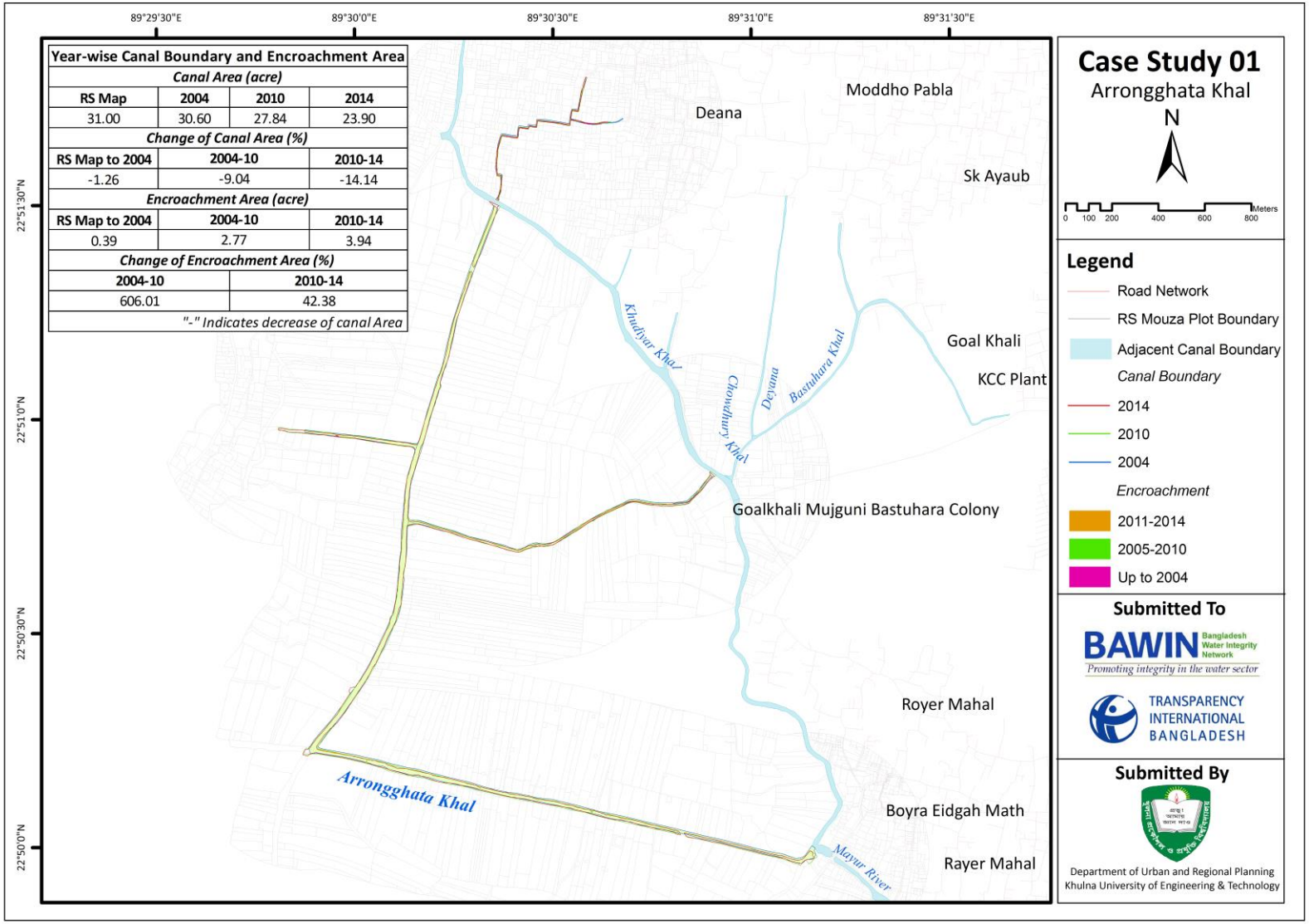


Figure C.1: Encroachment Scenario of Arrongghata Khal

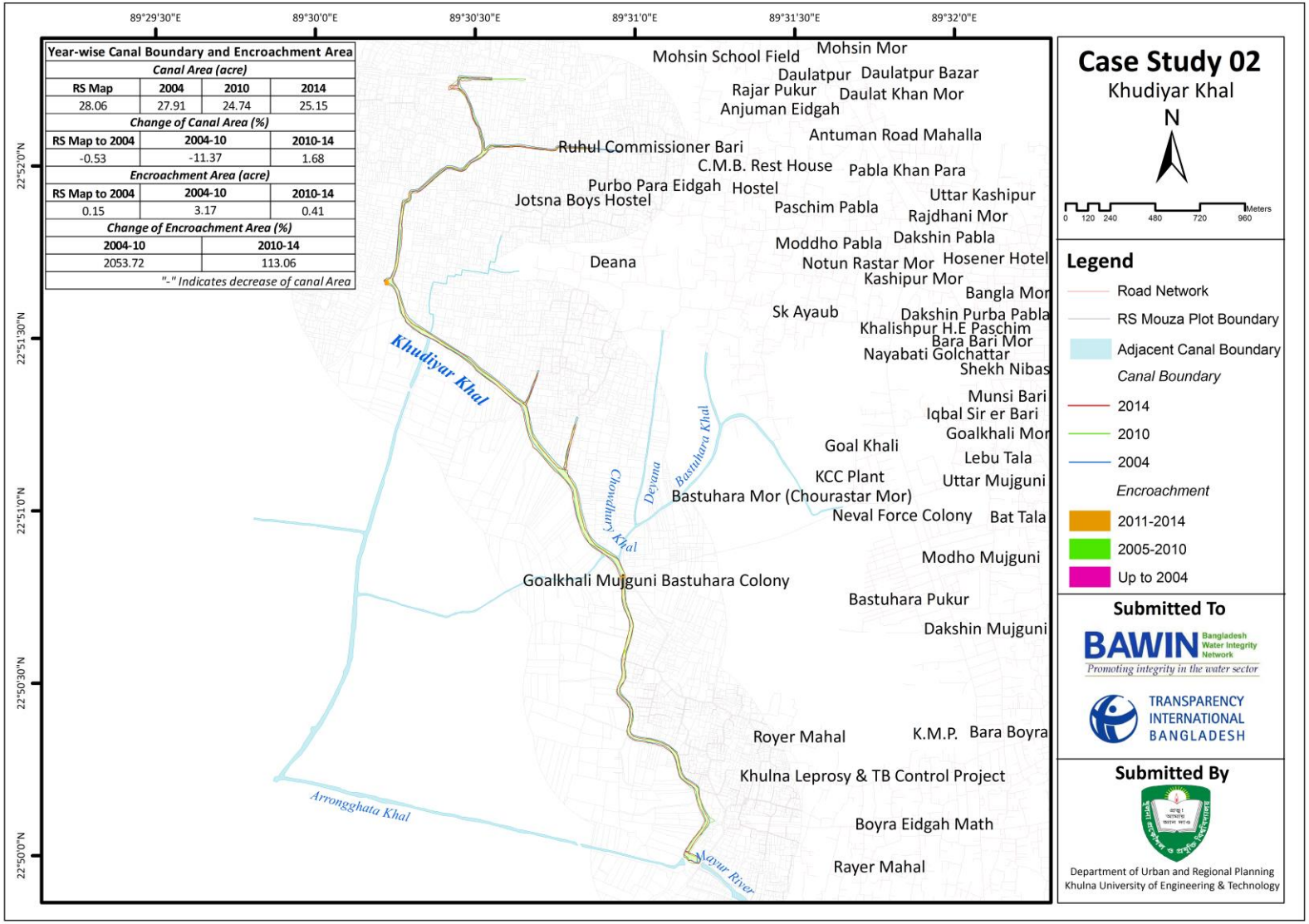
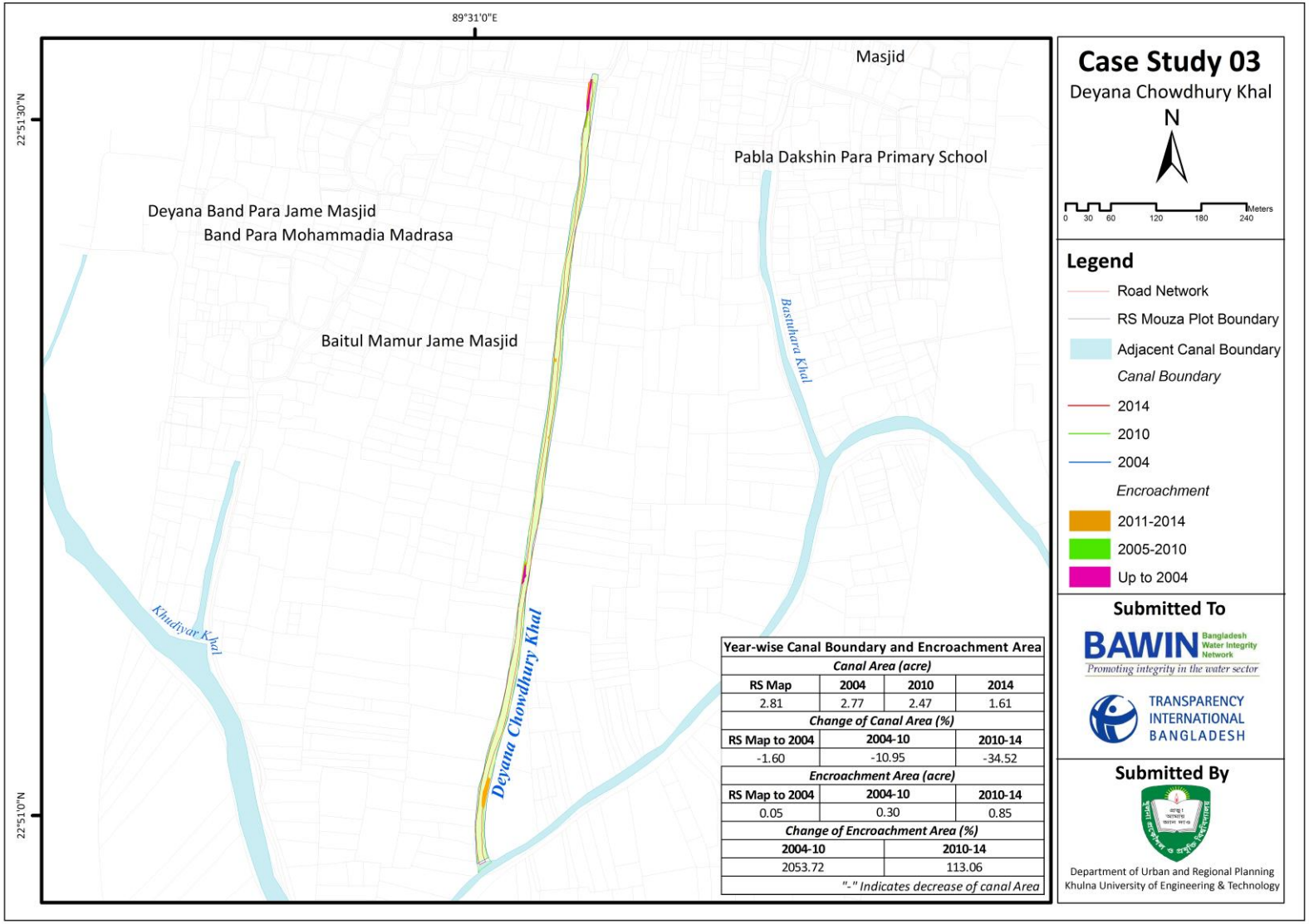


Figure C.2: Encroachment Scenario of Khudiyar Khal



Year-wise Canal Boundary and Encroachment Area			
Canal Area (acre)			
RS Map	2004	2010	2014
2.81	2.77	2.47	1.61
Change of Canal Area (%)			
RS Map to 2004	2004-10		2010-14
-1.60	-10.95		-34.52
Encroachment Area (acre)			
RS Map to 2004	2004-10		2010-14
0.05	0.30		0.85
Change of Encroachment Area (%)			
2004-10		2010-14	
2053.72		113.06	
"-" Indicates decrease of canal Area			

Figure C.3: Encroachment Scenario of Deyana Chowdhury Khal

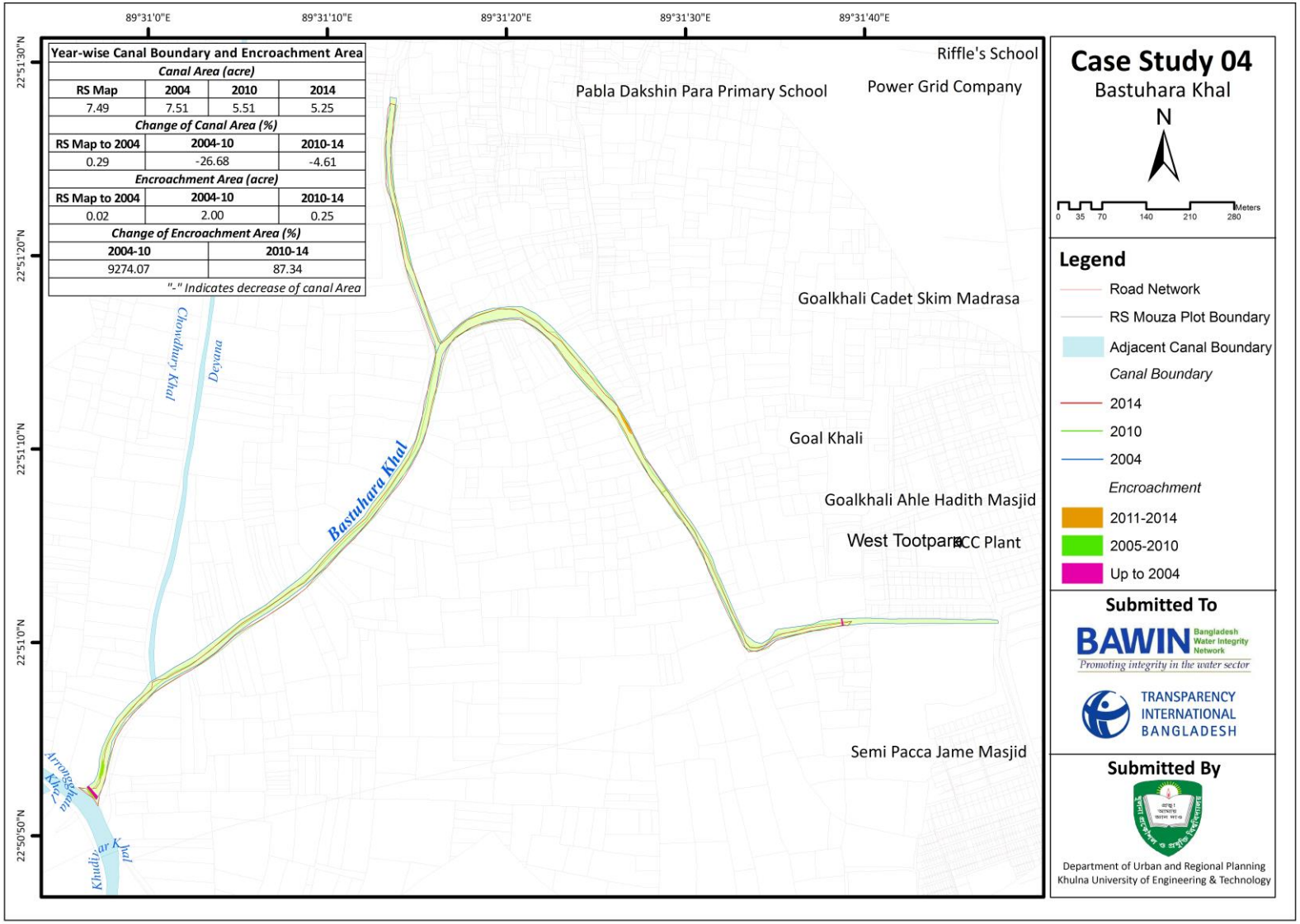
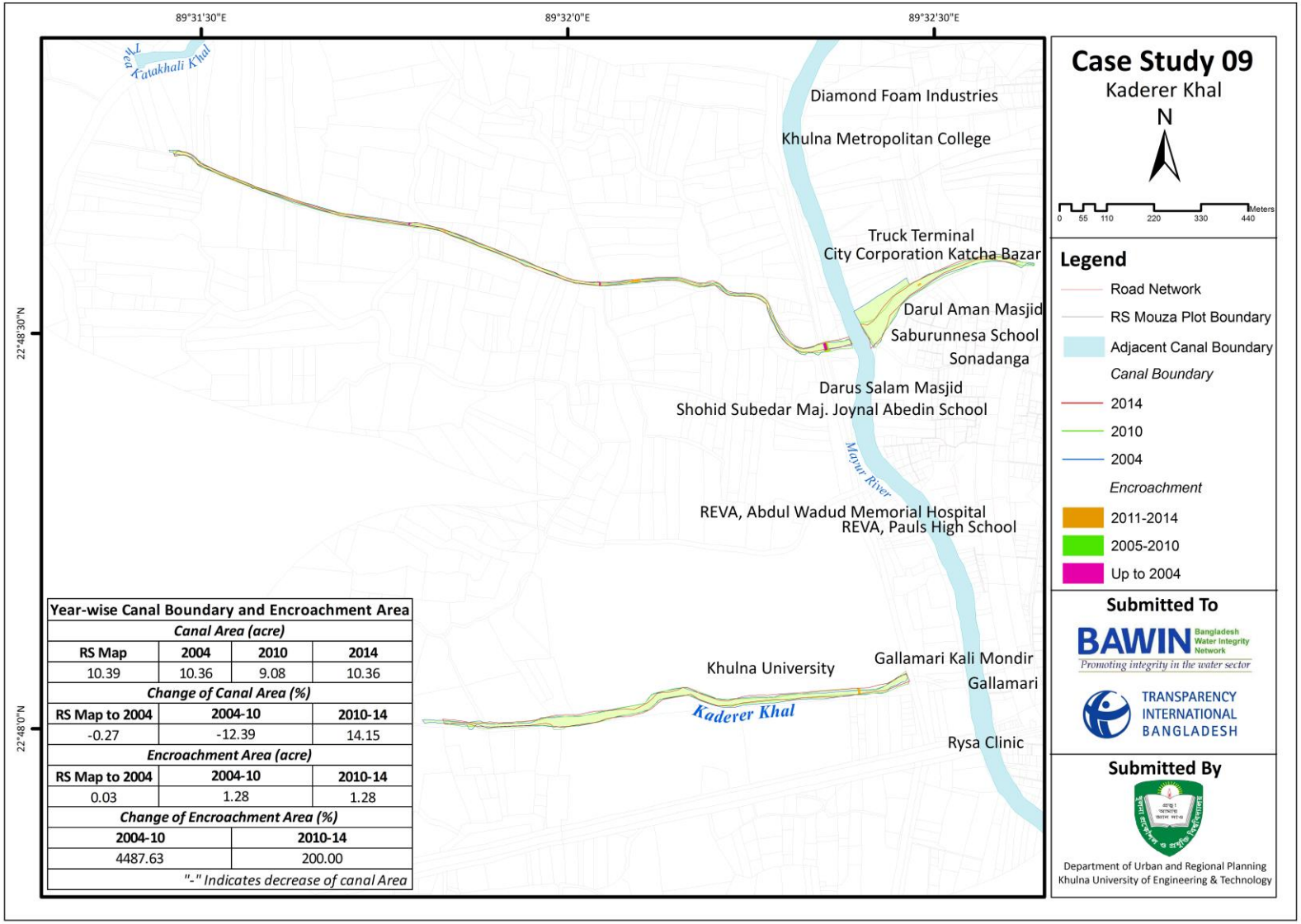
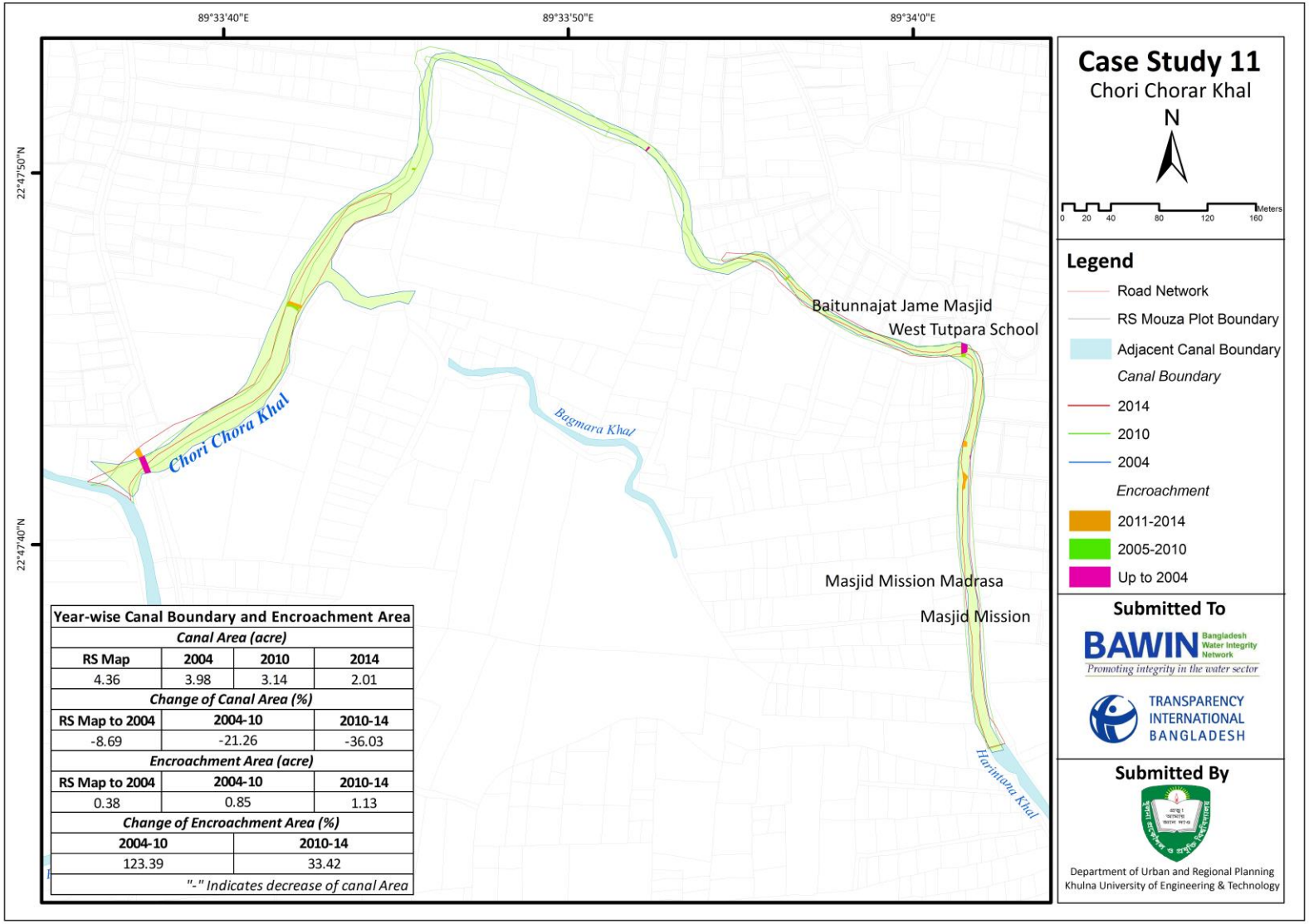


Figure C.4: Encroachment Scenario of Bastuhara Khal



Year-wise Canal Boundary and Encroachment Area			
Canal Area (acre)			
RS Map	**2004**	**2010**	**2014**
10.39	10.36	9.08	10.36
Change of Canal Area (%)			
RS Map to 2004	**2004-10**		**2010-14**
-0.27	-12.39		14.15
Encroachment Area (acre)			
RS Map to 2004	**2004-10**		**2010-14**
0.03	1.28		1.28
Change of Encroachment Area (%)			
2004-10		**2010-14**	
4487.63		200.00	
"-" Indicates decrease of canal Area			

Figure C.5: Encroachment Scenario of Kaderer Khal



Year-wise Canal Boundary and Encroachment Area			
Canal Area (acre)			
RS Map	2004	2010	2014
4.36	3.98	3.14	2.01
Change of Canal Area (%)			
RS Map to 2004	2004-10		2010-14
-8.69	-21.26		-36.03
Encroachment Area (acre)			
RS Map to 2004	2004-10		2010-14
0.38	0.85		1.13
Change of Encroachment Area (%)			
2004-10		2010-14	
123.39		33.42	
"-" Indicates decrease of canal Area			

Figure C.6: Encroachment Scenario of ChoriChorar Khal

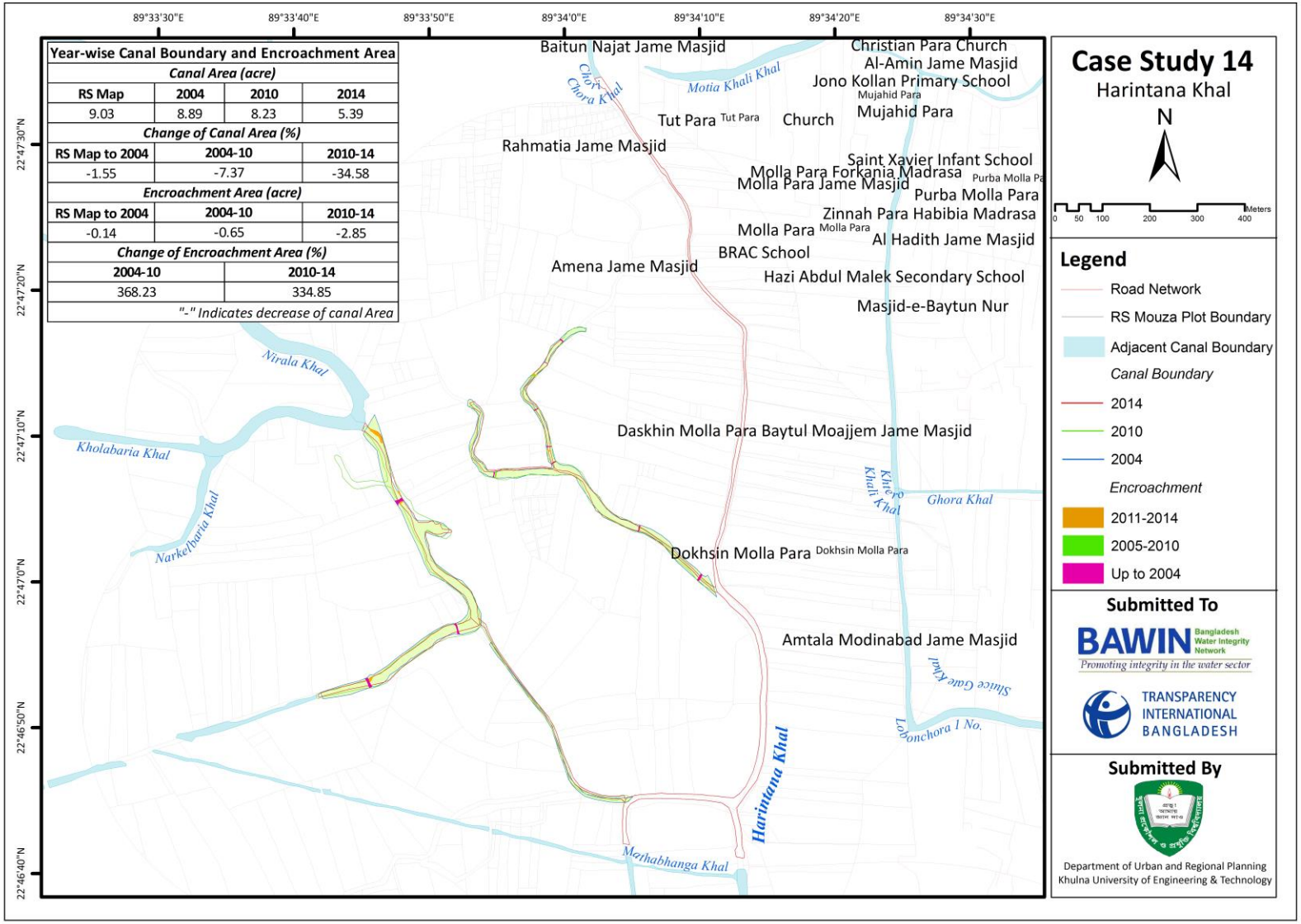


Figure C.7: Encroachment Scenario of Harintana Khal

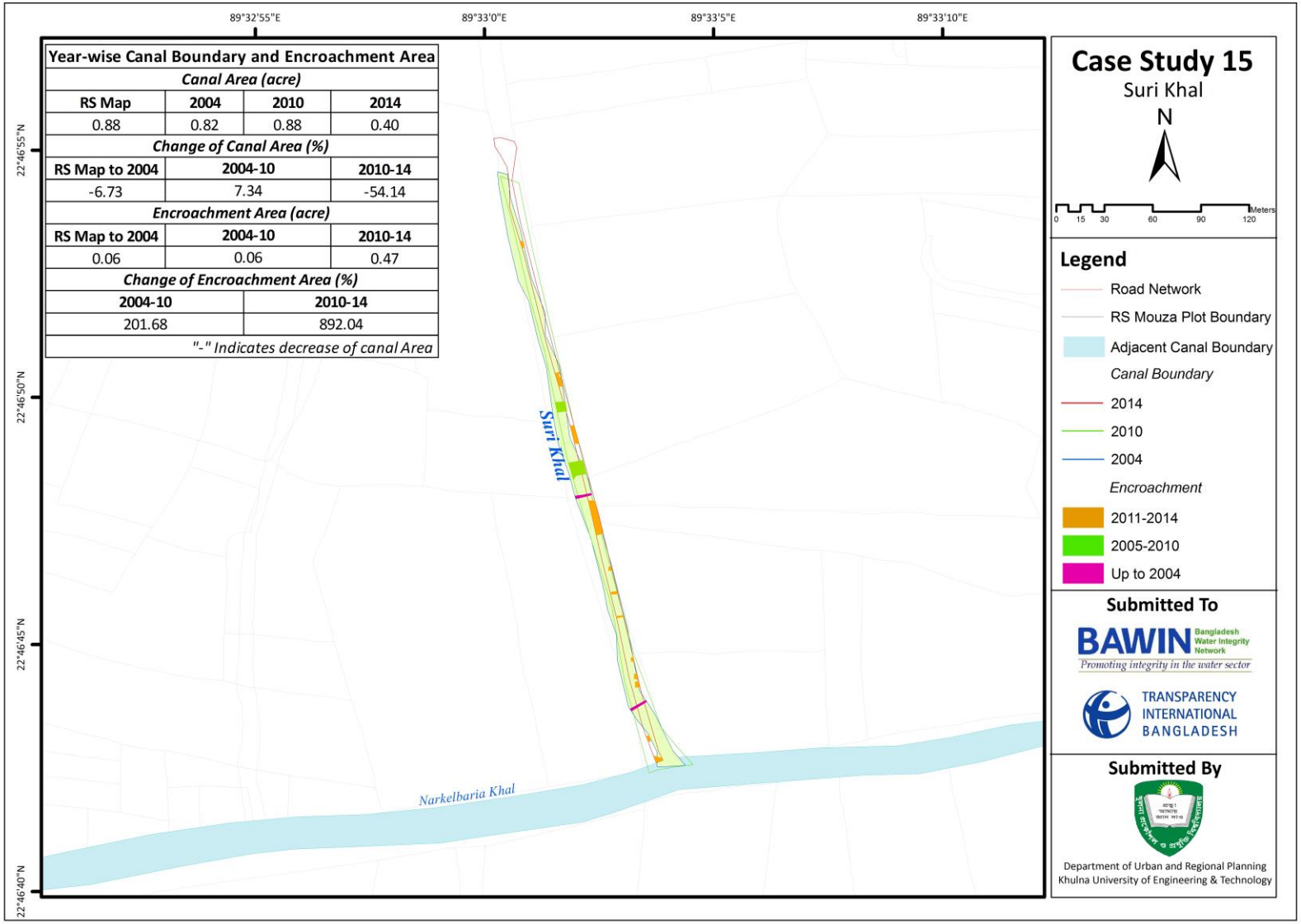
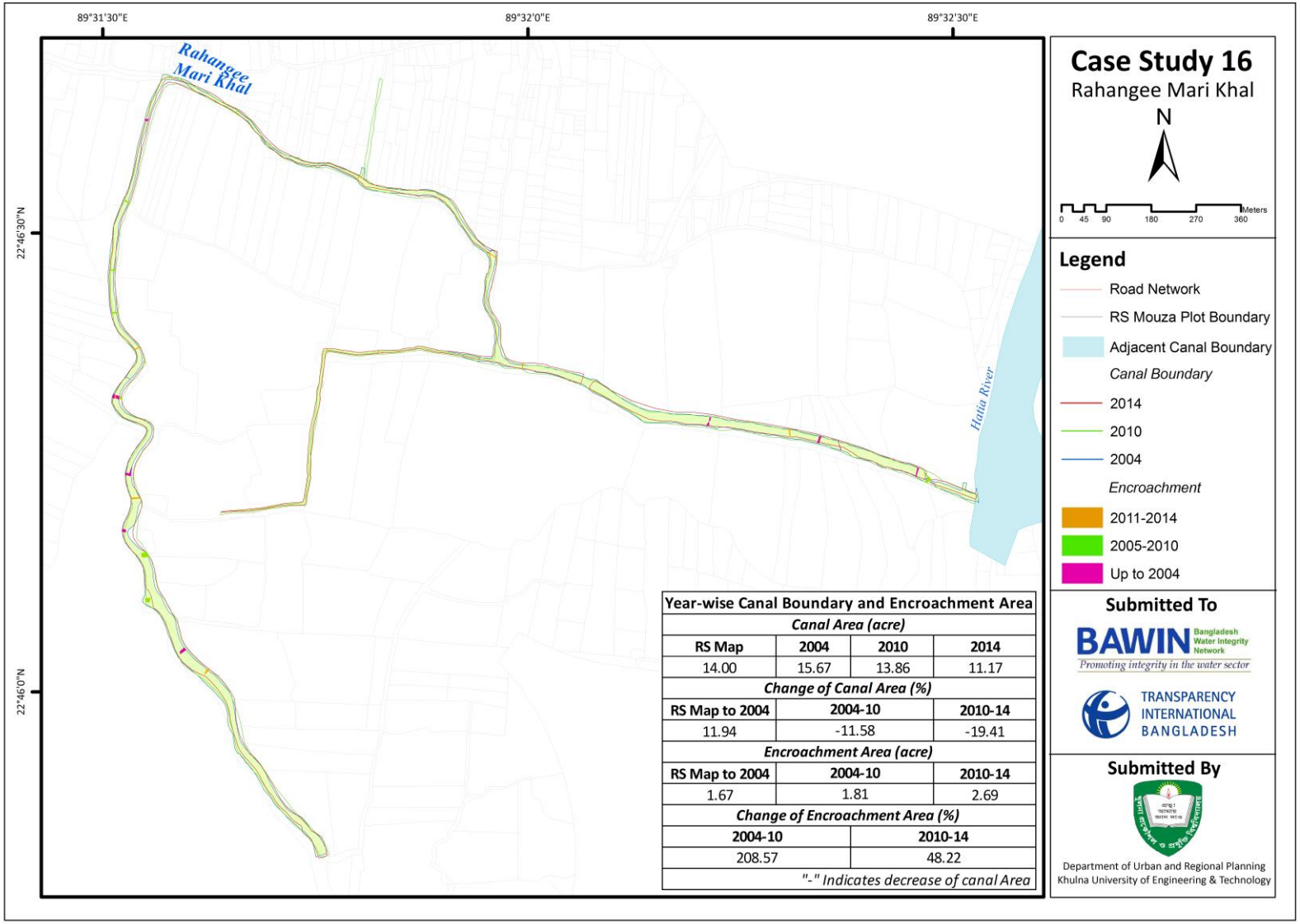
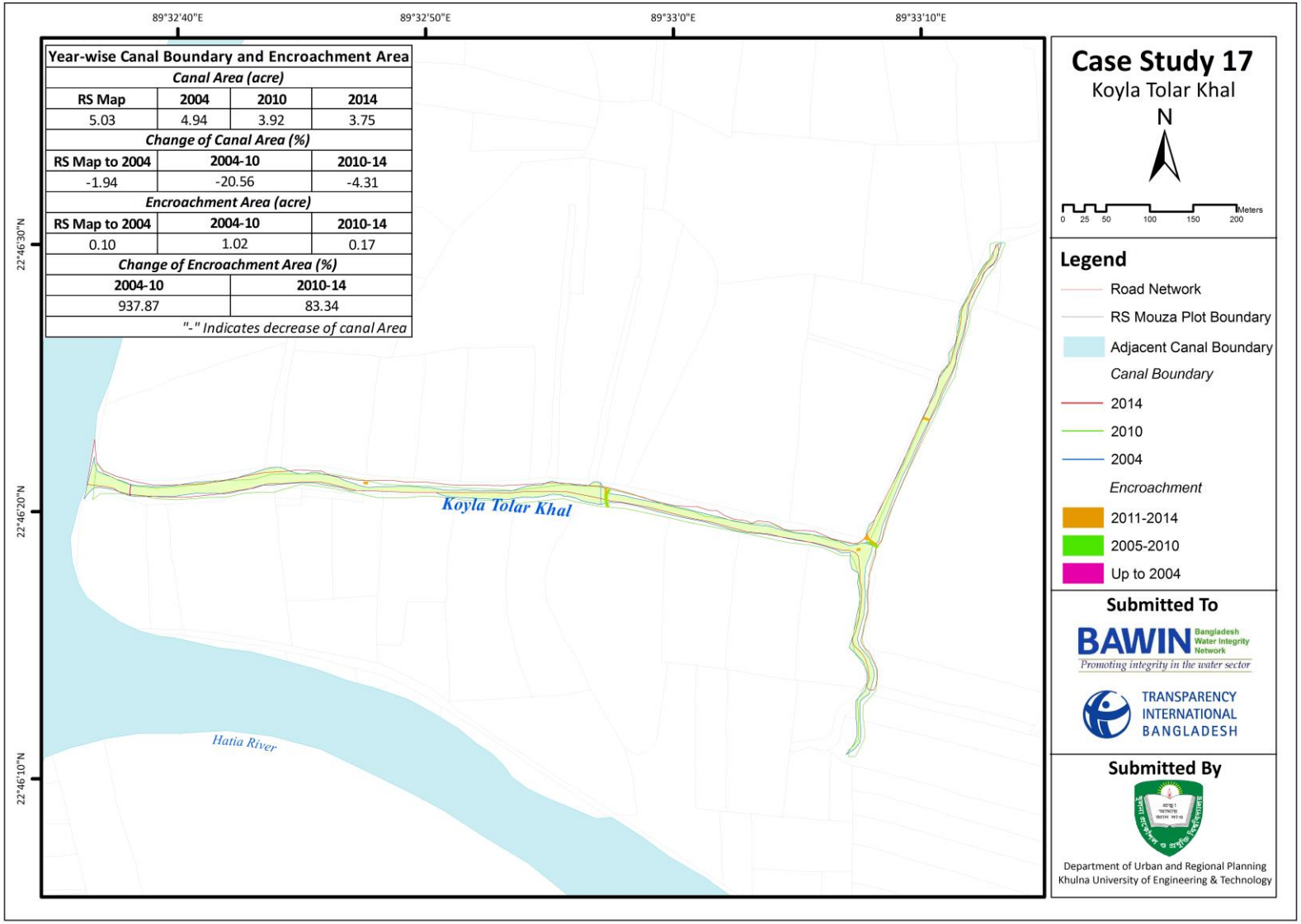


Figure C.8: Encroachment Scenario of Suri Khal



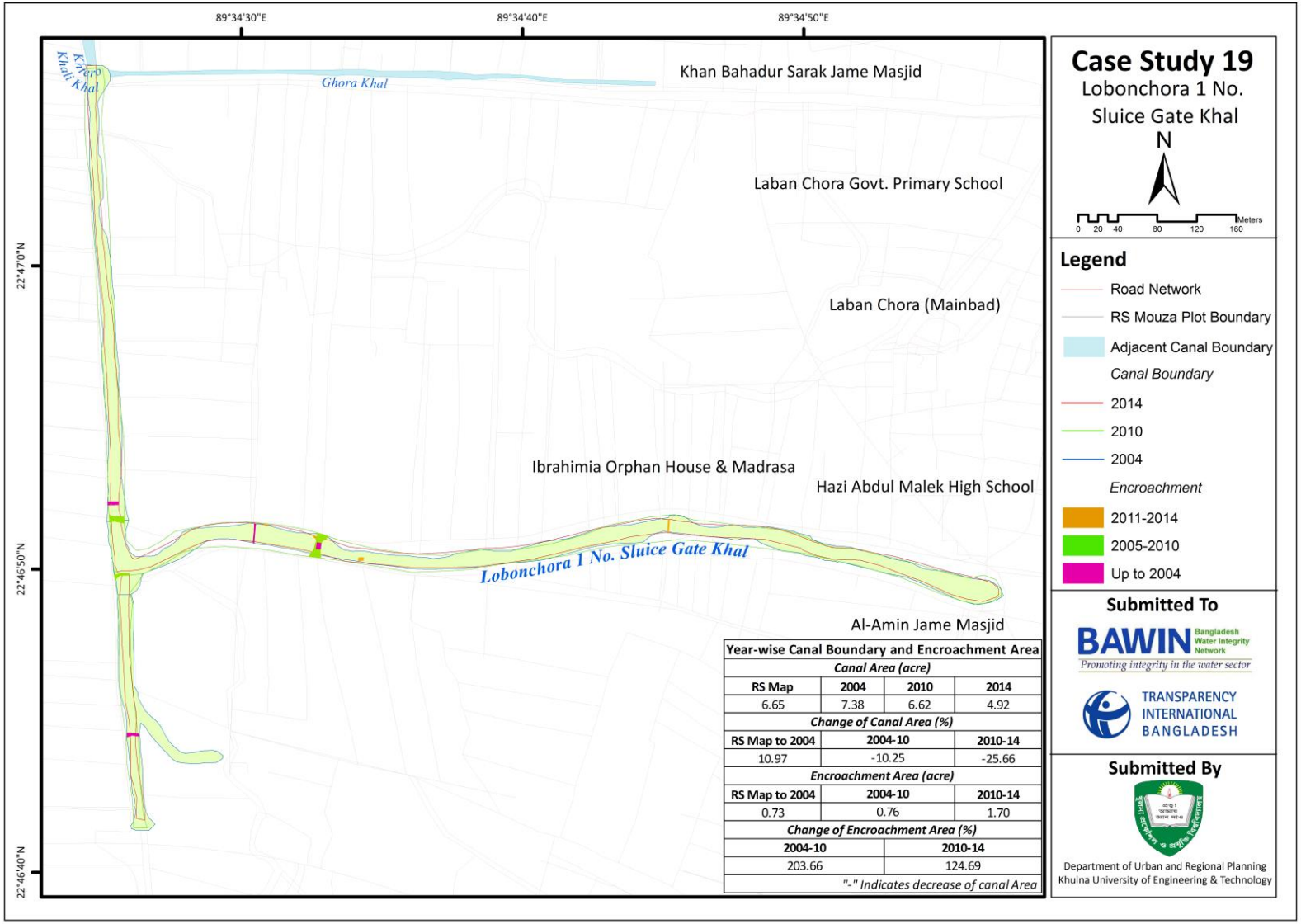
Year-wise Canal Boundary and Encroachment Area			
Canal Area (acre)			
RS Map	2004	2010	2014
14.00	15.67	13.86	11.17
Change of Canal Area (%)			
RS Map to 2004	2004-10		2010-14
11.94	-11.58		-19.41
Encroachment Area (acre)			
RS Map to 2004	2004-10		2010-14
1.67	1.81		2.69
Change of Encroachment Area (%)			
2004-10		2010-14	
208.57		48.22	
"-" Indicates decrease of canal Area			

Figure C.9: Encroachment Scenario of Rahangee Mari Khal



Year-wise Canal Boundary and Encroachment Area			
Canal Area (acre)			
RS Map	2004	2010	2014
5.03	4.94	3.92	3.75
Change of Canal Area (%)			
RS Map to 2004	2004-10		2010-14
-1.94	-20.56		-4.31
Encroachment Area (acre)			
RS Map to 2004	2004-10		2010-14
0.10	1.02		0.17
Change of Encroachment Area (%)			
2004-10		2010-14	
937.87		83.34	
"-" Indicates decrease of canal Area			

Figure C.10: Encroachment Scenario of KoylaTolar Khal



Year-wise Canal Boundary and Encroachment Area			
Canal Area (acre)			
RS Map	2004	2010	2014
6.65	7.38	6.62	4.92
Change of Canal Area (%)			
RS Map to 2004	2004-10		2010-14
10.97	-10.25		-25.66
Encroachment Area (acre)			
RS Map to 2004	2004-10		2010-14
0.73	0.76		1.70
Change of Encroachment Area (%)			
2004-10		2010-14	
203.66		124.69	
"-" Indicates decrease of canal Area			

Figure C.11: Encroachment Scenario of Lobonchora 1 No. Sluice Gate Khal

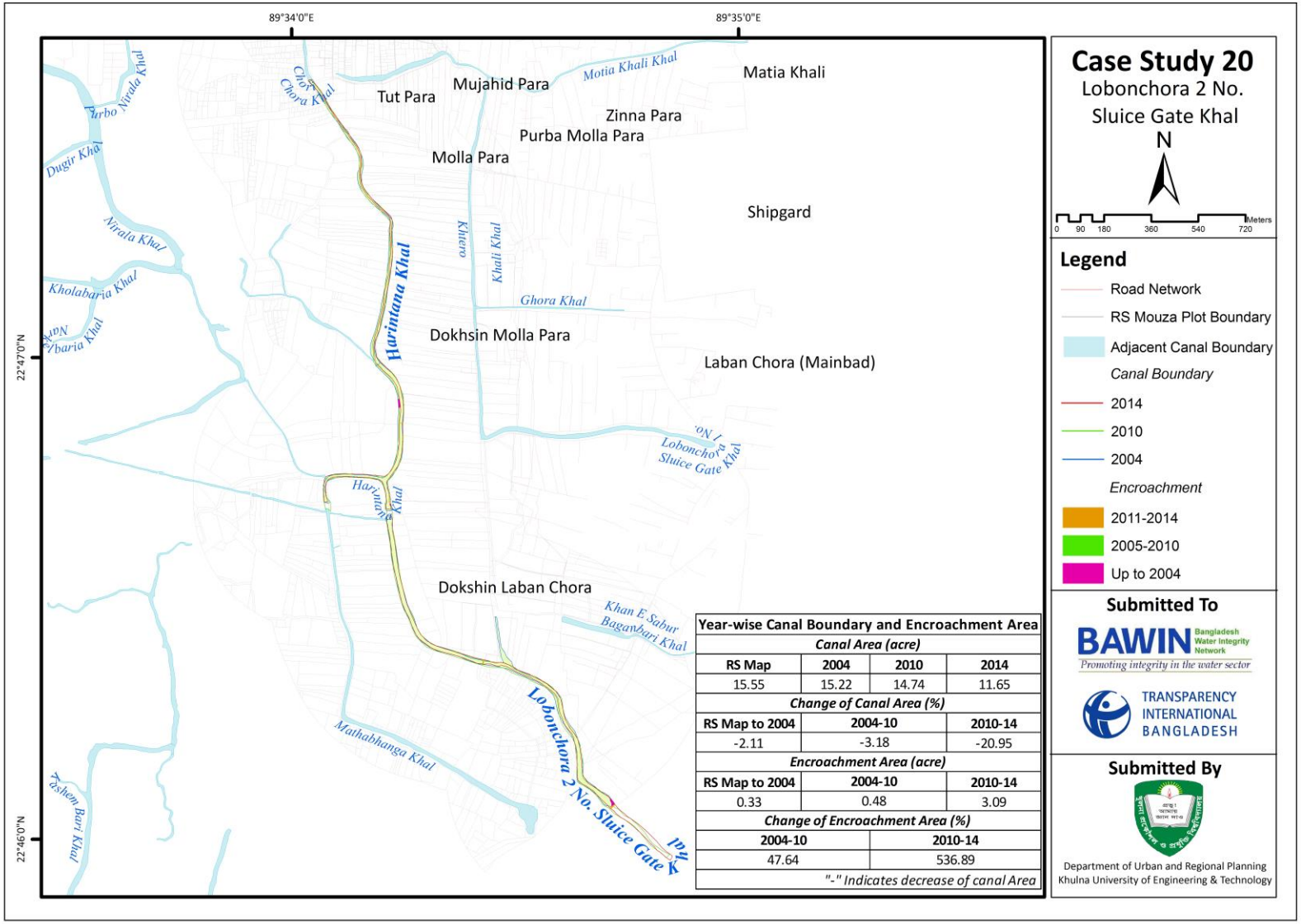
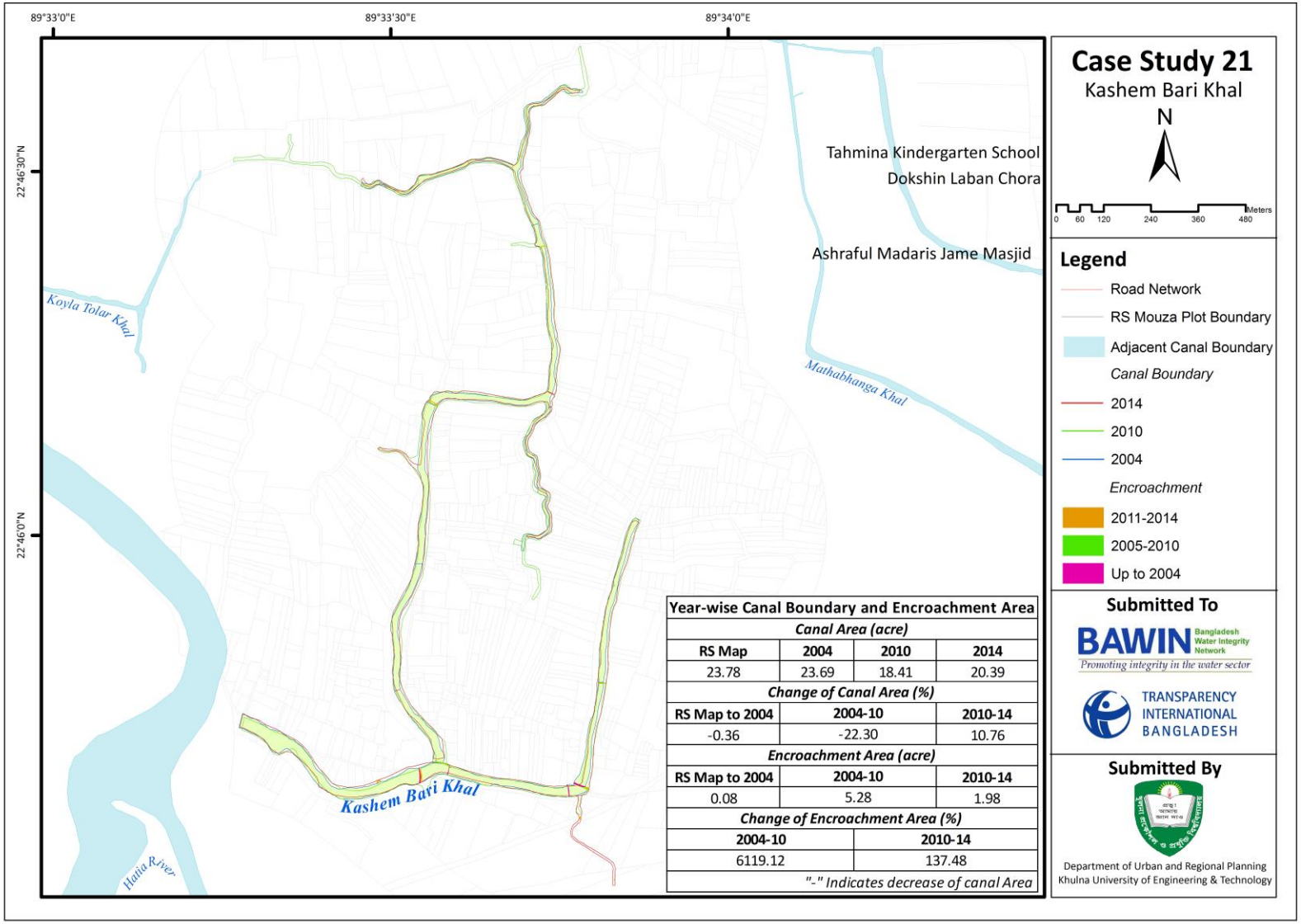
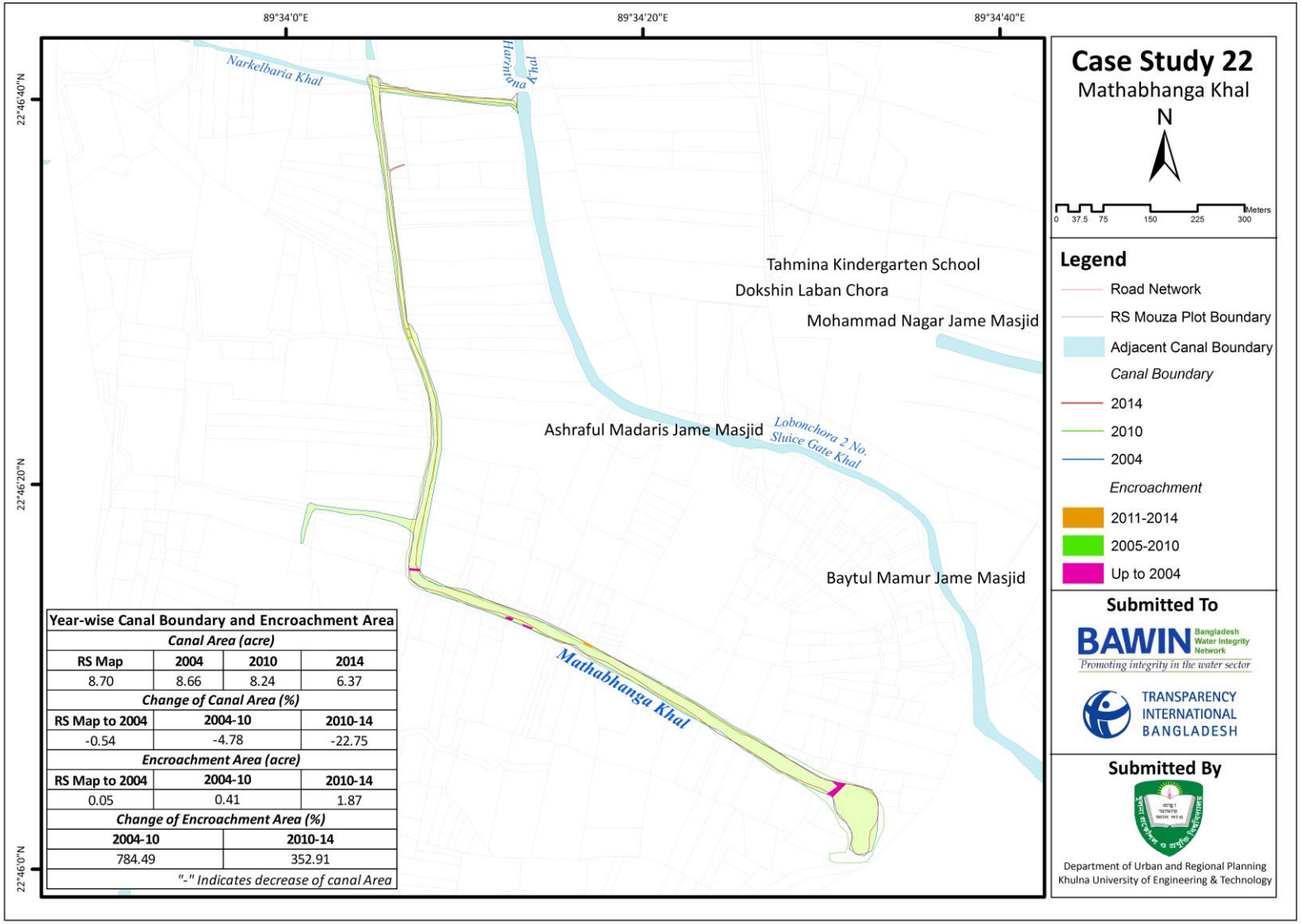


Figure C.12: Encroachment Scenario of Lobonchora 2 No. Sluice Gate Khal



Year-wise Canal Boundary and Encroachment Area			
Canal Area (acre)			
RS Map	2004	2010	2014
23.78	23.69	18.41	20.39
Change of Canal Area (%)			
RS Map to 2004	2004-10		2010-14
-0.36	-22.30		10.76
Encroachment Area (acre)			
RS Map to 2004	2004-10		2010-14
0.08	5.28		1.98
Change of Encroachment Area (%)			
2004-10		2010-14	
6119.12		137.48	
"-" Indicates decrease of canal Area			

Figure C.13: Encroachment Scenario of Kashem Bari Khal



Year-wise Canal Boundary and Encroachment Area			
Canal Area (acre)			
RS Map	**2004**	**2010**	**2014**
8.70	8.66	8.24	6.37
Change of Canal Area (%)			
RS Map to 2004	**2004-10**		**2010-14**
-0.54	-4.78		-22.75
Encroachment Area (acre)			
RS Map to 2004	**2004-10**		**2010-14**
0.05	0.41		1.87
Change of Encroachment Area (%)			
2004-10		**2010-14**	
784.49		352.91	
"-" Indicates decrease of canal Area			

Figure C.14: Encroachment Scenario of Mathabhanga Khal

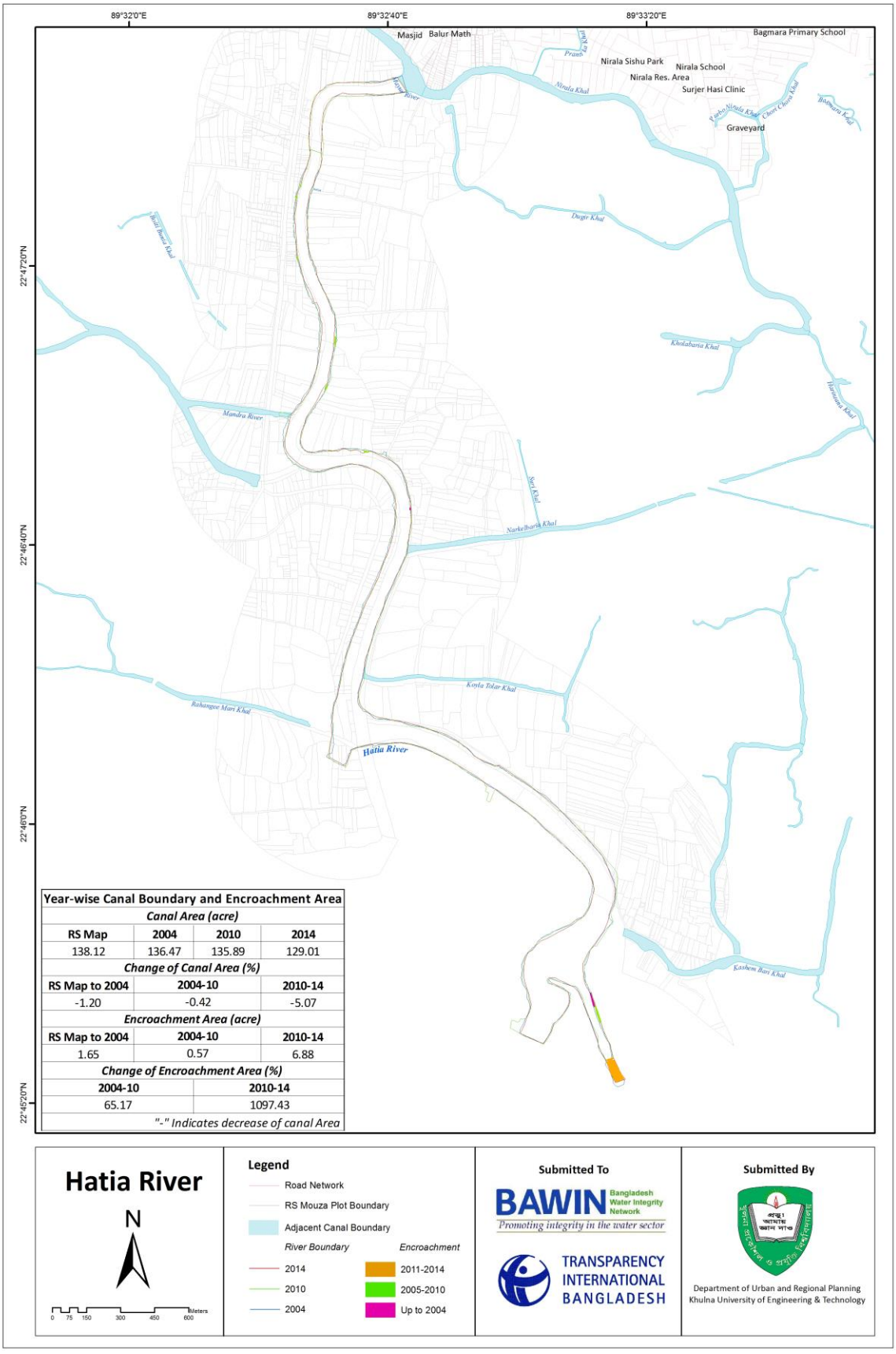


Figure C.15: Encroachment Scenario of Hatia River

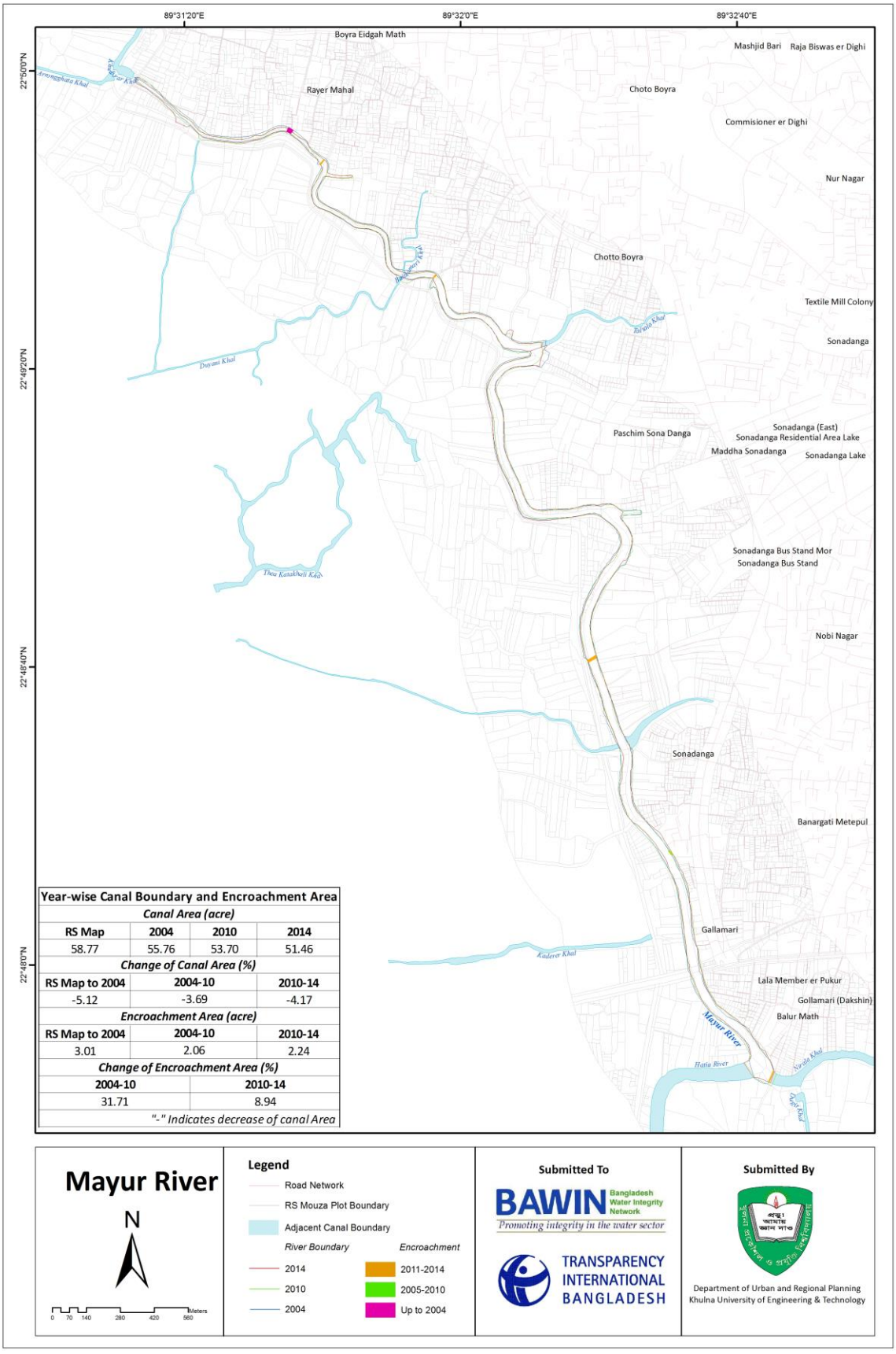


Figure C.16: Encroachment Scenario of Mayur River

Annexure D: List of Organizations included under Organizational Survey

Name of the Organization: Khulna City Corporation (KCC)

Main activities of the organization for the protection of rivers, canals and water bodies:

- Preservation of the canal, river and water bodies.
- Elimination of encroachment.
- Removal of illegal land.

Legal documents, laws, ordinances or Acts are followed for the protection of rivers, canals and water bodies:

-
- Local Govt. City Corporation Act, 2009 (amended)
-

Initiatives that have been taken and results of taken initiatives:

- Drainage Master Plan.
- Dredging 15km khal

The results of this initiatives are given below:

- Increase the depth of the canal.
- Proper water flow.

Initiatives that are going to be taken by the organization:

- Dredging canal.
- Plan for removing solid waste.

Recommendations or suggestions:

- Introduction of Urban Government under City Corporation.
- Safety and security of land, people.
- Organizational strengthen.
- Improvement of technology.

Limitations in regards to protection of rivers, canals and water bodies:

- Unlawful settlement.
- Local muscle man.
- Funding

- Corruption.

Name of the Organization: Khulna WASA

Main activities of the organization for the protection of rivers, canals and water bodies:

- No such activity

Legal documents, laws, ordinances or Acts are followed for the protection of rivers, canals and water bodies:

- No such document

Initiatives that have been taken and results of taken initiatives:

- Khulna Water Supply Project

Initiatives that are going to be taken by the organization:

- If KCC wants they will assist them.

Recommendations or suggestions:

- Every organization should be working with mutual understanding

Limitations in regards to protection of rivers, canals and water bodies:

- Other organizations and protocol.

Name of the Organization: Department of Environment

Main activities of the organization for the protection of rivers, canals and water bodies:

- Identification of responsible person or institution for environmental pollution and charge him fine.
- Collection of water sample from different water sources for sample research and water quality examination.
- Regular examination of water quality and degree of water pollution.
- Identification of encroachment on water body and charge them accused person or institution instant by Magistrate or Mobile Court.
- Social awareness to keep environment free of pollution.

Legal documents, laws, ordinances or Acts are followed for the protection of rivers, canals and water bodies:

- Bangladesh Environment Preservation Act, 1995
- Bangladesh Environment Protection Act, 1995
- The Environment Court Act, 2000

Initiatives that have been taken and results of taken initiatives:

- A project of social awareness

***Result*:** Project has not been passed from the ministry yet.

***Initiatives that are going to be taken by the organization*:**

- If the project is passed then it will implement within couple of years.

Recommendations or suggestions:

- Campaigning for raising Social awareness
- Increasing Funding for running current activities.

Limitations in regards to protection of rivers, canals and water bodies:

- Less budget
- Unwillingness or fewer co-operations from the people.

Name of the Organization: Bangladesh Water Development Board

Main activities of the organization for the protection of rivers, canals and water bodies:

- No such activities followed by the Bangladesh Water Development Board.

Legal documents, laws, ordinances or Acts are followed for the protection of rivers, canals and water bodies:

- The Canal Act, 1864
-
- The Bangladesh Water Development Board Act, 2000
- Bangladesh Water Act, 2013

Initiatives that have been taken and results of taken initiatives:

- River Belt Protection and Development (2008-2014)

***Initiatives that are going to be taken by the organization*:**

- No such initiative has been taken yet but if Khulna City Corporation call them for canal related research or other help, BWDB of Khulna zone will assist them.

Recommendations or suggestions:

- Government has to take necessary steps.
- Public awareness.
- Dredging.
- Sluice gate control.

Limitations in regards to protection of rivers, canals and water bodies:

- Canal protection of encroachment identification is not the main agenda of BWDB.

Name of the Organization: Nagorik Forum, Khulna.

Main activities of the organization for the protection of rivers, canals and water bodies:

- Seminar for awareness building among people.
- Plantation and Beautification.

Legal documents, laws, ordinances or Acts are followed for the protection of rivers, canals and water bodies:

- No such documents.

Initiatives that have been taken and results of taken initiatives:

- Coordination meeting with mayor and other key persons on various matters such as canal protection, removal of encroachment, dredging of the canal etc.
- Discussion and meeting with affected people.

Results: The affected people give their word to stay with this organization to wipe out the muscle men who are responsible for encroachment of rivers and canals.

Initiatives that are going to be taken by the organization:

- Increase the level of people participation.

Recommendations or suggestions:

- Co-operation between the local people and the government

Limitations in regards to protection of rivers, canals and water bodies:

- Lack of financial resources for organizing programs.

Name of the Organization: Rupantar ***Main activities of the organization for the protection of rivers, canals and water bodies:***

- Seminar
- Round table discussion
- Campaign and awareness raising

Legal documents, laws, ordinances or Acts are followed for the protection of rivers, canals and water bodies:

Not applicable***Initiatives that have been taken and results of taken initiatives:***

- Seminar
- Workshop
- Human chain

Results: People awareness increased, Increased people participation.

Initiatives that are going to be taken by the organization:

- Continuation of earlier initiatives.

Recommendations or suggestions:

- Government concerned organizations must take the responsibility
- Co-operation of government agencies.

Limitations in regards to protection of rivers, canals and water bodies:

- Inadequacy of fund and resources.

Name of the Organization: Rupayon

Main activities of the organization for the protection of rivers, canals and water bodies:

- Seminar
- Survey
- Human chain
- Round table discussion.

Legal documents, laws, ordinances or Acts are followed for the protection of rivers, canals and water bodies:

- Not applicable

Initiatives that have been taken and results of taken initiatives:

- Consultation with previous mayor
- Had meetings with DC.

Results: Stop leasing out of canals.

Initiatives that are going to be taken by the organization:

- Continuing the ongoing activities

Recommendations or suggestions:

- Local people should come forward
- Continuing the activities of protecting the Mayur River.

Limitations in regards to protection of rivers, canals and water bodies:

- Inadequacy of funding

- Shortage of manpower

Name of the Organization: Department of Fisheries

Main activities of the organization for the protection of rivers, canals and water bodies:

- No such activities

Legal documents, laws, ordinances or Acts are followed for the protection of rivers, canals and water bodies:

- Natural Reservoir Protection Act, 2000
- The Bangladesh Environment Conservation Act,1995
- The Protection and Conservation of Fish Act, 1950
- The Protection and Conservation of Fish Act, 1950
- The Protection and Conservation of Fish Rules, 1985
- The Protection and Conservation of Fish Rules, 2008

Initiatives that have been taken and results of taken initiatives:

- Participated in joint survey of Mayur and its connected canals in 2009.

Initiatives that are going to be taken by the organization:

- No such initiatives

Recommendations or suggestions:

- Dredging of Mayur and its connected canals
- Sluice gates should be controlled.

Limitations in regards to protection of rivers, canals and water bodies:

- Inadequacy of funding
- Shortage of resources and manpower.