PhD Thesis
on

Challenges and issues of Water Management in Bangladesh: Anthropological Study.

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January 2020

Thesis submitted to the Department of Anthropology, Faculty of Social Sciences, University of Dhaka for the fulfilment of PhD degree.

Declaration

I undersigned hereby declare that this dissertation is my original work. The findings accumulated here are the results of inquiry that conducted in the areas under Char Ashariadaha, Godagari, Rajshahi, Bangladesh. The dissertation titled "**Challenges and issues of Water Management in Bangladesh: Anthropological Study.**" of the requirements for the Doctor of Philosophy (PhD) at the department of Anthropology, University of Dhaka. I also proclaim that this dissertation or any part of this has not been submitted elsewhere for the award of any academic degree.

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Certificate of Supervisor

This is to certify that the dissertation titled, "**Challenges and issues of Water Management in Bangladesh: Anthropological Study.**" conducted by Md. Azizur Rahman, Reg. No. 126/2014-2015 has been completed under my direct supervision. It is an original work and it has not been submitted to any other University for a degree. I recommend this dissertation for final submission to the concerned authority.

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Acknowledgment

At first I would like to express my heartfelt gratitude to Almighty who gave me ability to endure this study with patience and full indulgence. It is really my pleasure to express my immense gratitude to my supervisor professor Dr. Zahidul Islam, Department of Anthropology, University of Dhaka for his continuous support and guidance. Without his real time support and suggestions this study would be futile. I also show my sincere gratitude to Md. Borhan Uddin for his constructive suggestions and technical guidance at various stages of the work including preparation of the questionnaire. I also benefitted by the various authors whose work seemingly relevant to my study. So, I convey my thankfulness to them. I also convey my deep appreciations to

I am greatly indebted to my loving children, my wife, my father and my siblings for their constant attachment, encouragement and sacrifice at all stages of this endeavor.

I also thank colleagues, friends, students and others who are directly or indirectly associated with the work of the present study. I also express my gratitude to Professor Dr. Shahed Hasan, Professor Dr. Ahsan Ali, Professor Shaheen Ahmed, Professor Dr. Saifur Rashid and other faculties at the Department of Anthropology for their potential guidance.

Finally, I remain ever grateful to the respondents who gave their valuable time through participation in the study.

Abstract

Undertaking the prime objective of exploring the major challenges of water management in Bangladesh, present study identified various geographic, socio-economic and environmental factors all are in coherent with anthropological aspect that shape the water management issues of Bangladesh. Water resource management has been focal point in Bangladesh for last few decades, but with the increasing conflict around the distribution of water to contending demands, and mounting water stress due to climate change, there is now a critical demand for social equity in water resource management. The present study mainly focused and concerned with the status and trend of these issues principally impact of Farakka barrage and it's impinging on stakeholders.

This paper is divided into eight consecutive chapters. Chapter one deals with the main problems being investigated and discussed, the aims and rationale of the study. Chapter two involves a critical review of some vital concepts and theories relating to this study. Chapter three discusses about research design and methodology. Chapter four explores about the socio-economic and environmental features of the study area Char Ashariadaha of Rajshahi. The chapter five consists of discussion on policy and stakeholder mapping. Chapter six talks about riverine ecosystem, lives and livelihood, and development interventions in the study area. Chapter seven discusses about major challenges of water management. Chapter eight includes concluding remarks and a way forward.

Deriving from anthropological tradition of research, present study uses observation, interview, key informant and other tools and techniques of anthropological fieldwork for collecting in-depth data. It finds out major issues of water management in the study area from holistic view. Water crisis is predominant among other problems which results from Farakka barrage in dry season. Farakka barrage has been able to tremendously influence the lives and livelihood of local people in Char Ashariadaha. Its degree of impact ranges from dry out of local water bodies to force occupational groups shifting river based livelihood option. Central to the impacts of Farakka barrage, decline of agricultural production further exacerbates many social crises directly or indirectly connected with hydraulic aspects of social life in the locality. Traditionally local people of the study area are totally depending on Padma River. Now Padma is likely going to be a curse for their livelihood, frequent flood washes way their assets and destroying the natural species. Before Farakka a lot of fishermen and boatmen were working there now mostly disappeared, shifted their work to other field. A good number of rickshaw pullers of Dhaka city come from Rajshahi to survive.

Critically reviewing water treaty of 1996, water act, and other legislative institutions, this study endeavored to mapping out stakeholder analysis with a view to pick up local perspective from the prism of bottom-up approach of anthropological research to reach at the heart of the problem and find out an effective way out. It argues that vital point of water crisis and management in the locality resulted from weaker negotiation with India for ensuring equal distribution of Ganges/ Padma's water in dry season. Other challenges

of water crisis management includes immoral political atmosphere, nepotism, unrestricted and unsustainable extractions of ground water etc. Flood and flesh flood induced by gate opening of Farakka barrage in rainy season, drought in dry spell, and political factionalism aggravate water mismanagement in the locality.

This study identified that local people have to suffer from water shortage in dry season. This shortage is derived from two important sources; natural cause and anthropogenic reason. Underground water level decreased followed by less precipitation in winter season is very common according to Bengali seasonality. Thus, construction of barrage like Farakka for impeding water flow into Bangladesh is proliferating water shortage in the community. This unusual shortage of both ground and surface water brings about many adverse impacts; drinking water crisis, sanitation water shortage, irrigation water scarcity, and all coupled with lower production and increased livestock and human disease.

Present study identifies two types of entitlement on ground of dimension; local entitlement and national entitlement. Despite having available water in natural water bodies, local poor and marginalized people have limited access to water which is lack of local entitlement. Contrasting to this, Padma River has natural water availability in dry season, but India impedes water flow and control over Bangladesh's accessibility to water which is lack of national level entitlement.

It argues that water bodies in Char Ashariadaha comprise of complex political ecology that is not only governed by local elite but centralized political system has direct and indirect influence. Rich farmers play despotic role by controlling over natural water bodies; impeding natural water flow and making poor and marginalized farmers to depend on their will for getting irrigation water. Hence, water management system goes under political ecology, water governance runs under hydraulic despotism concept, and water use rights is protected under entitlement approach produce a multidimensional crisis that is difficult to deal from single lens. Present study propose two critical ways for these issues; a multidisciplinary comprehensive research model should be taken to account the versatility of water crisis, and a multi-stakeholder based intervention and action group for the effective implementation of the model.

However, informed policy making to meet policy goals and make local people aware of their significance and impact is an essential requirement of a dynamic water management policy in Bangladesh. Present study argues that as the water management becomes progressively complex with various dimensions in rural areas like Char Ashariadaha, further research should be conducted from in-depth anthropological insights and from social sciences with a view to ensure bottom-up knowledge venture instead of top-down system for local people engagement in decision making process regarding water crisis management.

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Chapter 1

Introduction

1.1 Introduction

Water is a basic human need which is rarely regarded as a so-called consumer good rather it is crucial human rights that is frequently violated. Being source and resource, it is claimed that forty percent of the population living around the earth survives depending directly upon river water and majority of them living in developing country like Bangladesh (Islam 2011). World community put emphasis on equal distribution of international water, albeit dominant countries do not always abide by the water treaties. So, water is becoming the core of contemporary socio-political debate that poses rigorous threats to local and global harmonies. Thus, alternative of water is not discovered yet, politics over water is creating new challenge that is likely to affect mostly the developing nations with poor socio-economic capital. As world population is growing promptly and water sources are getting contaminated gradually, water crisis calls for proper management which the present study undertakes with grave concern. The economy, culture and values are directly or indirectly rely upon water in many respects. Bangladesh has six distinct seasons with seasonal variety, the amount of available water changes significantly in each season. So in every twelve months cycle, Bangladesh starts the year as water stressed country and become wet in the middle of the year and again become water stressed at the end of the year (Ahmed 2019).

From prehistory to date, the world has been encountering severe water shortage. Throughout the 21st century, water scarcity and availability become the hot topic as hydro-politics starts to play critical impacts on human lives and livelihood. Bangladesh is the raw example of being adversely impacted by this politics. Water is basic of all financial advancement and for keeping up solid environments. As the rate of population rises and improvement calls for expanded designations of groundwater and surface water for the residential, agribusiness and mechanical segments, the load on water resource heightens, prompting strains, clashes among clients, and unnecessary load on nature. The expanding burden on freshwater resources triggered by regularly rising interest and reprobate use, just as by developing contamination around the world, is of genuine

concern. Awkward nature among accessibility and demand, the contamination of groundwater and surface water quality, inter-sectoral rivalry, and interregional and worldwide clashes, all bring water issues to the fore. The accessibility and quality of water in several regions of the world are more and more vulnerable by overuse, misuse and pollution. Water is not an unlimited gift of nature; somewhat it is a predetermined resource.

Water covers 70% of our planet, and it is anything but difficult to feel that it will consistently be ample. Just 3% of the world's water is new water, and 66% of that is concealed in solidified icy masses or generally inaccessible for our utilization. Thus, some 1.1 billion individuals overall need access to water, and a sum of 2.7 billion find water rare for at any rate one month of the year. Lacking sanitation is likewise an issue for 2.4 billion individuals—they are presented to sicknesses, for example, cholera and typhoid fever, and other water-borne ailments (World Wild Life 2019). Two million individuals die from diarrheal illnesses alone. A significant number of the water frameworks that keep biological systems flourishing and feed a developing human population have turned out to be focused. Streams, lakes and springs are evaporating or winding up too contaminated to even think about using. The greater part the world's wetlands have vanished. Agribusiness expends more water than some other source and squanders a lot of that through wasteful aspects. Environmental change is modifying examples of climate and water far and wide, causing deficiencies and dry spells in certain regions and floods in other parts of the world and as well as in Bangladesh (Islam 2011).

Water resource management is facing comprehensive challenges for resolving numerous problems and issues. The grave of these are flood in rainy seasons and water paucity in dry seasons, ever intensifying water needs for a growing economy and population, enormous river sedimentation, river bank erosion etc employs of water together with agricultural, industrial, household, recreational and environmental activities are resourceful. Practically all of these human uses necessitate fresh water. 97.5% of water on the Earth is salt water, leaving only 2.5% as fresh water of which over two thirds is

frozen in glaciers and polar ice caps (Yearly report -2013 by BWDB). The left over unfrozen fresh water is mainly found as groundwater, with only a little portion present above ground. Fresh water is a renewable resource, yet the world's supply of clean, fresh water is steadily lessening. Water demand already exceeds supply in many parts of the world, and as world population keeps on to rise at an unprecedented rate; many more areas are expected to experience this imbalance in the near future.

Bangladesh has one of the most elevated population densities in the world, with a population of 160 million living inside 57,000 square miles. Of those 160 million individuals, 4 million need safe water and 85 million need improved sanitation. Absence of access to safe water and improved sanitation in rustic regions, packed conditions, and an absence of solid methods for arranging waste in urban focuses, all add to the water and sanitation disaster in Bangladesh. Bangladesh has a bounty of water, with around 24,000 km of streams moving through its fruitful land. However, giving water safe enough to everybody to drink is a mind boggling national issue (Water Aid 2018).

Water is a usual resource of immense substance in Bangladesh. The convenience of fresh water is highly seasonal since the region’s weather is mainly overseen by a monsoon climate. This seasonality is reflected in its plenty during the monsoon vis-à-vis its shortage in early summer given that groundwater is focus to increased abstraction and arsenic contamination, the country has to rely more on surface water not only for fishery, navigation industries, forestry, livestock, poultry, horticulture, salinity control and protection of biodiversity but also for household use, agriculture and other human and environmental services, as well as in contexts of both scarcity and abundance of surface water, address kinship, territory, hierarchy, conflict, identity, representations, or even patrimony. Under these circumstances sufficient supply of water in the river systems will largely rely on continued collaboration with India and other basin countries in the region. On the demand side, economic efficiency of water use in irrigation must be improved and economic enticements should be designed for less water intensive crops. In this regard

water pricing must play an important role in reflecting the true opportunity cost of water for its various users.

The Government of Bangladesh has formulated many rules and policy to manage water resources in this country. Some of them are listed like Preparation of Land and Water Resources Sector Study (1972), Formation of National Water Resources Council (1983), Creation of Master Plan Organization (1983), (subsequently renamed as Water Resources Planning Organization in 1991), Preparation of National Water Plan – 1 (1988), Creation of Flood Plan Coordination organization (1989), Preparation of National Water Plan – 2 (1991), Preparation of Flood Action Plan (1990), Adoption of Bangladesh Water & Flood Management Strategy (1995), Preparation of National Minor Irrigation Development Project (1996), Adoption of National Water Policy (1999), Adoption of national Water Management Plan (2001), Adoption of Guidelines for Participatory Water Management (2001).

The agencies or organizations which have significant occupations in water sector are of four categories: (a) government agencies; (b) local government institutions; (c) other organizations and the private sector; and (d) development partners. The government agencies include 13 ministries and 35 organizations, the most important among which are the Ministry of Water Resources, Bangladesh Water Development Board, Water Resources Planning Organization (WARPO), Joint Rivers Commission, River Research Institute, Surface Water Modelling Centre, Bangladesh Haor & Wetland Development Board, Ministry of Agriculture, Bangladesh Agricultural Development Corporation, Ministry of Local Government, Rural Development & Cooperatives, Local Government Engineering Department, Department of Public Health Engineering, Dhaka Water Supply and Sanitation Authority, Chittagong Water Supply and Sanitation Authority, Ministry of Environment & Forest, Department of Environment, Ministry of Ports, Shipping & Inland Water Transport, Bangladesh Inland Water Transport Authority, Ministry of Fisheries & Livestock, Department of Fisheries, and Disaster Management Bureau.

The local government institutions are the Paurashava (municipalities) and the Parishads (councils, mainly the upazila parishads). The category 'Other Organizations & Private Sector' includes community based organizations, non-government organizations, cooperatives, and private sector organizations and institutions. Noted among the development partners are the World Bank, the Asian Development Bank, government of Netherlands and the United Nations Development Programme and numerous bilateral development agencies of countries such as Denmark, Japan, UK, and Canada.

However, water is a natural resource of immense importance in Bangladesh because it is a riverine country. Moreover, Bangladesh is in high risk zone both for artificial and natural cases as well as national and international politics. All the aspects are creating disastrous situation in Bangladesh. Water Resources Management (WRM) aims at managing the tasks required to generate water and produce water related goods and services for the benefits of the society as a whole considering natural and men made disaster like Farakka barrage. In this context the present study has endeavored the challenges in particular issues of water management to properly utilize in various sectors of human society. As a result of the study must be helpful to understand & disseminate the knowledge of water management in Bangladesh as well as elsewhere in the world. The study is designed in a way that may cooperate in academic and strategy of planning of the state.

1.2 Background of the Study

The economy of Bangladesh is predominantly agrarian. Bangladesh lies in the northeastern part of South Asia between 20^0 34’ and 26^0 38’ north latitude and 88^0 01’ and 92^0 41’ east longitude. The country is bounded by India on the west, the north, and the north-east; Myanmar on the south-east and the Bay of Bengal on the south. The country has an area of 1, 47,570 sq. km with a population of about 160 million (GIS 2016). It is situated at the lowest reach of the three large rivers of the world, the Ganges, the Brahmaputra and the Meghna.

Water is both scarce and abundant in Bangladesh. Flood and drainage obstruction turn into a huge water management issue during the monsoon when heavy rainfall coincides with peak river flows. During the winter there is a significant shortage of water, hampering irrigation, fishing and navigation activities akin to spider network for instant, affects subsistence food production like aquatic plants and biodiversity as a source of supplementary food for the rural. Further, these plants supply essential nutrients for open-water fisheries. For the lack of proper water management have caused natural water bodies such as rivers, canals and wetlands to dry up, thereby denying opportunities of subsistence food production to the landless people and small and marginal farmers, who cannot afford to pay for water in irrigation schemes as well as small and marginal farmers, who use natural water bodies to irrigate their farms using traditional methods, consequently face difficulties that often affect their livelihoods. Regarding fisheries perspectives, a large section of the rural population depends on fishing in these natural water bodies for their livelihoods. In the north-west regions of Bangladesh, small and landless farmers in agricultural communities are found to be significantly dependent on fisheries, while in the north-central, north-east and south-west regions, over 60% of all categories of farmers have had some participation in fishing (ODA 1997). Subsistence fishing is carried out by households for domestic consumption as well as for commercial purposes. Fish are a major source of protein for the rural poor. For proper lacking of water management and arid in winter & summer consequently, aquatic habitat is rapidly shrinking and many fishermen have lost their livelihoods (WARPO 2001b; Ministry of Water Resources 1999). This is also reducing aquatic biodiversity and protein availability for the rural poor (Sultana and Thompson, 1997). With regard to, lose of livelihood for boat men shortage of water in the dry season obstructs boat transport. The movement of country boats is also hindered when the water in many small rivers and canals becomes shallow or dry in the arid season due to irrigation by low-lift pumps. Consequently, many boatmen have lost their livelihoods (Hal crow et al., 1998). In dry season also affects rural water supply for water shortage, an increasing number of hand tube-wells for drinking and domestic purposes are unusable for two to three months of the year towards

the end of the dry season because of excessive lowering of ground water levels due to the expansion of shallow and deep tube-wells for irrigation. The impact on rural domestic water supplies of seasonally-lowered water levels due to ground water irrigation is a concern for water management (WARPO, 2001a). In the environment side, the water regime is also affected by activities over which water managers do not have control, for example deforestation, hill cutting, inappropriate road alignment, wetland filling, river and canal encroachment, unplanned urbanization and industrial waste disposal. Roads constructed across floodplains cause a backwater effect and increase the duration, frequency and extent of flooding upstream (LGED 2008).

Arid term scarcity of water also affects wildlife and biodiversity dependent on water ecosystem. Continuous and severe riverbank erosion accounts for a massive land loss every year. March is a critical month in terms of water availability when rainfall and river discharges are low. An increasing demand for both surface and groundwater comes from irrigation in the dry seasons. Environmental degradation caused by the intrusion of saline water is a major problem in the locality. Recently high levels of arsenic have been detected in groundwater.

Bangladesh is a downstream country and upstream intervention by India significantly affects surface water availability during the dry seasons. Moreover, there are 57 cross-boundary rivers, of which 54 are shared with India and the remaining three with Myanmar. Bangladesh is the common lower riparian of all these trans-boundary rivers. Water management in Bangladesh is a critical as well as burning issue owing to growing demand and increasing conflict between alternative uses. Demand and focus on water is growing rapidly in agriculture mainly from irrigation for production, fishery, inland navigation and salinity control. The supply of clean and uncontaminated water has fallen far short of demand owing to inadequate flows in the Ganges, pollution caused by the disposal of effluents and chemicals, salinity intrusion in the coastal area and arsenic contamination. Further, the availability of freshwater is highly seasonal depending on the presence and duration of the monsoon. The incidence of both flood and drought in a

yearly cycle profoundly affects river morphology. Actually rivers, wetlands and the seasonal floods are the lifeblood of this country as well as in the world. Though floods sometimes cause havoc, usually they are beneficial for groundwater recharge, soil fertility, moisture and renewal of fish stocks. Floods cause further aggravation with increasing water coming through the cross boundary rivers during the monsoon.

Regarding all, this study identified various geographic, socio-economic and environmental factors all are in coherent with anthropological aspect that shape the water management issues of Bangladesh. Water is a basic resource for life and production and is essential for sustaining a variety of environmental and ecosystem services. Water resource management has been an important area of focus since the 1950s in Bangladesh, but given the growing conflict around the allocation of water to competing demands, as well as growing water stress due to changing climatic conditions, there is now a pressing need for ensuring social justice and equity in water resource development. The present study mainly focused and concerned with the status and trend of these issues principally impact of Farakka barrage and it's impinging on stakeholders.

1. 3 Objective of the Study

The broad objective of the study is to explore about the major challenges of water management in Bangladesh. The specific objectives are explored as follows:

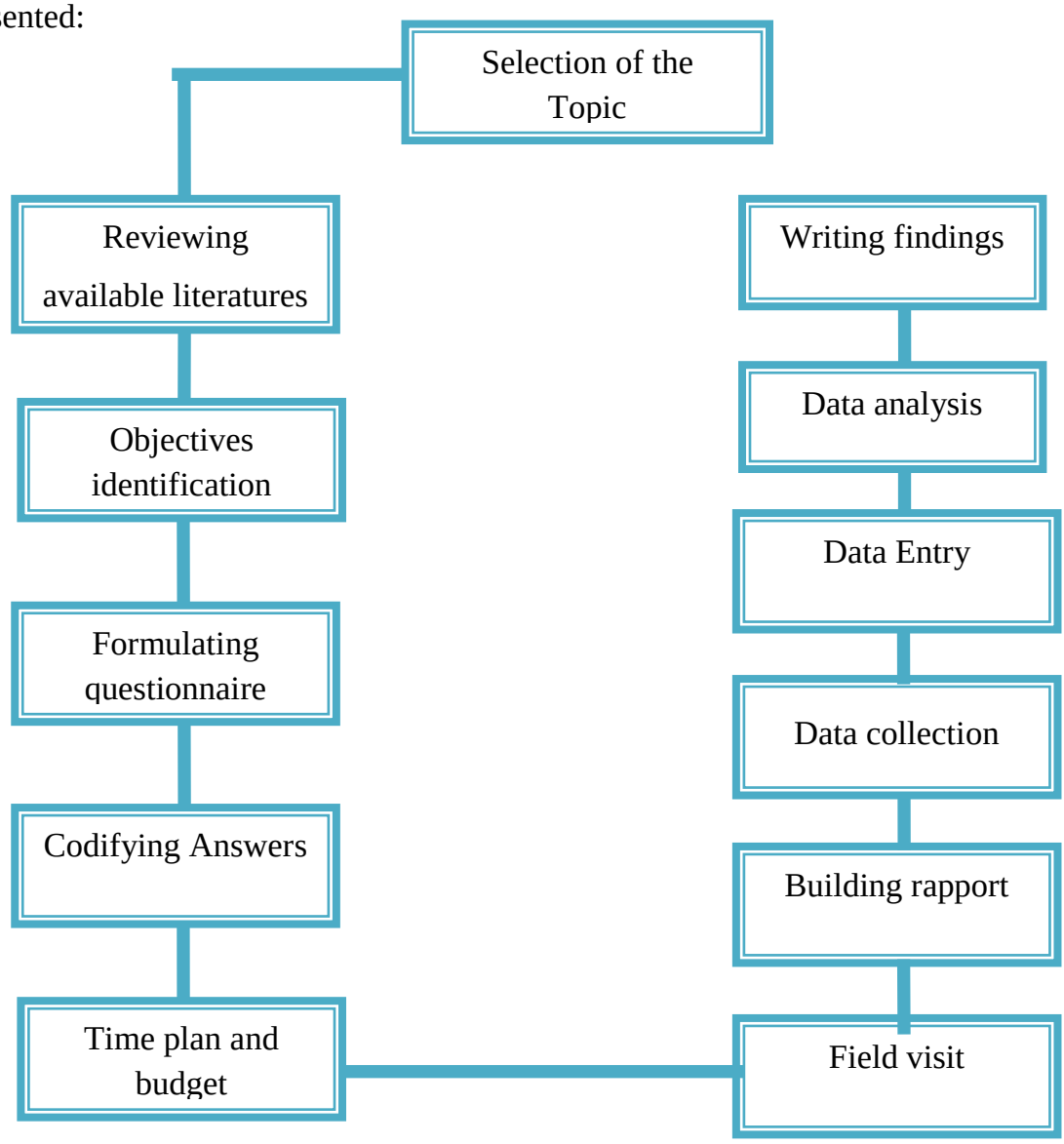
- To identify the major problems faced by local people living around Farakka Barrage area of Bangladesh due to the current water management trend.
- To review policies and regulation supporting stakeholder participation in water resources management specially exaggerated stakeholder of Farakka Barrage.
- To find out the coping and adaptation mechanism and way out to water challenges.
- To identify impacts of current water management on place and people

1.4 Rationale of the Study

As an agrarian and riverine nation, Bangladesh is reliant on stream water for human utilization, crop water system, fisheries, transportation and preservation of biodiversity. With fast industrialization and population development in the locale, agrarian interest for water is likewise contending with hydropower and modern interest. In parts of the GBM Basin there are upsetting indications of diminishing dry-season stream with genuine ramifications for farming yields and groundwater renewal (PRIO 2013). The issue is additionally exacerbated by water contamination and wasteful water. As the most minimal riparian regions inside the GBM Basin, Bangladesh is exceptionally subject to and vulnerable to run-off from upper-riparian states, with 92.5% of the nation's surface water gave by out-of nation sources (Mirza 2011). This reliance shows in the conflicting and polarizing difficulties of water shortage and flooding caused by monsoonal precipitation examples and fluctuation. This offer ascends to combative disagreements about allocation rights and future use. The progression of a stream relies upon a few factors – some normal, some human-instigated. An essential benefactor of surface run-off is the spatial and fleeting dissemination of precipitation notwithstanding the zone's geography, icy mass/snow dissolve commitments and groundwater maintenance limit, which again rely upon geomorphology and soil properties in the catchment territory. In Bangladesh, these benefactors are available and assume a persuasive job. The GBM Basin goes about as the last end for over 90% of South Asian monsoonal downpours. In this way, the fleeting and spatial convergences of monsoonal rains generally manage the agro-biological scene of Bangladesh, as the rainstorm contributes 80% of yearly precipitation in Bangladesh over a four-month time frame traversing from June until the finish of September. In this regard, findings of the present study would help policy makers, academicians, development practitioners, and students to internalize water management process from local aspects.

1. 5 Design of the Study

Before discussing about the structure of this paper, total process of the research should be presented:



This paper is divided into eight consecutive chapters; chapter one deals with the main research issues. It introduces the problems being investigated and discussed, the aims and rationale of the study. Chapter two involves a critical review of some vital concepts and theories relating to this study. This Chapter shapes the backbone of the thesis, consequently it significantly reviews important current debates, theories and concepts

accounting for, and having implications for major challenges of water management globally that coincide with Bangladesh.

Chapter three goes research design and methodology in conjunction with how the data is analyzed and interpreted. The key aim of the chapter is to show the ways that data have been generated and analyzed. The common of the data were gathered through both qualitative and quantitative approaches. The chapter four explains the basic hydrological and environmental characteristics Char Ashariadaha of Rajshahi. Customary agricultural livelihoods in this locality are sound adapted to seasonal variations in rainfall and to usual episodes of borsha (wet) and khora (dry), which make a diversity of freely obtainable ecological services. Chapter five consists of discussion on policy and stakeholder participation. The chapter gives a wide range of thematic and sectoral discussion on water management in public and private and its substitutes by tracing the main sources of water in Bangladesh.

Chapter six talks about development interventions in Char Ashariadaha of Rajshahi. This chapter expresses the social and physical infrastructure of the Godagari Upazila of Rajshahi district. The chapter highlights the existing water resources on which the demand-oriented community water projects will rely on, in accordance with the international community and Bangladesh's development partners. Chapter seven introduces the major challenges and issues of water management. Chapter eight summarizes and concludes the study with policy implications and suggestions for future research.

Chapter 2

Literature Review and Theoretical Aspects

2.1 Introduction

Literature review recognizes, assesses and incorporates the important previous writing inside a specific field of research. It lights up how information has advanced inside the field, featuring what has just been done, what is commonly acknowledged, what is developing and what is the present condition of intuition on the theme. It presents significantly more than an outline of applicable sources. The demonstration of inspecting includes assessing individual sources just as combining these sources so as to pick up a wide perspective on the field. At this 'field level', literature review examines normal and rising methodologies, striking examples and patterns, regions of contention and discussions, and lacking inside the significant writing. Literature review not only needs to engage with a body of literature, also need to be able to compare, contrast, synthesize, and make arguments with that literature in ways that indicate a readiness to contribute to the literature itself" (O'Leary 2010).

This chapter significantly reviews important current debates, theories and concepts accounting for, and having implications for major challenges and issues of water management globally that coincide with Bangladesh. The argument in this chapter is that the neoliberal principles of the WB and IMF have led to water management through participatory approach. In the most vulnerable areas like Rajshahi division of Bangladesh where water management is being advocated as complementary to private sector management of water, neoliberal principles still unearth their way into water management under the label "cost recovery" or "cost sharing". The Dublin Principles, which set the scene for incorporating the private sector into water management (Bakker, 2007) also called for vigorous reliance on women to deal with community water resources.. The chapter therefore reviews theories, principles and policies that help to understand the major water management challenges and issues globally that help to replicate the management of water at the community level to national level to set the scene for the case study research.

2.2 Literature Review

2.2.1 Anthropological aspects of Water

Whilst water, in its diverse forms – rivers, lakes, oceans, ice, and rain - has a long history within anthropology, its position in the field has deeply increased in current years. In their 2010 Annual Review of Anthropology entitled "Water Sustainability: Anthropological Approaches and Prospect". Ben Orlove and Steven C. Caton (2010:401) state that water has turn into an "urgent theme" in anthropology. They speak about this to the rising demand for clean water across the world. While water is presently a key area of research within anthropology, this has not constantly been the case. In order to know the function of water in anthropology today, it is essential to pathway the historical route of anthropological inquisition into water. Part of this history was tracked in a 2013 virtual issue of American anthropologist so as to underscored effort on water that has come out in the journal since its beginning in 1888. In their "Introduction" to the issue, Rasmussen and Orlove (2013) link the present well-known position of water in research agendas to *"shifting consumption patterns, local politics, environmental degradation, and climate change."* They also underscore three shifts in the role of water in anthropology. The first is a shift from water as the "contextual backdrop of culture" to water as the "entity of knowledge." The second is a shift from a passive view of water as freely moving all over the world to a view of water as "contested and an entity of social struggles." This shift consists of effort on water as an entity of power as well as water as a source of power. The third shift followed parallel trends in anthropology from views of the researcher as indisputably objective to a period of greater reflexivity and eventually, to more commitment. Water was actually what led Franz Boas, oftentimes referred to as the father of American anthropology, to the field. In 1881, he completed his PhD in physics with a dissertation entitled "Contributions to the Understanding of the Color of Water" which explored the role of light (i.e. the absorption, reflection, and polarization of light) in altering the appearance of the color of seawater (Kroeber 1943). In 1883, Boas set out for the Arctic to further explore seawater and it was during his keep on that he became

interested in local knowledge and traditions (Bohannon and Glazer 1973). Boas did not keep on employing with water in his research but he guided several well-known anthropologists who did, namely Julian Steward and Leslie White. Ben Orlove (1980) identifies the work of Steward and White as the first research stage in his three stages of the development of ecological anthropology. While water played little role in Leslie White's work in anthropology except tangentially in his theory of the role of energy as a determinant of cultural evolution (1943, 1959), water did play a prominent role in Julian Steward's work. Sidney Mintz (1979) tracks the role of water in Steward's work, beginning with "Irrigation without Agriculture," in which Steward (1930) implied that the carry out of irrigation may have been invented separately in the Owens Valley. He builds on this work in his 1938 piece "Basin-Plateau Aboriginal Sociopolitical Groups" where he appraises water as one of the physical restraints on the peoples of the region. In "Cultural Causality and Law", Steward (1949) fully lays out his views in the connection of water and irrigation as part of his general theory of social evolution. Both Steward's multilateral evolutionary scheme and White's unilateral theory affected research in Orlove's (1980) second stage of ecological anthropology. This stage is characterized by nonfunctional and neoevolutionary approaches that drew on White's and Steward's work in different ways. Neoevolutionary approaches drew on Darwinian evolutionary theory to argue the inevitable progressiveness of evolution whereas neofunctionary approaches focused on culture as a series of functional adaptations to the local environment. Neoevolutionary approaches actually took strong hold in archaeology where a large amount research was conducted on the function of irrigation and the development of the state. This work reproduces the move make out by Rasmussen and Orlove (2013) from water as part of the cultural scenery to water both as an object and as a source of power. Karl Wittfogel's (1957) theory of hydraulic despotism is the major example of this neoevolutionary approach. His views were rooted in his statement that some states, mostly in desert regions and seasonal dry area evolved because of the necessity for flood control and irrigation, which required a centralized bureaucracy. He as well argued that states preserved power through the whole control of this limited resource. Nonfunctional

approaches also centered on the evolution of cultural traits as a consequence of the contest over scarce resources. Such approaches also discovered human responses to environmental stress. In this research, concepts such as adaptation, niche, and carrying capacity were borrowed from biological ecology (Orlove 1980:241).Water was subsequently thanked about as part of the characteristics of a niche (e.g. Love 1977), or as part of the limitations of cultivation practices when calculating carrying capacity (e.g. Brush 1975), or as a cause of adaptation (e.g. changing climatic conditions as highlighted by Reyna 1975). Equally neoevolutionary and nonfunctional approaches came into similar critiques, namely that humans do not stay at or under carrying capacity nor is energy the only factor in population growth. These approaches were also criticized for "ecological reductionism" or dipping culture to sets of unrelated practices with ecological elucidations but without "possessing internal coherence" (Orlove 1980: 244). With these critiques, Orlove (1980) argued that a new stage of ecological anthropology was emerging, "procession ecological anthropology," so-called because of the stress on mechanisms of change. Effort within procession ecological anthropology was strongly influenced by Ester Boserup's (1965) argument against the concept of carrying capacity that food production will add to equivalent the demands of a growing population. In the 2005 reprint of Boserup's book, Virginia Abernethy presents a foreword in which she critiques the lack of reflection in Boserup's argument that human attempt to make best use of agricultural yield will result in eternal damages such as erosion and desertification. She also notes that Boserup fails to look at water "as an ultimate limiting resource" (pg. 56). Within anthropological approaches incorporating Boserup's argument, there is a corresponding lack of the reflection of water and only a few researchers (e.g. Bacdayan 1974) look at how water sources were used to expand agriculture.

Besides the coming out of procession ecological anthropology in the 1970s, Applebaum (1987) also identified another area of research within ecological anthropology: hazards. Inside this vicinity of research, he included work on "geographical hazards like earthquakes, hurricanes, tornadoes, droughts, frosts, and floods, along with, there are

human-made hazards like pollution, oil spills, chemical dumps, starvation, and waste dumps" (1987: 206).

Over and above Boserup, structural Marxism also influenced work within this new realm of ecological anthropology. Assessment regarding the lack of attention to power relationships in previous anthropological approaches (e.g. Peet and Watts 2002; Robbins 2004) led to the amalgamation of the political economy into ecological anthropology explorations. This premature work placed anthropology beside other disciplines, most notably geography, in the advance of the field of political ecology (Netting 1996; Derman and Ferguson 2003). This ground now takes in a wide diversity of issues from politics and authority and marginalization (e.g. Bryant 1998; Paulson et al. 2003) to biodiversity and protection (e.g. Escobar 1998) to the role of indigenous/traditional knowledge (e.g. Banuri and Marglin 1993). By means of the coming out of work in political ecology, water began to take more of a innermost role in anthropology. As Whiteford and Padros (2011) reminder, the "mechanisms of water politics became the lens in the course of which anthropologists studied social relations and power differentials" (199). The study not only focused on water shortage as an issue of physical entrée but also on the cultural constructions of the value of water (e.g. Donahue and Johnston 1998; Derman and Ferguson 2003), patterns and levels of access and use (e.g. Johnston et al. 2012), and control over the distribution of water, especially with regards to water privatization (e.g. Bywater 2012; Cole 2012). These scholars have led to a push among anthropologists to develop water lack of confidence scales that do not just determine physical access to water but measure changeability in the quality and quantity of water as well as the psychosocial misery associated with dealing with unbalanced water systems (e.g. Wutich 2009, Stevenson et al. 2012).

Among the most thriving results of anthropologists' engagement in political ecology is that anthropologists have started to employment with ecologists and other natural and social scientists in interdisciplinary associations. Anthropology is exclusively suited to not only discover the political, economic, gendered, and class constraints of ecological

issues but also the historical conditions and cultural values that have led to the current. By itself, anthropologists have been flourishing members of several large-scale teams together with several of the NSF-funded Long Term Ecological Research (LTER) Network sites, particularly the Central Area Phoenix Long Term Ecological Research at Arizona State University and the regain initiative at the University of South Florida. Other than broad ecological work, these projects have also focused sponsored research particularly on water such as Wutich and Brewis's Global Ethno hydrology Study (e.g. Crona et al. 2013; Wutich et al. 2012; Wutich et al. 2013) and Reclaim's Context Sensitive Implementation of Synergistic Water-Energy Systems (e.g. Wells et al. 2013; Whiteford 2012).

Whilst these interdisciplinary partnerships have proved productive, several other anthropologists have pursued ecological and environmental issues in other ways. Ecological anthropology is a large field, occasionally synonymous with ecological anthropology even if there are several scholars who think ecological anthropology to be "one particular type of research in environmental anthropology – field studies that explain a single ecosystem together with a human population" (Townsend 2009:12). Latest work in environmental anthropology and the anthropology of water has been miscellaneous, covering issues from biodiversity preservation (Kottak and Costa 1993; Orlove and Brush 1996), to environmental (in) justice/racism (e.g. Carter 2007; Checker 2005), to risk perception (Costa et al. 1995; Douglas and Wildavsky 1982), to water rights (i.e. the right to water vs. the right over water and water as a commodity) (Boelens and Doornbos 2001; Roth et al. 2005; Wutich 2006).

The increasing concern in environmental anthropology and water is the result of impressive changes to our atmosphere due to the interacting forces of modernization. Though these factors cannot always be spited, several scholarships has chosen to focus on one over the other. Effort within the realm of globalization has focused on water privatization and the commoditization of water resources (e.g. Aiyer 2007; Kaplan 2007) Over and above the threat of globalization in growing health disparities and decreasing

access to natural resources (e.g. Whiteford and Whiteford 2005). These similar issues come into view in work on water and urbanization, while seen in Swyngedouw (2004) who names the "power/money/water nexus" as his conceptual framework and also recognizes the health risk of the urban water puzzle, or the fact that "each form of urban life depends on water but is at the same time threatened by it" (49). Additional work in the anthropology of urbanization and water has focused on the transportation of water delivery, which is not just the physical delivery arrangement but also on what it means to be a citizen of an urban structure (e.g. Anand 2011; Von Schnitzler 2008). Globalization and urbanization have led to other issues as well, such as the growing pollution of our water resources. Barbara Rose Johnston explicitly links development and urban growth to pollution and threats to our freshwater supply in her 2003 article "The Political Ecology of Water" and reviews a number of cases such as Silicon Valley groundwater contamination by the Fairchild Semiconductor facility in San Jose, CA. Pollution of water can have numerous causes together with salinization (e.g. Whiteford and Cortez-Lara 2005) and petrochemicals (e.g. Auyero and Swistun 2009) and is often overshadowed in places where there is an plenty of freshwater resources (Kane 2012). The shortage of sewage services and thus pollution by human waste is another area of research. Jason Lind (2009) combines ethnographic work with water testing to appear at the affiliation between sanitation services, microbial loads, and ethnicity in a rural society in Costa Rica. Kendall (2005) discovers the public health risk of pollution by fecal matter, in this case, in Lima, Peru. In his paper, Kendall observes how residents categorize and set out (or make use of) diverse types of feces. He also talk about the lack of collective organization or reply to the lack of and/or maintenance of utility facility. Merrill Singer and Jacqueline Evans (2013) also look at issues of water pollution, focusing on low income, rural African Americans in Louisiana.

Over and above, exploring issues related to "inadequate sewer treatment" (175-176) and "fertilizer run-off" (176), Singer and Evans also discover the impact of climate change on growing water quality matters. Environmental change is another side effect of

globalization and urbanization and one that many anthropologists have been looking at. Even as researchers in the hard sciences are answering questions about how climate change will impinge on outlook weather conditions, anthropologists are the ones "making strides at relating global warming models to everyday lives" (Brown 1999). Carla Roncoli and colleagues (2008) as well refer to the "irrevocable transformation" caused by climate change to the people and places conventionally studied by anthropologists as well the opportunities for anthropologists to take on in interdisciplinary research as supplementary reasons for a increasing concern in climate change inside anthropology. Crate (2011) analysis the impact of climate change on anthropological research and makes out four areas of place-based community research: ethno climatology, resiliency, disasters and displacement, and resource management, specifically water management. While Crate (2011) does analysis anthropological work related to too little water (Columbi 2009; Gartin et al. 2010; White et al. 2010; Wutich 2009;), she also appraises effort in which climate change's melting of ice and permafrost has resulted in too much water (e.g. Green 2009; Finan 2009; Lazrus 2009).

Shortages of water govern the literature though, and Wutich and Brewis (2014) present a combination of a number of approaches to water scarcity. Probing hypotheses derived from research on food deficiencies, they test these schemes on water uncertainty issues in order to obtain a broader understanding of resource safety. They look at five drivers: ecology, population, governance, markets, and entitlements. The matter of domination covers the wide literature on lack of sufficient infrastructure as a cause of water shortage and covers research such as Gandy's (2008) on the require of entrée to the urban water system in Mumbai slums and Bakker's (2010) work on privatization of water.

2.2.2 Community Participation and Water Management

Here discusses theories and practices of community participation and management of water resources together with principles under which community management of water

can be achieved. The set is to the scene for assessing how the facilities are being managed in the present study.

"Community" is a word that means diverse things to diverse people. Kunfaa (1996) defined it based on social groups that live in a common territory and having one or more supplementary ties. Kunfaa stated that a community is often used synonymously with a village. In this way it is predictable to view a community on a geographical basis such as village or city (Doe and Khan, 2004). Bangladesh's rural water prerequisite deals with communities on a geographical basis. Yet, community can also refer to a group of people with similar characteristics such as the youth, disabled or aged. Willmott (1986), and Crow and Allen (1995) looked at community as a group of people with a universal setting that share a common concern with an agenda to take combined action to achieve a shared aim. As the meanings of community are not consistent, the attempt by the Government of Bangladesh (GoB) and its development associates to put the management of water into perform through stress on community participation can lead to challenging elucidation by water managers and users. This is because the community based approaches presume homogenous communities without due regard to conflicting interests, perceptions and livelihoods (Mehta, 2000). a number of people will see the ability as belonging to the community ("us") and all those who do not hail from such a community will be make out as outsiders ("them"). Uniqueness and belonging may surpass the benefits to be derived from the amenities because Villages are made up of people from different tribes and locations in a country (GSS, 2002a). To this study, referring to a community as a geographical unit in water stipulation can lead to problems because in rural areas of Bangladesh, people mostly refers to a community as where they are born but not on the sharing or prerequisite of resources. This thesis will therefore employ people managing the water institutions and water users to analyze miscellany (ies) within the study area in managing the water amenities. As well, it is easier to develop the involvement of people when they allocate certain traits like culture, religious ideas, and similar socio-economic status, belong to or come from the same area or association. A community, in the sense of

water supply management is a group of water users who subsist in the same region and have access to, and use the similar service (Anschütz, 1996). This realistic definition of community avoids the inclination of being caught in the definition of community that squeezes social and cultural meanings of the notion which can be difficult in the Bangladesh situation. Some academics and development professionals indicate that the most efficient way to provide facilities in communities is to involve them frankly (Watts et al., 2000). Correspondingly, many works have been written exploring issues of community attachment and user participation in the arrangement and the provision of services that assistance them (Barnes and Shardlow, 1996; Cooke and Kothari, 2001; Hart et al, 1997; Hickey and Mohan, 2004; Page, 2003; Warren, 1997). The entire these authors point to the idea that participation is a way of connecting beneficiaries to add more fully in services that meet their needs. Issues of participation and empowerment in planning need:

"Local voices are to be heard. Local perceptions and priorities must be listened to and addressed, and participation by 'beneficiaries' ensured early and meaningfully in decision-making at policy, programme and project levels. Sustainability in policymaking demands that those in power disempowered themselves" (Holland and Blackburn, 1998: 1).

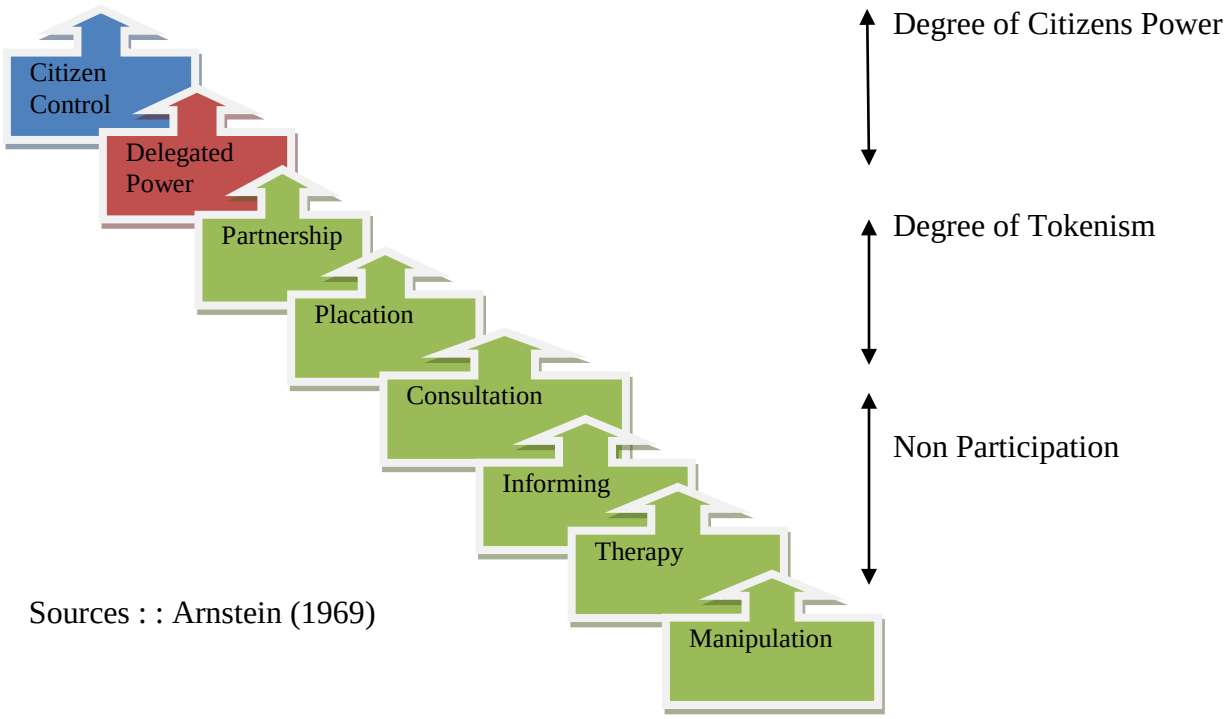
Different writers and development organizations have their own definitions of participation, be it groups or communities. Pearse and Stiefel (1979) for instance defined participation as:

"the organized efforts to increase control over resources and regulative institutions in given social situations on the part of groups and movements hitherto excluded from such control" (in Chambers, 2005:103).

Similarly, the WB also defined participatory development as:

"a process through which stakeholders influence and share control over development initiatives and the decisions and resources which affect them" (WB, 1994: i).

The notion of participation can be related to the rights of people to work out their egalitarian right within the social arena and within the community in order to offer social facilities like water and sanitation amenities (Gaventa, 2004). Participation, arguably has given voice to common citizens by including them in decisions that change their lives, households and communities all over the world. Community participation, akin to supplementary concepts such as development, has been shifting but a general thread that runs all the way through all the definitions is that people have perfectly been given their self-governing right to participate and present their outlooks. Participation has evolved over the years in sense and capacity and is still developing (Chambers, 2005). Chambers (2005: 87) analyzed participation in three ways: who participates, institutions involved, and the objectives and meaning of participation. To Chambers, persons who participate can be local government staff, inhabitants of an area or a mix of together. The institutions involved sort from local government authorities, development committees, self help groups, local concern groups, town or village development committees or women's assembly. Chambers (2005) sees the major functions of participation to consist of making wishes known, generating development ideas, providing local knowledge's, allocation as a laboratory for testing proposals for step up, developing the competence of communities to switch and develop their environment and dealings. Other functions consistent with Chambers are means of representing prop up for a government in power, and responsibility what governments want to be completed. Additional reasons for community participation comprise extracting, developing and investing in local resources like labor and investment. Finally, it is to encourage desirable relationships between people through cooperative employment (Rose, 2003). Arnstein (1969) devised the ladder of participation which has served as a helpful model for presentation community participation in development projects. The model has eight rungs as shown in Figure 2.1 below ladder.



Sources : : Arnstein (1969)

At the underside of the ladder are manipulation and therapy where people never take part in decisions that influence them but the decisions can be said to be imposed on them. The phases of Citizen Control Manipulation Delegated Power Partnership Placation Therapy Consultation informing and consulting are presently telling the people that this and that capacity will be provided in their community. The beneficiaries have no say at this time. At times scheme financiers or governments confer with beneficiaries on projects but they do not take part for their voices to be heard. Placation is a advanced stage of participation where the poor propose, but influential authority holders settle on what should be completed. Partnership is the least form of empowering people Yet, the highest shape of participation according to Arnstein is citizen manage (Watts et al, 2000: 121).

Choguill (1996) criticized Arnstein's ladder on the grounds that authority is not all that people, particularly those in developing countries, seek to accomplish. Yet inside the developed country (USA) where the ladder was applied, residents of low-income communities desire more than presently power to make choices. As, Hyman and Shingler (1999) noted that, citizen participation is not only related to power inside a community but can be intimately associated with economic, social and political issues Arnstein's

ladder can be said to unite the views of common citizens of a community with those of rulers or elders in society to explain the divisions between them, though this seldom happen in real life particularly in developing countries where elders frequently have more say in decision making than normal citizens. Still within elders in a community, there is separation between groups who have their possess interests and cleavages. The ladder seems too easy because it assumes that the elders in a community will try to look for the interest of everybody in the community, which does not happen in real living. Also, the ladder's stress *"on the transfer of power assumes that power has a common basis for users and providers (or policy makers)*" (Tritter and McCallum, 2006: 166). Separation like gender, ethnicity and income at times bring in differences. Organizing legislatures who will be responsible to ordinary citizens can also be a difficulty with Arnstein's ladder. Yet though Arnstein's model has been re-interpreted, advanced, and revised, the majority of the new typologies retain a *"hierarchical approach and uncritically embrace citizen control as the pinnacle of involvement*" (Tritter and McCallum, 2006: 157-158).

Because of the criticisms leveled at Arnstein's ladder of participation, other authors such as Reij (1988); Cernea (1991); Uphoff (1991), Scoones and Thompson (1994) and Pretty (1995) also redesigned a typology of participation based on Arnstein's model. They indicate that a citizen's participation is a decisive module of success in irrigation, livestock, health, water, sanitation and agriculture (Pretty et al, 1995). The authors indicate that achievement is achieved when people's ideas and awareness is valued. In addition, power should be given to them to make their own independent decisions without an external agency's input. Pretty et al's (1995: 61) typology of participation involves reflexive participation, participation in information giving, participation by consultation, participation for substance incentives, functional participation, interactive participation and self-mobilization which are said to be in line with issues that concern people in developing countries (Pretty et al, 1995).

The appreciation level against Arnstein's ladder and the coming out of other concepts like that of Choguill, (1996), Burns et al, (1996), Pretty et al, (1995) and Wilcox (1994)

led to Chambers (2005) to come to the end that writers plan the ladder or typology to fit their particular condition therefore there is no right or final ladder. Community participation: "asserted the importance of placing local realities at the heart of development interventions and the need to transform agents of development from being directive 'experts' to 'facilitators' of the collection of local knowledge and the 'enablers' of capabilities……the power transformations required between 'uppers' and 'lowers' could be achieved through participatory roles to the subjects of development at each stage of development interventions" (Hickey and Mohan, 2004: 11).

Cooke and Kothari (2001) also re-enforced the appreciation that participation benefits people with say and authority more than poor people. They argued that it also benefits men more than women, and it is gender blind. Cooke and Kothari (2001: 3) argued that participation has become the new autocracy: "because the manner in which participation has been critiqued, and the language with which this has been done, has clearly thus failed to affect, qualitatively and quantitatively, the apparent inexorable spread of participation in development".

These authority dynamics of participatory development and its breakdown to engage with the implications of the fundamental processes of development was the main criticism leveled against community participation by its critics (Hickey and Mohan, 2004; Mohan and Skokke, 2000). Citizen control which is at the top of the ladder "can mean manipulation; collective action can mean compliance; and empowerment can mean license to gender discrimination and petty tyranny. Participation can concentrate power and benefits in the hands of men and of local elites. Ladders of participation are not enough. They need to be qualified by ladders of equity. And this may require, authoritative, non-participatory interventions to ensure that those who are poor and weak gain and do not lose" (Chambers, 2005: 107).

Citizen control of power and empowerment apart, Page (2003: 485) points out that community participation is used because of the belief that:

“people only respect something they have paid for. So communities who build, operate and pay for the water supply are considered to appreciate its value more than those who are merely recipients of government largesse or international aid. People only respect what they sense they own”.

It is supposed to be noted here that participation of people who are to gain from a development intervention can be originate not only within the water sector but also in forestry, information technology, education, health agriculture to talk about a few. However, its growing use within the water sector is unequaled. Professionals and writers on community participation within the water sector argue that it is beyond governments of developing countries to supply water through national networks to rural communities, therefore the call for community participation (Page, 2003). This author also argues that the technology (spare parts of boreholes) that is used to run water facilities in rural communities in developing countries can technically be managed by rural communities rather than a sophisticated and luxurious pipe-borne infrastructure foremost to the dependence on boreholes as a basis of water for rural settlements. Finally, the advantage of relying on labor, cash and local raw materials provided by community members is cheaper when one compares the limited resources at the disposal of Bangladesh governments leading to the confidence on community participation.

As a result of the understanding of what participation can do to poor people and how it affects men and women excessively, it has move toward under inspection, particularly its promise of empowerment and transformative development (Cooke and Kothari, 2001; Hickey and Mohan, 2004). While can be seen, the debate on power has moved a step further to empowerment. Empowerment, in this thesis is defined as: “enhancing the capacity of poor people to influence the state institutions that affect their lives, by strengthening their participation in political processes and local decision making” (WB, 2000/2001; 39).

Empowerment can be achieved aggressively as can be seen with a number of guerilla movements however; liberals argue that marginalized groups can bring about revolutionize through the mobilization of people to talk into the power holders of the need for transform (Parpart et al, 2002). Women's empowerment has been brought to development question. This is yet a dynamic procedure which includes their capability to change the obtainable ideologies subjecting them to a minor position to men (Bhasin, 2001). Empowerment consequently aids women to put on access to resources, be in command of their lives, independence and decision-making. Here, women are to be given the ability to develop self-assurance in running their own lives (Cornwall, 2007).

Development planners, scholars, and activists have arrive to the standpoint that empowerment of poor women in the third world is the key to solving some of the problems of poverty, hunger and environmental degradation (World Resources Institute, 1994). Nevertheless, the fixation with how empowerment can be measured by agencies that fund NGOs points to the difficult way in which women's empowerment has been accommodated into development thinking.

In Bangladesh as in other developing countries, some of the main themes under which women were to be empowered comprise; the condition of health facilities especially for women's reproductive health, investment to generate income, and education for the decrease of child and maternal mortality, get better child nutrition and health, to poorer fertility rates, to improve women's domestic role and their political participation, and get better women's economic productivity and growth (Tembon and Fort, 2008). Of late, the condition of water near the house is being stressed in women and development literature (Ivens, 2008; Verschoor, 2008) to facilitate men to help in water provision in order that women can have time to do additional income earning activities or take part in community activities and decisions that influence them. The UN and many NGOs are working to assist the empowerment of women in developing countries, with proposal focused mostly on income generation endorsement to decrease poverty especially in rural areas where the majority of women are poor (Botchway, 2001). In Bangladesh, NGOs

are playing an active role to empower women in order to shift them from current dependency on men. Water provision is identified as one such movement which can empower women.

There are diverse sides to empowerment however, Moser's definition entails: "the capacity of women to increase their own self-reliance and internal strength. This is identified as the right to determine choices in life and to influence the direction of change, through the ability to gain control over material and non-material resources" (Moser, 1989: 1815)

In a parallel way, economic empowerment has been described by Moyle et al (2006: 246) as taking *"into account the economic strength of the individual or group"*.Rissel (1994) on the other hand indicated that there are two aspects to empowerment; psychological empowerment which engaged an increased sense of self-determination within individual or groups; and community empowerment which engrosses political actions with lively participation and redeployment of resources or decision-making that is of assistance to the community. Friedmann (1996: 164) also defines psychological empowerment as a *"Consequence of participating in collective action and gaining greater control over the means to one's livelihood"*. Rappaport (1984) also reveals that empowerment does not have a single meaning and needs to be defined by the people concerned. While can be seen empowerment is a multifaceted phenomenon with numerous aspects and elements within it and these dimensions are directed at individuals, among individuals, within a household, the community or society and nations. Rowlands' (1995; 1997) statement that empowerment should be understood and experienced in diverse ways by different people, and that empowerment should squeeze agency about decision making and option to get rid of inequity becomes vital in analyzing how water provision brings about modify in peoples' livelihoods. Feminists from Bangladesh and other developing countries and women's organizations around the world started to use the notion of empowerment to border and facilitate social justice and women's impartiality in various issues such as deprivation, subordination and exploitation (Awumbila, 2007; Mana, 1996). They

consequently call for transformations of economic, social and political structures at the local,

Community, national and international levels for the betterment of women, their households and the world in general. The above changes would entail a "*redistribution of power*" between nations, classes, races, women and men, or individuals in general and not at the local level alone (Batliwala, 1994). By means of water provision to accomplish empowerment in rural areas is very significant because the confidence on untreated water amenities coupled with the long distances covered to fetch water shows how women at the local level are suffering (Ivens, 2008). Water provision will to some level have impact on improved water supplies and *can "be translated into tangible benefits for women: better health, time freed up for other activities and more productive potential" (UN, 2005: 5).*

There are questions on the methods by which women can be empowered. Even as some see it as being achieved throughout their participation in decision making processes, others like Phillips (1999) argue that participation can produce differential burdens on women as they will still be guilty for major works at home even after being empowered in decision making in community affairs. It is argued by Moyle et al (2006) that time is not available to women to enable them to participate more fully in decision-making both at the household and community levels. Additionally, the cost is too high and works against women in the logic that they are not helped by men even after participation in development activities. This study seeks to enlarge the debate to demonstrate how the new form of participatory approach of CM can lead or not lead to sustainable explanation to water provision in rural communities. CM is discussed in section 2.4.2 below.

2.2.3 Community Management of Water Resources

Community Water Management (CWM) of amenities is not only restricted to the water or environmental sector of Bangladesh and other countries but can be initiate in other areas similar to health, agriculture and education (Schouten and Moriarty, 2003).

Communities are being involved in running resources akin to lands, forestry and mines, and amenities like education and information communication technology. In Bangladesh, the organization of resources and amenities by communities aims to "*maximize community involvement, especially women, in sustainable land, forest and wildlife resources management" (GoG, 2005a: 91)*

Community Management of water resources still though not new in Bangladesh and other developing countries emerged as a leading paradigm within the last decade as a result of: "large scale break down of water supply systems and failure of governments either to provide clean water themselves, or to devise a system where other agencies supply it reliably and consistently" (Schouten and Moriarty, 2003: 1). According to Anschütz (1996: 13) "as a situation, in which a community takes the responsibility for, gets authority over and carries out control on operation, management and maintenance of a service benefitting its members".

Schouten and Moriarty (2003: 2) also described CWM as a condition where communities formulate strategic decisions concerning the stage of service they want, how they desire to pay for it and where they want it; they are as well involved in the day-to-day process and continuance of the system; the community also assemble money from users and buys spare parts, but they do not have to do this if they can hand over professionals to do this for them. Bell (2001) on the other hand argues that communities are involved in the management of water resources as of the require to use indigenous knowledge (IK) and people's vital view for the management and conservation of environmental resources like water. CWM is effectively carried out when the group is small (Anschütz, 1996). CWM is about power and control of water amenities. In developing countries like Bangladesh, before CWM was applied as a major development strategy in the 2000s, water supply amenities were planned and operated by the government or its agencies on behalf of the people (Page, 2003). Nevertheless, budget constraints, low revenues, and feeble operation and maintenance have led to the ruin of facilities even as demand for water has increased (Engel et al., 2005; Karikari, 1996). A lot of NGOs advocated for CWM of water

amenities particularly in the rural areas (WaterAid, 2008) due to the withdrawal of government from providing and managing these amenities. Supporter of CWM yet do not advocate the full freeing of water amenities to the communities but indicate that they should be under government guidance (Altaf et al., 1993; Brookshire and Whittington, 1993; Munasinghe, 1992). Yet CWM is not new inside development circles, a number of main antecedents can be traced to its attractiveness these days. At the 'Global Consultation on Safe Water and Sanitation for the 1990's' conference held in New Delhi in the 1990, a number of failures that were identified throughout the IDWSD from 1981-1990 includes feeble or insufficient involvement of communities in water facility provision. The third principle of the New Delhi Statement points out that:

"Community management is a key to sustaining services for the rural poor and is a viable option for poor urban settlements. Governments should support community management, through legislation and extension, and give it priority in national sector strategies for the 1990s" (UNDP, 1990: Principle 3).

Patron and governments built water plans to dish up large numbers of people devoid of potable water facilities based on the IDWSD's aim of proving 100% coverage of potable water amenities by 1990 (Smout, 2000). Facilities of Water were constructed during the IDWSD in the majority countries but most of them could not be kept up after the donors exited because sustainability issues were not considered (Woods, 1994). For the period of the IDWSD, Partaking of beneficiaries in managing the water amenities was seen by donors as a "time wasting" and time consuming work out in providing resources to scheme staff to arrange meetings with chiefs and elders before meeting the community (Woods, 1994). On the eyes of Woods (1994) the water amenities were not sustained as people were not trained to handle them and resources needed to keep up water points were not obtainable. In Bangladesh, for example, plain tools that could be manufactured locally in case of collapse have to be bought in the city or imported, parting the people with no option other than to relapse to the employ of their conventional water sources, therefore undermining the new water amenities (Karikari, 1996; Kendie, 1993). Bah

(1992) through a detail study of the collision of improved water provisions within one integrated rural development plan - Plan International Project in the Bombali District, Northern Province of Sierra Leone argues that: "rural communities are willing to meet some of the cost incurred by participating in the programme not because of the need for an improved water supply system per se, but because they are interested in the associated benefits of the integrated package" (Bah,1992: 31).

Development agencies providing water amenities in rural communities consequently require realizing the local knowledge of rural people and employing it for the development and sustainability of rural water amenities. The achievement of rural water and sanitation programmes in delivering sustainable rural water services in Bangladesh has been extensively documented by the works of Carter et al (1997). Also, Carter and Rwamwanja's (2006) assessments of the efficiency, impact and sustainability of the rural water programme in Bangladesh shows that the services provided throughout community initiatives were sustainable. Critics argue that CWM has been adopted as a "convenient mechanism to*'pass the buck' when it comes to the complex issue of ensuring sustainability" (Harvey, 2008: 126)* Botchway (2001) argues that the key reason for the amplify in CWM in development projects is to mitigate the state from classic state functions similar to the condition of vital needs such as water as is being promoted by the WB and its other agencies under their policies of SAP and HIPC. There is no explanation for government aid in providing pipe-borne water to urban people who have normal sources of income and who pay out less than 1% of their income on water, whilst the rural poor have to give and run their own water (Botchway, 2001). If a key factor in their poverty status is the shortage of water, forcing them to donate to the terms and management of their own water cannot assist in achieving the MDGs. Additional, asking poor communities to run the capability and women who have been identified as helpless in all aspects of income disparity (GSS, 2008) to formulate decisions and run the water amenities devoid of payment needs consideration. This criticism of CWM was eloquently put forward by Botchway: "a focus on local participation and empowerment can provide

the state with a legitimate opportunity for shirking its responsibilities by dumping them on local areas even though those areas lack the resources needed" (Botchway, 2001: 136).

Along the lines of the criticisms over, it is argued in this study that CWM of water amenities in Bangladesh's Villages and small town will bring about collective action problems. Communal action: "refers to any situation where several or many individuals cooperate in order to produce some collective good. A collective good on the other hand is any good or service provided to the members of such a collective group through the efforts of some or all of its members" (Smith, 2010: 232).

Communal action problems are faced by every species. In accordance with Olson (1965), people look "Social dilemmas" in achieving collaboration when the finest shift from a egotistic point of view of an individual does not produce the best collective outcome that is desired. Human beings are however best at solving their collective action problems and in the long run avoiding the "tragedy of the commons" (Bolo, 2011.102).

Communal action problems have been significant issue that encumber not only the management of environmental resources other than resources in common. Diverse models and metaphors have been used to explain the communal deed problem such as Samuelson's (1955) underprovided public goods notion. Hardin (1968) also brought the calamity of the commons and Hume (1978) brought the free-rider difficulty even as Hobbes (1991) postulated state of environment. Comonly, communal action problem is a condition where individuals, the stage in a group allocate a common production. They yet all individually have choices for actions based on their own anticipation of benefits they expect to gain from the activities. A variety of models have been developed and applied to determine the communal action problems of resource management (Hobbes, 1991; Smith, 1981; Ostrom, 1990). Though, communal action problems enlarge as the size of the group enlarge. Additional variables that influence the organization of combined action consist of physical immediacy, homogeneity, language and the charisma the

guidance of the group posses (Glasbergen, 2010). Under these situations, the costs of coordinating the group turn into higher and communal action is less probable to occur (Carlsson, 2000). There is consequently required for an outside force to control the group and answer the communal action problems (Glasbergen, 2010).

Yet, communal action problems exist inside CWM of water amenities, the United Nations Development Programme (UNDP, 1993) pointed out that CWM is a plan that empowers those affected by a development scheme to get liability for initiating, implementing and maintaining the scheme for sustainability. This does not engage presently participation in the building of the scheme. Additional supporters of CWM observe it as another path to development that will diminish the ills of neoliberal policies of state removal from the provision of vital services to the people (Korten, 1990). The proponents indicate that the strategies have to be elastic and locality-based for communities to take manage of their own destinies (Burkey, 1996; Chambers, 1997). Bell and Franceys (1995: 1177) points out that "Attractive slogans like voluntary initiative and the role of women, both of which underpin much development work, raise many searching questions".

This interpretation the flaws in the social and moral concepts of community on which the water and sanitation decade of the 1980s was based. Caution was made by Bell and Franceys (1995: 1177) that; "communities lacking the modern management skills, those which do not conform to the new "model community" image or who do not display the necessary consumer individualism, will once again become obstacles to development to be excluded on grounds of their irregular incomes and weak institutions".

A number of proponents even refuse any shape of company with the state or the private sector as espoused under neoliberal principles of private-public-partnerships and as a substitute, advocated for communities to carry out all development efforts by themselves (Escobar, 1997; Esteva and Prasak, 1997) Schouten and Moriarty (2003; 2) noted that "is about communities making strategic decisions of: what level of services they want, how

they want to pay for it, where they want it. The community may also be involved in the day-to-day operation and maintenance, in collecting money from users and in buying spare parts - but they do not have to be. They may choose to hire a professional to do this for them. CM is about empowering and giving control".

These characteristics can be said to equivalent "citizen power" on the rungs of participation and is an exacting shape of participation that is being promoted by critics of neoliberal policies (Escobar 1997). As well, Schouten and Moriarty (2003indicate that a variety of communities and countries accept their own method of managing their water points and a number of form of exclusivity is said to be present in all communities Harvey (2008).Yet differs with the thought of uniqueness in CWM in countries and argues that, CWM has been implemented consistently throughout the developing world. He again argues that, the plan did not have the much needed impact owing to problems like sustainability of the amenities. He calls for many *"checks and balances"* inside communities themselves to keep up the water infrastructure although he did not speak what these checks and balances should be. A number of these checks and balances can hail from diverse interest groups inside the communities, akin to chiefs and assembly members asking for accounts to be audited. Or else, governments can argue in outlook that they were not liable for rural water services as these are 'community managed'. These checks and balances of CWM as followed by the international community are what the conversation turns on in the next part.

2.2.4 Human Rights

Traditionally, the accomplishment of human rights is measured foundational to the advancement of human civilization. The process of human rights through the English Magna Carta (1215), the United States Declaration of Independence (1776), the French Declaration of the Rights of Man and the Citizen (1789), and the United Nations Universal Declaration of Human Rights (1948) are among the most significant human rights manuscripts (Khadka 2010). Besides the Universal Declaration of Human Rights,

the UN General Assembly has also approved declarations ascertain the human right to water and also to food, work, health and housing. Corresponding to other researchers who employ UN definitions to appraise the wellbeing of particular societies (Davidson-Harden et al. 2007; Khadka 2010:38; Langford 2005: 275), my judgment in this study is that right to use water, particularly to Ganges River water, is the precondition for other human rights.

Article 25 of the Universal Declaration of Rights highlights on standards of living and well-being and spells out the requirement for universal access to food, water, clothing, housing, health care and social services. The human right to water is foremost revealed in the 1966 UN Covenant on Economic, Social and Cultural rights and in 2002 articles 11 and 12 of the convention were revised to take in guidelines for protecting basic water rights (Dennis 2003; Khadka 2010; Klawitter and Qazzaz 2005:253; Irujo 2007; Langford 2005). International water law agreements such as the Helsinki Rules (1966), the UN Watercourses Convention (1997), and Berlin rules (2004) also provide to carry on the water as a human rights argument and endow with detailed recommendation in support of the improved governance of international waters (Khadka 2010:42). Most recently, in 2010, the UN General Assembly taken on a additional declaration recognizing "the right to safe and clean drinking water and sanitation as a human right that is essential for the full enjoyment of life and all other human rights" (General Assembly Resolution 64/292 as cited in Sultana and Loftus 2012:1).

UN declaration has limited legal authority even within signatory countries and, as Bakker (2012) and Sultana and Loftus (2012:10) highlighted, the right to water can denote very special things to special people. However, a increasing number of scholars are currently evaluating the actions of governments and firms regarding the international standards chart in international water agreements. Record of human rights failures, at a smallest, lends ethical authority and political influence to the arguments of community associations and social movements advocating for advance water access. Langford, for example, is reminders that all households in South Africa have the right to take delivery of 25 liters

of free water, in line with the rule that water is a human right. Equally, in Chile, following World Bank guidance, water companies charge clients the full cost for water but the government grants subsidies to water companies so they can provide a basic amount of water free to low income families. Langford also notes, yet, that execution of these policies have been difficult in both countries (2005:277). In South Asian Countries for instance Sri lanka, by contrast, Langford (2005: 277) notifies us that water prices doubled overnight, for rich and poor alike, when a public water efficacy was privatized, a shift made by the national government so as to make the system striking for foreign investors.

Irujo (2007) argues that water rights security is a key precondition for other human rights derived from the United Nations (2002) principles of respect, protect, and fulfill. Klawitter and Qazzaz (2005:253) concentrate on the status of human rights in a number of Middle Eastern countries highlighting on water quantity, quality and cost for domestic use. They reveal that the right to water must be supported due to its significance to human survival, security and capability construction (Klawitter and Qazzaz 2005:255). Water management should be arrangement, they argue, in order to guarantee these freedoms derived from impartiality and social justice approach. From this viewpoint governments are also liable for defending their citizens from the control of a third party akin to the International Monetary Fund or the World Bank. Neoliberal economic policy and structural adjustment programs should not be permitted to reduce the right to water.

2.3 Theoretical Aspects

The following theories thematically suit with the present study:

2.3.1 Entitlement

In the theory of Entitlement (1981), Sen explores poverty and famine with the framework of possession that is coincidental to the present study. Entitlement theory is centered around deciding how individuals' dependence on the different foundations that administer access to sustenance—creation, exchange, work, and moves (e.g., from family or

government) — put them in danger of starvation (Sen 1981). "Entitlement" depicts an individual's capacity to acquire nourishment legitimately through different institutional channels; entitlement failure happens when, drawing on this assorted arrangement of organizations, an individual can't acquire enough sustenance to endure. As of late, Anand (2010:188) has contended that the use of entitlement to water research—and the related acknowledgment that water shortage is a issue of who gets an asset, not its amount exists. Different researchers have likewise underlined the worth of entitlement attention on financial organizations in clarifying how water weakness emerges (e.g., Butterley and Sheperd 2010; Mehta 2006). Until this point in time, just a couple of researchers have unequivocally adopted a qualification strategy to analyzing how mind boggling, interlocking institutional courses of action shape water access and weakness. Chalaune's (2009) examination of water uncertainty in Nepal, for example, investigates how entitlement connected to the state, nongovernmental associations, neighborhood authority and chieftainship frameworks, and connection progressive systems produce water uncertainty for some social classes. As this model illustrates, a specific bit of leeway of this methodology is that it can encourage the examination of various foundations inside the equivalent hypothetical structure. Past the bunch of concentrates that expressly use entitlement, a developing number of concentrates additionally utilize related methodologies to see how the coupled elements of socio-ecological frameworks produce nourishment or water instability (Eakin and Luers 2006; Nelson et al. 2007).

This theory is extremely relevant to the present study as various communities in the study area have water with limited accessibility. Thinking at state level, on the other hand, Bangladesh has profound water bodies albeit it entitles a little water due to the failure of national level negotiations with international communities. Undertaking these issues, this theory helps looking at how state level policy and local elite delimit poor people’s access to water resources.

2.3.2 Hydraulic Despotism

Hydraulic despotism is a theoretical ground for internalizing water governance in the world and particularly it has practical relevance in Bangladesh. Derived from Oriental Despotism, a hydraulic despotism refers to a social or government structure which keeps up power and control through restrictive authority over access to water (Wittfogel 1950). It emerges through the requirement for flood control and water system, which requires focal coordination and a particular bureaucracy. Regularly connected with these terms and ideas is the thought of a water tradition. This body is a political structure which is normally described by an arrangement of chain of command and control regularly based around class or rank.

Wittfogel contends that climate made a few pieces of the world create more elevated amounts of development than others. He is known for guaranteeing that climate in the Orient prompted dictator standard. He views that climatic and ecological determinants have been the focal factor deciding the ascent and fall of empires. This natural determinism comes to shoulder when thinking about that in those social orders where the most control was displayed, this was ordinarily the situation because of the focal job of the asset in monetary procedures and its earth restricted, or obliged nature. This made controlling free market activity simpler and enabled an increasingly complete imposing business model to be set up, just as forestalling the utilization of elective assets to redress.

Anthropologists have explored the recursive affiliation between political understandings and cosmological belief systems. Narrow legal definitions of property have been challenged throughout the consideration of more miscellaneous ways of owning and scheming resources. Analyzed of material culture have exposed how it extends human society, with having agentive capacities itself; and studies of transportations have underscored their role in composing socio-technical and political relation. Such approaches are readily applied to water and the material culture through which it is managed and utilized. Illustration on historical and ethnographic research on water in

Bangladesh and India, this paper outlines changing relationships between cosmological beliefs, infrastructure and political arrangements over time. It recommended that a present trend towards privatized, transnational water ownership potentially opens the door to the coming out of new 'despotic regimes.

In 1957, when Karl Wittfogel recommended, through a study of water and governance in Asia, that there was an inherent connection between the control of water and political power, he had small complexity in persuading the academy that this was a rational assumption. each human society, all over history and across cultures, has custom and frequently worshipped water as the most crucial component and as the generative basis of health and wealth. The concept of a main relationship between the material control of water and political power was consequently unquestionable: how could it not be authorizing to express the most vital of elements?. More arguably, Wittfogel highlighted that centralized control of water permitted 'despotic regimes'. He proposed that the formation of key irrigation infrastructures had both necessitate and right centralized forms of governance, behind the coming out of hierarchical and despotic states. The thought of a recursive relationship between physical and political structures pleaded to those eagerness in how power is materialized. Marvin Harris (1979), for example, placed infrastructure as the prime mechanism through which societies prepare relationships with environments. Afterward, STS analyses explained technology as 'a political phenomenon' in which particular 'affordances' are promoted by symbolic discourse and ritual, and infrastructures give to the composition of social relations (Foucault, 1972; Pfaffenberger, 1992: 282,284; Anand, 2012). Pfaffenberger noted how, in Sri Lanka, "virtually every aspect of social life including family life and worship was designed along with the dams and canals" (Ibid: 291; see also Pfaffenberger, 1990). But Wittfogel’s explanation also sparked substantial criticism, from Sinologists promoting a extra nuanced vision of Chinese political arrangements (Needham, 1954-2008), and from those with vary theories about state formation and development (Carneiro, 1970; Hocart, 1970). In the course of last fifty years, even if scholars have remained mainly in agreement that there is an

significant relationship between power and the control of water, closer explanation of the ways wherein water intersects with social and political relations have revealed a extra complex image recognizing that a lot of kinds of power – not just despotic regimes – are allowed throughout its control and management (Lansing, 1991; Glick 1996). Equally, drawing on analyses of material culture exploring the agentive capacities of artifacts (Gell, 1998; Tilley, 2007; Boivin, 2004; Knappett and Malafouris, 2008), supplementary turned these theories towards normal resources and the infrastructural pacts through which these are controlled (Strang, 2004, 2015; Boivin, 2008; Harvey and Knox, 2010). It is clear that – whether artifacts or elements – the meanings and potential agency of objects can shift with changes in social and political context (Appadurai, 1986). As Caton and Orlove (2010) view, water flows through and joins a lot of realms of social life, and there are numerous ways to understand and value it (see also Helmreich, 2011). These multiplicities turn out a diversity of institutions and processes for managing and distributing water resources, all of which state not only social but also political relations. Here actually focuses on the association between water and power, addressing in special the role of infrastructure. It describe on a number of areas: current work on the a lot of dissimilar ways in which water can be owned; notions of human-environmental relations; and theories concerned with organization and materiality. It views that a vital component – often neglected in analyses of water and power – are the fundamental cosmological beliefs and values (religious or secular) which replicate and assert societal arrangements. For example, it represents concentration to an vital relationship between the development of large-scale water infrastructures and the euhemerisation (humanisation) of religious deities (Strang, 2014a). The clearest determine of social and political parity is the supply of property rights (Widlok and Tadesse, 2005). There are numerous ways in which the rights and control of vital resources and related material systems can be allocated. Yet when these are held by a centralised government, the state may approve quite diverse roles. It may (as Wittfogel suggested) work as 'other' to the people and impose a despotic regime; it may obtain on a fatherly task as a agent 'of' the people; or – underpinned by cooperative ownership arrangements –it may work more directly 'as' the people

(Alexander, 2004). There is also a query about whether centralised control leads, certainly, to forms of empowerment that estrange those 'in charge', and this latent is nicely illustrated by Herzfeld's study of how bureaucracies turn into 'indifferent' to the populations they are intended to hand out. The prospective for such alienation – certainly a key principle for 'despotism' – is rationally increased when such governance is considerably removed from the social and political systems able to require responsibility. A procedure of hierarchy formation and the coming out of governing elites are evident in long-term trends towards the inclusion and privatization of land, water and other resources, which has brought about a serious modify in property and social relations (Hann, 1998). This domination has often subsumed more combined arrangements and the present study argues that, in so doing, it has methodically disenfranchised the most of human and nonhuman beings, placing the control of water and power in fewer and fewer hands. There are outstanding gender issues too withdrawal has tended not only to put back general water ownership with that of elites, but has also favored male control of water and power (Coles and Wallace, 2005; Lahiri-Dutt, 2006). In some countries, it has turn into general to bring private companies into public-private partnerships (PPPs) to handle the outfitted side of urban and rural water supply and agricultural irrigation, as public rights of expensive-to-maintain infrastructure has often been keep. In America, for example, there has been a steady increase in PPPs, and today "more than 2,000 facilities from New York to California are operated in public-private partnership contract arrangements" (National Association of Water Companies, 2012). A number of these involve major transnational water companies such as Veolia, Suez Environment and RWE. Globally, The World Bank and The International Monetary Fund have endorsed water privatization as a way of enabling developing countries to deal with general debt issues (with varied responses), and water companies in industrialized countries have turn into increasingly good-looking to private investors. Consequently Wolff and Palaniappan (2004: 1) view that "the number of people served by private companies has grown from 51 million in 1990 to nearly 300 million in 2002. Six water companies alone expanded from 12 countries in 1990 to over 56 countries by 2002". There are a variety of diverse

formulae for the ownership of water in these complete and semi-privatizations, but every focus mainly on the gaining of rights to conceptual, seize, straight and distribute water, therefore conferring material control over it. Known the broad inclination towards privatization globally, it is functional to believe cases where there has been a famous enlarge in the gaining of water rights by transnational corporations. In the UK, the ownership and control of freshwater was sold to major transnational corporations in 1989, through the direct privatization of the water supply industry. National legislative bodies, the Office of Water Services and the Environmental Agency, have found it difficult to regulate these effectively (Bakker, 2003, 2005; Strang, 2004). In Australia, with de facto privatization (through water trading schemes and the sale of abstraction licences) major irrigation companies have been bought up by large transnational corporations, with similarly ineffective regulatory protection for local, social and ecological needs (Strang, 2013).

The first thinks the privatization of domestic water supply in Bangladesh; the second examines the changing ownership of major irrigation companies in Bangladesh. In both cases, it endeavors to link key gaps between the literature concerned with property and that which compacts with material culture and agency, and taking into account how social and political relations are materialized through infrastructural developments. It's vital premise is that the shift of legal or de facto ownership and control of water into private hands, coupled with fragile regulatory mechanisms, represents a decrease of state power and a associated shift of political trend to an international network of intercontinental corporations responsible mainly to shareholders and market forces rather than to the populations of these countries. Aiming to promote further research and debate on these issues. What occurs when the control of freshwater is put in the hands of companies physically situated outside national and societal boundaries? What types of associations come out between intercontinental corporations and local and regional communities and environments? What is the substance and community responsibility of water transportation in these relationships? And is there a actual risk that transferring the power

of water and supply infrastructure to outside bodies opens the entrance to 'despotic' behaviors? Popular pictures of despotism tend to represent it as evil and absolute. However, properly speaking, despotism simply means unaccountable, unregulated and, above all, dictatorial. Despotism can really be evil and indifferent, but it can also be progressive and search for benefit society.

2.3.3 Political Ecology

Political ecology is closely connected with the present study since it aims to explore about water management and crisis from deep anthropological understandings. Political ecology is a domain that undertakes the study of relationship among various factors that influence ecology and its element namely water. Political ecology studies cultural formation and human activity that deal with the environment. Political ecology consequently envelops the issues of the conflict of individual interests and the potential for arrangement that lie at the core of political economy, and its worries with our organic and physical condition and accentuations on all encompassing investigation that associates with the more social and power-focused field of political economy. Currently, political ecology has acknowledged connections with gender and social development research. Nonetheless, normal presumptions over the field give it importance. Raymond L. Bryant and Sinéad Bailey (1997) have created three major presumptions in rehearsing political ecology:

- First, expenses and advantages related with natural change are conveyed inconsistent. Changes in the earth don't influence society in a homogenous manner: political, social, and monetary contrasts represent uneven conveyance of expenses and advantages. Political strategic maneuvers a significant job in such disparities.
- Second, this inconsistent ecological distribution definitely strengthens or decreases existing social and financial disparities. In this suspicion, political ecology keeps

running into political economies as any change in ecological conditions must influence the political and financial business as usual.

- Third, the inconsistent circulation of cost and benefits and the fortifying or lessening of previous disparities hold political ramifications as far as the modified power connections that are delivered.

Political ecology is an inter-disciplinary research field tending to nature – society interrelations, frequently with an emphasis on conflicts and battles over land and common assets. Power asymmetries and social disparities are basic purposes of flight, and numerous researchers in the field seek after a sort of emancipatory commitment with subalterns or minimized individuals whose employments rely upon the neighborhood asset base. Anthropologist Eric Wolf was the first to utilize the term in line with political economy with its contemporary significance. Wolf proposed that: ‘we shall need to combine our inquiries into multiple local ecological contexts with a greater knowledge of social and political history, the study of inter-group relations in wider structural fields (1972: pp. 204–205)’’. As indicated by Steward, the culture core' of society is an adjustment to a particular natural setting, interceded through the innovation or type of subsistence of that specific culture (Steward 1955). He felt that the key inquiry to pose in cultural ecology is the means by which individuals bring home the bacon, and that once one comprehends the subsistence framework, parts of culture and social association pursue.

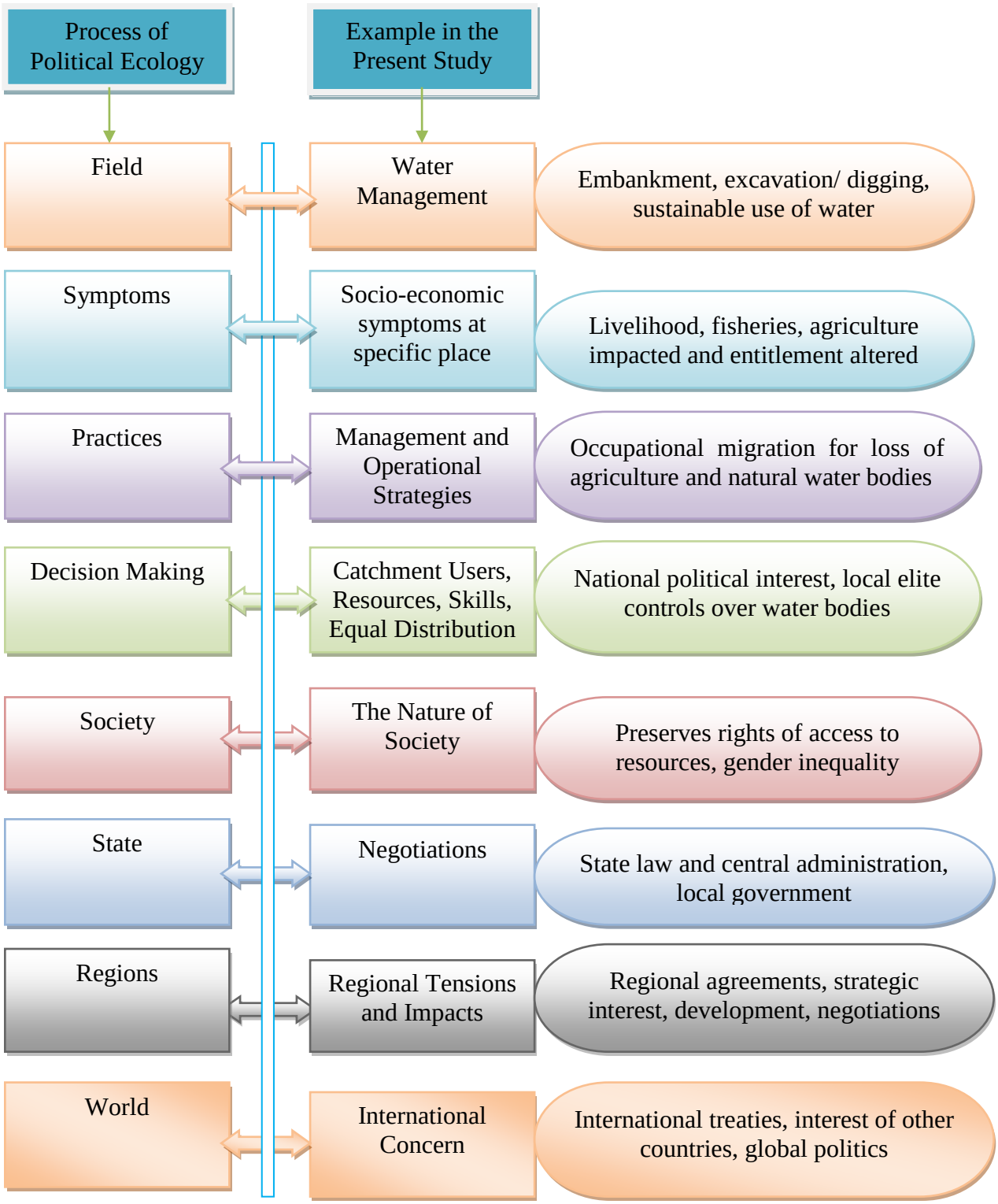
Another of Steward's persuasive understudies was Roy Rappaport. In 1968, Rappaport distributed the much examined book Pigs for the Ancestors: Ritual in the Ecology of a New Guinea People, where he applies a type of frameworks hypothesis to catch the communication of culture, as custom, and nature. In a spearheading study, Piers Blaikie and Harold Brookfield (1987) address the issue of land debasement. Political ecology endeavors to give studies just as options in the interchange of the political, monetary and social elements. Robbins (2005) affirms that the control has a regulating understanding that there are all around likely better, less coercive, not so much exploitative, but rather

more maintainable methods for getting things done. From these suppositions, political ecology can be utilized to:

- Inform policymakers and associations of the complexities encompassing condition and advancement, subsequently adding to better ecological administration;
- Understand the choices that networks make about the common habitat with regards to their political condition, financial weight, and societal guidelines;
- Look at how unequal relations in and among social orders influence the common habitat, particularly in setting of government strategy.

Ecological elements—including regularity, aridity, dry season, and environmental change—likewise contribute altogether to water shortage. For example, transitory developments permit pastoralists and their groups to get by in bone-dry and dry spell inclined situations (e.g., Dyson-Hudson and McCabe 1985). On the other hand, pastoralists' development can significantly undermine their capacity to flourish in erratic bone-dry atmospheres (Ellis and Swift 1988). In agrarian and urban networks, as well, social frameworks overlay environmental ones and intercedes human access to water resources.

Figure 2.1: Relevance of Political Ecology to Present Study



(Source: Adopted from Matthews 2012 with modification as per understanding of the present study)

Escobar in particular, is a well known development theorists for his contributions to political ecology. While Robbins (2012) reveals, the field of political ecology has arisen from the convergence of a number of areas of study together with cultural ecology, environmental history, development studies and political economy. Distinct from development studies, yet, political ecology essentially involves a stress on the environmental as well as the political.

As a leading figure in the world of political ecology Piers Blaikie is particularly well known for his work on environmental degradation (Blaikie and Brookfield 1985). Blaikie reveals the multifaceted relationship among policy makers, politicians, consultancy firms, aid agencies, civil society and NGOs and the inclination for their communal efforts to keep out the voices of marginalized people from decision-making processes (Blaikie 1985). As a result, ecological justice movements have arisen, in the entire south particularly, and political ecologists have more and more been drawn to text and shore up these movements. Blaikie mentions the work of Robbins (1998) on the ecological aspects of development in Rajasthan, India and his opinion that rendezvous between southern and northern activists can turn out a better ending of than merely local movements.

A little, though not all, political ecologists also directly check the ways in which diverse social groups “erect” their ideas of “nature” and observe how those constructions prop up or destabilize political structures and processes (Robbins 2012:122-138). Bruno Latour, yet, in Politics of Nature: How to carry the Sciences into Democracy, disparage the field of political ecology for its affinity to endorse a plan of nature that has been constructed through western science. Latour suggests the restitution of political ecology through the “depoliticization of science” (1998). This depoliticization will only be achievable, he argues, when sciences appears of modernism and negotiate the discuss of hierarchy (Latour 1998).

Mann (2009) argues that political ecology should be more Gramscian in move toward in order to integrate the “ethico-political” ingredient of Gramscian analysis. Ethico-politics

in this situation refers to the ethical struggles that notify political debates. Mann (2009:336) consequently argues that, “what is of interest is more than the discursive production of nature; it is a nothing less than a moral ecology”. Mann suggests that the ethical ecologies that resist hegemonic processes turn into part of the historical process by which ecological amend occurs and that political ecologists should line up themselves with the ethical ecologies that prop up ecological justice movements and resist processes of marginalization. This view is accordingly very constant with that of Escobar where isocracy is the most liable conclusion the existing hegemonic processes informing the sustainable development plan.

2.3.4 Water Governance

The theory of environmental governance broadens the view of how resources are deal with to consist of much more over the government regulations shaped as part of a prescribed management system. These broader outlines take in the roles of community members, advisory groups, interest groups, lobbyists and NGOs (de Loë et al. 2009; Wagner 2009). Governance theory also make out the role of values in determining decision-making processes and the fact that diverse governance approaches coherent with different types of human/water relationships. Wagner (2013:7) argues that, “if our goal is to live sustainably within the watersheds we inhabit, then we need to understand watersheds as socioecological systems, as whole systems, not systems that are sometimes social and sometimes ecological, and not always both at the same time.” Hastrup (2013), similarly, argues that “water worlds,” take form derived from the link among river flows, seasonal patterns, vegetation and habitat as well as cultural practices.

A socioecological approach to governance is appropriate to present research since it could assist support community voices in water management and hold an ecosystem-based approach. The ecosystem notion has its inadequacy, as a lot of scholars have mentioned, but it is suitable to the present study due to the vest reliance of marginalized households in Char Ashariadaha on the environmental services of the Ganges River basins.

An environmental approach that is comprehensive of the social relations entrenched inside it is dependable with the surveillance by Orlove and Caton (2010:402) that water is a "total social fact" that necessitate to be understood holistically. On that basis they significantly explore the Integrated Water Resources Management (IWRM) approach due to its affinity to incorporate only specific resource sectors in management processes and to limit IWRM boundaries to national boundaries (Orlove and Caton 2010). Disparaging excessively techno centric and bureaucratic approaches, they argue for insertion of cultural factors and the incorporation of different sectors and groups at regional, national and international levels. More willingly than the World Bank's assessment of water as a commodity, Orlove and Caton appraise water as a human right and highlight the social justice phase of water policy and governance.

Researcher Wagner (2009) recommends distributive, multi-level water governance approaches that make easy the participation of both formal and informal institutions in decision-making processes. He reveals that this approach will be further helpful than centralized, state-dominated water management systems if the objective is to conserve ecological spirit as well as economic sustainability. Dealing out authority along with institutions at diverse levels inside the total system, he reveals, is also additional democratic and can generate a structure of checks and balance among rival groups. Rooted in his research in the Okanagan Valley in British Columbia, Wagner reminders that governance systems, which are extremely centralized in formal terms, can perform more similar to distributed systems in observed, other than that legislative transform should be made to recognize the rule of joint authority by institutions at diverse levels and to put off one-sided decision-making by central authorities (2009:5). Lebel et al. (2005) highlight more openly than Wagner, on the issue of scale in their research of Mekong Delta water governance, noting the concurrent attendance of spatial, temporal and jurisdictional scales. Multi-scalar institutional networks engender their own sole political dynamics and diverse actors' interests "constrain, create and shift scales and levels" (Lebel et al. 2005:2). Governance networks are powerfully influenced by local

development record, through international development institutions like the World Bank, class relations and by hydrological and ecological factors together with climate change. Preferably, a multi-scalar system will take in mechanisms for including marginalized groups at diverse scales and will offer them with real power in decision making processes. Finally, the governance approaches that are mainly helpful to present research are those that highlight on social justice and human rights matters and on the rule of equity and environmental sustainability, since opposed to the additional thin approaches that highlight on solely economic aspect of water.

2.4 Conceptual Framework

2.4.1 Water Management in Bangladesh

Water Resources Management intends at managing the tasks required to generate water and produce water related goods and services for the assistance of the society as a whole. It comprises physical intervention, related financial management, institutional arrangement, legislation, and regulations as well as human made infrastructure, institutional arrangements to regulate and control the availability and access of users to these components. Water management in Bangladesh is a critical concern owing to growing demand and increasing divergence between alternative uses. Demand for water is growing swiftly in agriculture mostly from irrigation for cereal production, the urban and industrial sector, fishery, inland navigation and salinity control. The supply of clean and uncontaminated water has fallen far short of demand owing to insufficient flows in the Ganges, pollution caused by the disposal of effluents and chemicals, salinity intrusion in the coastal area and arsenic contamination. Additional, the accessibility of freshwater is highly seasonal depending on the presence and duration of the monsoon. The incidence of both flood and drought in a yearly cycle profoundly affects river morphology. In view of the entire abstractness, Bangladesh has diverse national policies for different key sectors to accelerate the balanced way of Water Management improvement. Unfortunately, Bangladesh did not have any water policy at the very early stage after

independence. All the activities used to be conducted on the basis of the country's experience and expediency at that period. However, after realizing the fact that, water is not an infinite bounty of nature, rather it is a finite and scarce resource; the necessity of a sound water policy then came in front of the political authority of the state. There are several policies and acts for formulating the rules and regulations on general usage on water. The key policies and acts are: a. National Water Policy (1999); b. Coastal Zone Policy (2005); c. Coastal Development Strategy (2006); d. National Water Management Plan: Development Strategy (2011); e. Bangladesh Water Act 2013. This study identifies various geographic, socioeconomic, political and environmental factors that shape the water management issues and challenges in Bangladesh.

2.4.2 River ecosystems

River ecosystems are flowing waters that drain the landscape, and include the biotic (living) interactions amongst plants, animals and micro-organisms, as well as abiotic (nonliving) physical and chemical interactions of its many parts. River ecosystems are part of larger watershed networks or catchments, where smaller headwater streams drain into mid-size streams, which progressively drain into larger river networks. River ecosystems are prime examples of lotic ecosystems. Lotic refers to flowing water, from the Latin lotus, meaning washed. Lotic waters range from springs only a few centimeters wide to major rivers kilometers in width. Much of this article applies to lotic ecosystems in general, including related lotic systems such as streams and springs. Lotic ecosystems can be contrasted with lentic ecosystems, which involve relatively still terrestrial waters such as lakes, ponds, and wetlands. Together, these two ecosystems form the more general study area of freshwater or aquatic ecology (Allan 1995).

2.4.3 Char Land

Char a tract of land surrounded by the waters of an ocean, sea, lake, or stream; it usually means, any accretion in a river course. It includes all types of bars including both lateral (point-bars) and medial (braid-bars). In the dynamics of erosion and accretion in the

rivers of Bangladesh, the sand bars emerging as islands within the river channel (island chars) or as attached land to the riverbanks (attached chars), often create new opportunities to establish settlements and pursue agricultural activities on them. A distinction should be made between island chars, which are surrounded by water year-round and attached chars, which are connected to the mainland under normal flow. Once vegetated such lands are commonly called chars in Bangladesh. Chars in Bangladesh can be considered a 'by-product' of the hydro-morphological dynamics of its rivers. The Irrigation Support Project for Asia and the Near East (ISPAN) study indicates that the chars that are not eroded in the first four years of their emergence could be used for either cultivation or settlement by the end of these four years.

BBS report of 1997 suggests that in the relatively lower reaches, where land is more fertile, cropping intensity in the chars appears to be between 150 and 185, which is quite similar to the average intensity of 165 for the entire country. However, the island and attached chars appear to be less productive than adjacent mainland areas. The major reasons for this are the relatively less favourable soil conditions in some of the chars, uncertainties caused by erosion and frequent floods.

Although both river water and groundwater are abundantly available in chars, irrigated crops are scarce in many of the chars except for the ones within the Meghna river. Forestry has also been successful in some of the chars. The perennial availability of water in the rivers provides year-round opportunities for fishing to many of the char communities. Many of the chars have extensive areas of grasslands. These are used as grazing lands for the cattle. Catkin grass, which grows quite extensively on chars during the early period of vegetation, is used as thatching material. In some chars there are good prospects for sand mining, which can be properly exploited to benefit from the increasing demand for sand as a construction material. The chars are extremely vulnerable to both erosion and flood hazards. Recent analysis of time series satellite images indicates that over 99% of the area within the riverbanks of the Jamuna had been char at one time or another during the 27-year period of 1973 to 2000. The same analysis shows that about

75% of the chars persisted between one and nine years, while only about 10% lasted for 18 years or more. In certain areas, however, the chars can be quite stable (for example, in the Upper Meghna area).

During the period of 1984 to 1993, char areas increased in all rivers, except in the Upper Meghna. The net increase of chars during this period amounted to 36,000 ha. The effects of riverbank erosion and widening of the river channel on the people living in chars have been significant. Each year a large percentage of the chars get flooded. The flooding, if it comes early, can damage the crops in the fields. People in chars build their homesteads on the highest available land and, if they stay there for any length of time, they further elevate their homesteads on built-up plinths to avoid annual inundation. The island chars are found to be flooded more extensively than the attached chars. Among the chars within different river reaches, those within the Ganges are found to be most extensively flooded.

Chars in Bangladesh have been divided into five sub-areas: the Jamuna, the Ganges, the Padma, the Upper Meghna and the Lower Meghna rivers. There are other areas of riverine chars in Bangladesh, along the Old Brahmaputra and the Tista rivers. But compared to the chars in the major rivers, these constitute much less land area. It is estimated that in 1993 the total area covered by chars in Bangladesh was 1,722 sq km. The Jamuna Within the braided belt of the Jamuna, chars have different sizes. An assessment of 1992 dry season Landsat image shows that the Jamuna contained a total of 56 large chars, each longer than 3.5 km. There were an additional number of 226 small chars, varying in length between 0.35 and 3.5 km. This includes sandy areas as well as vegetated chars.

During 1984-1992 period, the area within the banks of the Jamuna has increased by 15%, out of which the increase in sand area accounts for more than half. Increases in water area and vegetated land area account for about one-sixths and one-thirds of the total increased area respectively. This signifies that widening of the braided belt of the Jamuna and corresponding floodplain erosion during the above period has been compensated to a

substantial extent by the increases in sand and vegetated land areas. In the Jamuna the period between 1973 and 2000, chars have consistently appeared in the reaches opposite to the Old Brahmaputra off take, north and east of Sirajgani and in the southernmost reach above the confluence with the Ganges. The process of char formation in the Ganges is quite different from that of the Jamuna. These two rivers have rather different hydromorphologic and plan form characteristics. The dynamics of chars is more complex in a braided river like the Jamuna than in a meandering river like the Ganges.

In 1993, total vegetated char within the bank was 35% in the Ganges River and 43% in the Jamuna River. The characteristics of the two types of chars (attached and island chars) are different for braided and meandering rivers. The ratio of attached char area to island char area in the Ganges was found to be 1.6, compared to the ratio of about 1.0 for the Jamuna. Widening of the Ganges was attributed to the migration of its meandering bends. As the bends migrated within the active corridor, chars built up in the direction of the migration. Often the chute channels are not as dynamic as the anabranches in the Jamuna or the main channel of the Ganges river. Therefore, the stability of the chars in the Ganges is higher than in the Jamuna River, except in the reaches where the planform of the river shows braiding characteristics.

In the dry season of 1993, the Padma had a total of 13 accreted island chars, each longer than 3.5 km and an additional 18 island chars were each between 0.35 and 3.5 km long. These islands include vegetated char lands and sand masses. Char erosion and accretion depends on the migration of the meandering bends of the river. The area of attached chars is higher than that of island chars. The area of vegetated chars in the Padma is much less than that in the Jamuna or the Ganges. Vegetated land area covered only 12% of the total within-bank area in 1984. In 1993, the vegetated area increased to 20% of the total within-bank area.The Upper Meghna. The chars in the Upper Meghna river are quite stable. The river is a multi-channeled stream, consisting of parallel channels, which behave as separate meandering rivers rather than forming a braiding river. Therefore, unlike the chars in a braided river, the chars here are very stable. The chars in this river

are almost exclusively island chars. Most of these are more than 70 years old. Char area of the river constitutes 38% of the total area within the banks.

The characteristics of char dynamics at the confluence of the Padma and the Upper Meghna rivers are different from those in the Lower Meghna river downstream of the confluence. At the confluence the river has widened, which has resulted in an increase in char area. The widening of the river during 1984-1993 resulted a loss of about 4,500 ha of land. The increment of vegetated land during 1984-1993 was about 3,000 ha. The vegetated land area in 1984 was 10,500 ha, constituting about 30% of the total area within the banks.In the part of the Lower Meghna downstream of Chandpur, the situation is completely different (Banglapedia 2014).

Chapter 3

Research Design and Methodology

3.1 Introduction

Anthropology is widely recognized as a holistic discipline that incorporates knowledge from diverse social facts. It proffers a diverse continuum of qualitative and quantitative research methods. Anthropological research is in-depth that combines observation, social expression, and scientific verification to illustrate changing relationship between human culture and nature. Conducting research through proper methods is central importance in any empirical research as research methodology explains how the study was conducted. The present study strived to undertake proper methods so that quality data and information could be collect. The core of anthropological research is ethnography that emphasis on in-depth investigation of components of culture. The traditional ethnographic approach assumes that cultures are whole units and can be comprehended as such. Ethnographic research endeavors to elaborate the symbolic meaning of social facts from distinct perspective of anthropology through conducting fieldwork on long term basis. Methodological focus on human culture insists that individuals are bearer of directly observable material items, individual behaviors, performances, ideas and arrangements. Undertaking this set of criteria with in-depth anthropological ground, present study endeavors to explore people's perception of water crisis from multi-faceted socio-cultural realities.

3.2 Selection of the Study Area: Place and People

Field work for the present research has been conducted in Char Ashariadaha union under Godagori upazila of Rajshahi district. This area has been selected considering its population, occupation, and residence pattern and water resource. In connection with study objectives and sampling procedures, this area has been selected for the intensive field study. This area is ideal and representative of all other villages in Bangladesh that face water problems. The total land area of the Rajshahi District is about 1,077^2 km, with a total population of about 93,477 (BSS, 2016a). Char Ashariadaha is a union under Rajshahi district. It has 19,017 (BBS 2000) inhabitants (GSS, 2002a). Char Ashariadaha water management is chosen for this study because the water body is part of the modeled

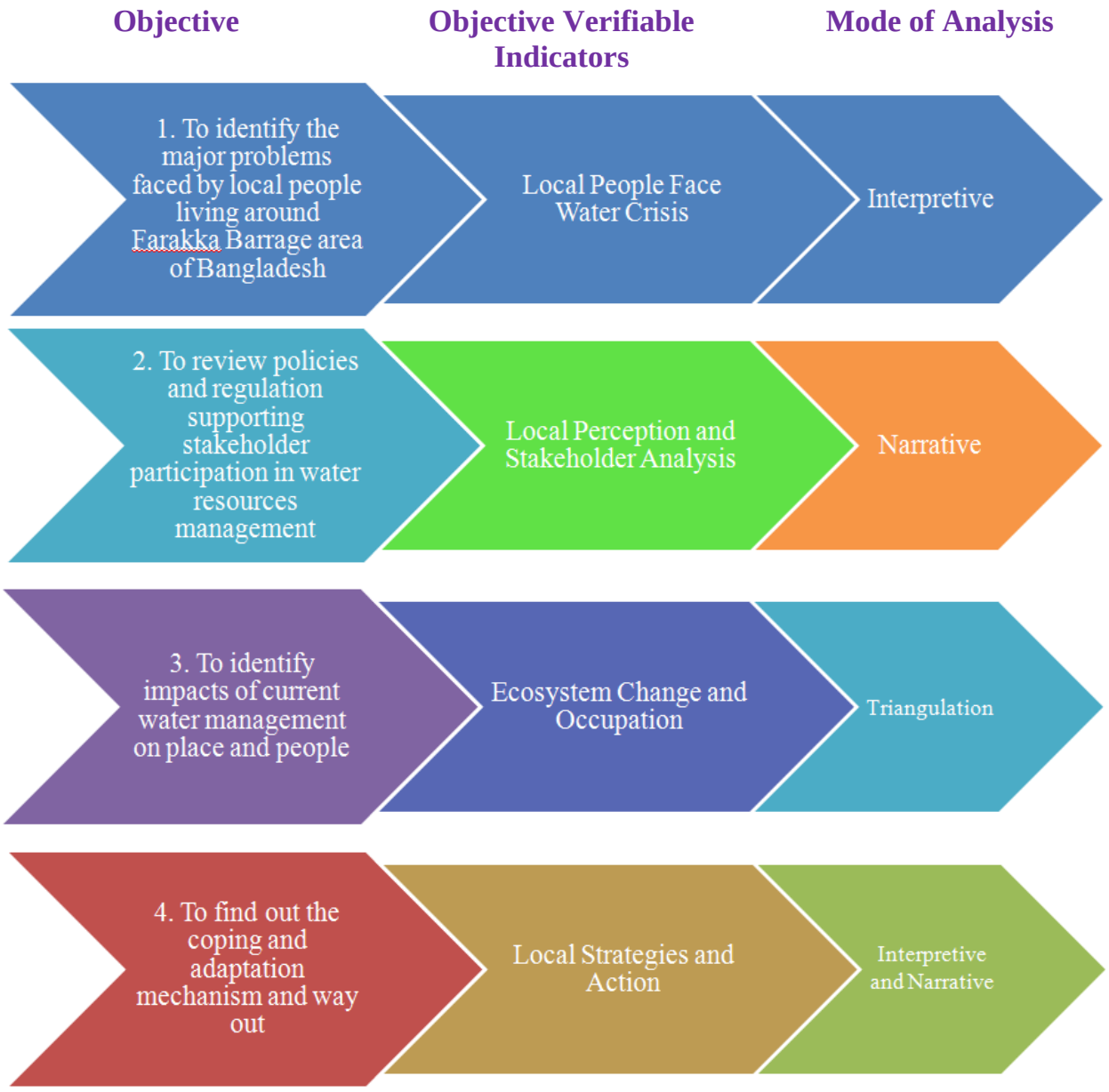
water body being located within the Gangas river basin and one of the top Farakka barrage affected areas of Bangladesh. It is selected for the study rooted in the fact that it is the main centre in the district where flood and drought as well as desertification all together affect the locality and people are habituating in this regard.

3.3 Research Design and Methods

Research design is central to any study due to methodological justification and proper data collection steps. Identification of proper methods in methodological regime to field data collection requires anthropological insights with a view to making study methodologically and logically sound that may bring about better empirical outcome. With hard perseverance and methodological insights, present study strives to make it more perceptible.

Present research engineered methodologies for the systematic and scientific collection of data and necessary justification. It required following other methods while conducting within a method. Methodological design allows conducting the data collection, data editing, data checking, and data analysis process professionally with a view to reliable and valid outcome of the research.

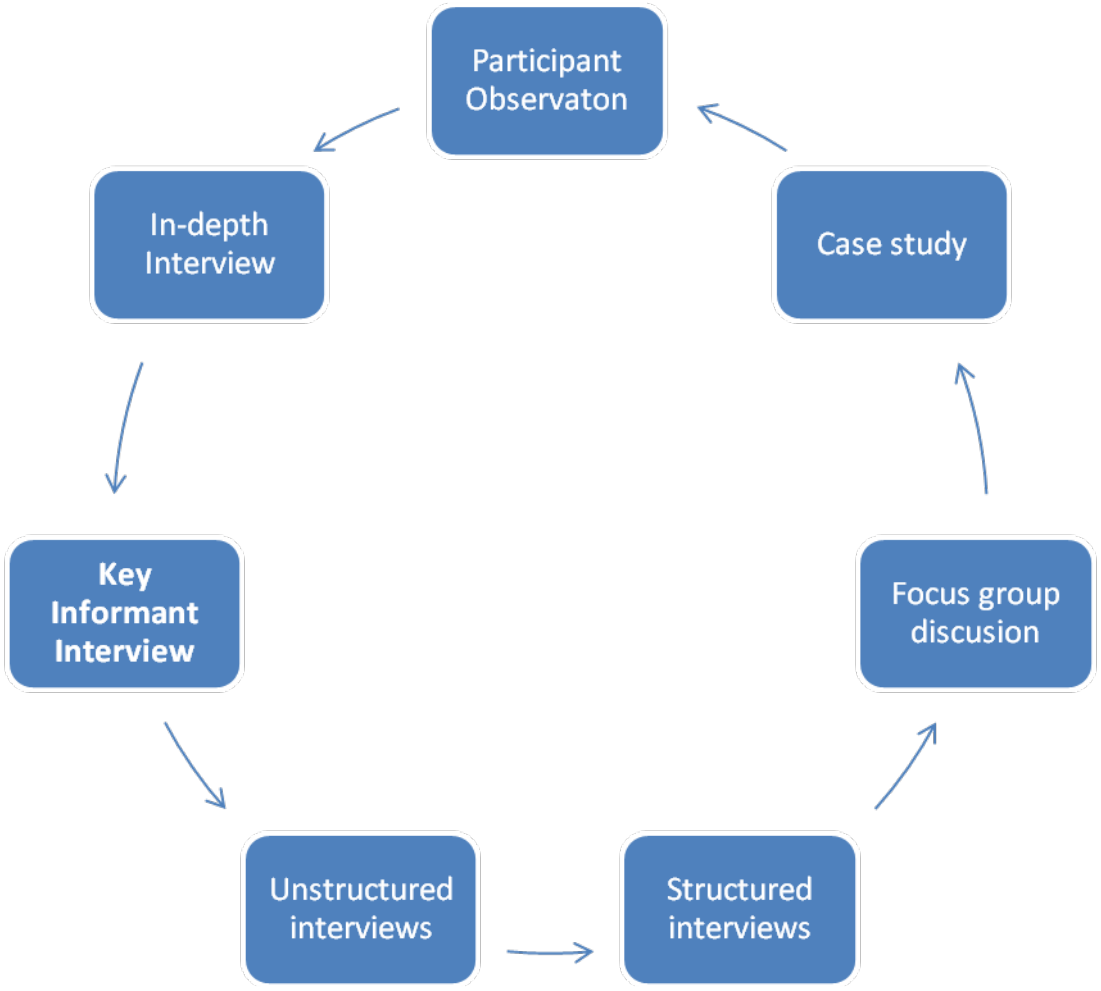
Figure 3.1: Relationship with Objectives



The employ of both quantitative and qualitative methods is very significant as some objectives necessitate the employ of qualitative research and others require quantitative research. The first and second endeavors of the study rely generally on the employ of primary data and interviews with District Water related department members, policy makers within the District local Government, Water Development Board (BWDB), Water and Sanitation (WATSAN) committee members and water point attendants. The third

intend is achieved through the administration of both closed and open-ended questionnaires in the study community together with analysis of the qualitative and secondary data in the study area. The fourth intend is achieved through analysis of comprehensive qualitative and secondary data gathered.

Figure 3.2: Methodological design of the study



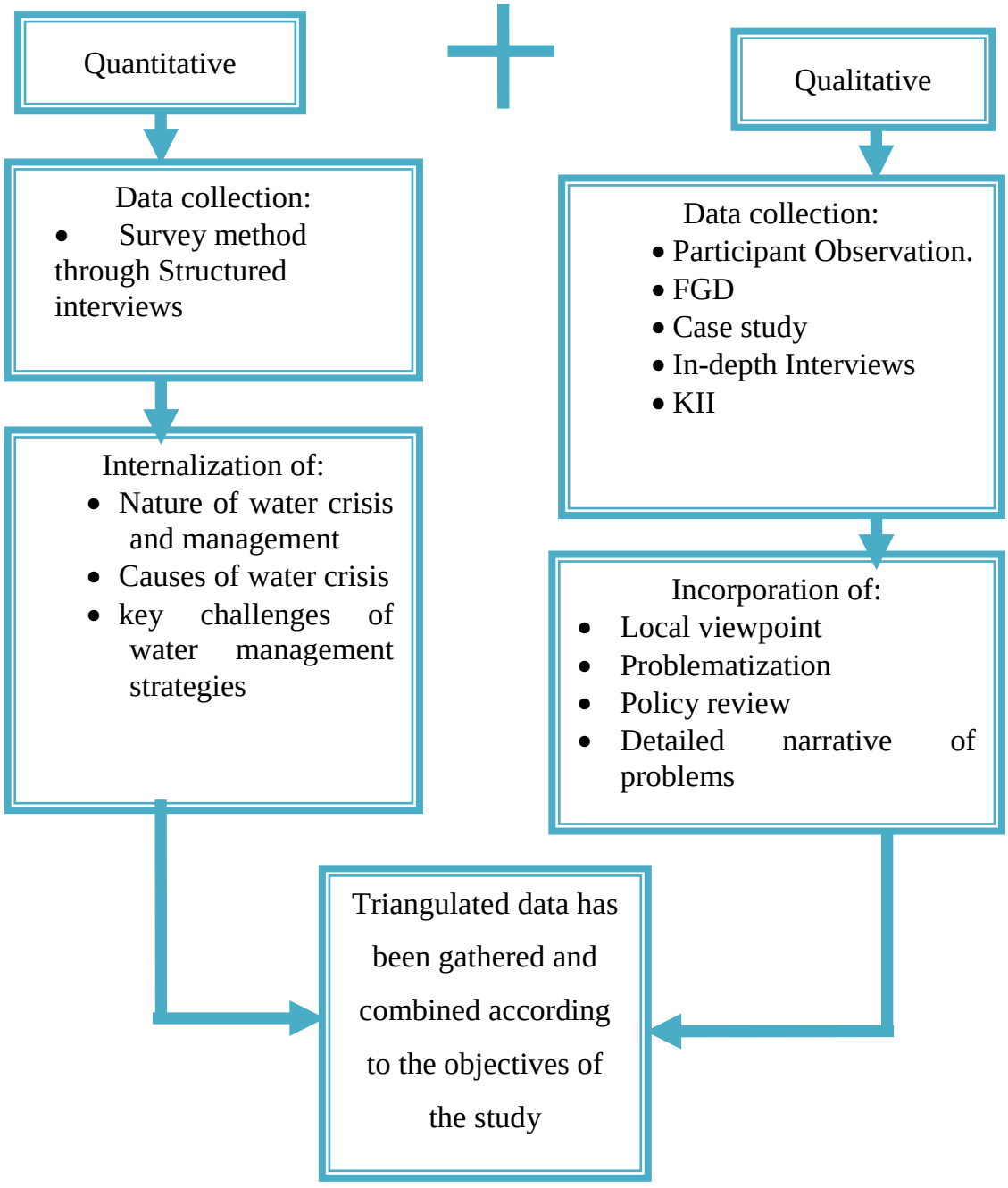
The above figure shows concurrent followings of methodologies that is synchronous using of methods whenever required. For example, case studies were taken even when data collection was going through interview methods.

3.3.1 Triangulation Approach

There is an idiosyncratic custom in the writing of anthropological research strategies that promotes the utilization of numerous techniques. It is otherwise called mixed method which makes the examination more productive. Rather than utilizing just qualitative or quantitative strategy, it contains a both qualitative and quantitative technique in the meantime with the goal that information can be approved or advocated.

The present study utilized the most significant type of triangulation approach that is to blend household survey with qualitative methods. In such manner, firstly observation was taken to collect data and get a close view point of the people and the area. Then questionnaire method was followed in order to conduct structured interviews. For this purpose, structured questionnaire were formulated for structured interviews. After collecting structured response, unstructured interviews was operated through open ended question. Some methodologists feel that triangulation technique now and again makes methodological troubles in evaluating information. Present study likewise confronted a few issues and dealt with them through methodological bits of knowledge. It empowered me to gather both numeric and qualitative information that hitherto guaranteed the legitimacy of research.

Figure 3.3: Triangulation process of this study



3.3.2 Participant Observation

Among the various types of observation methods, participant observation method is widely used in anthropological study that present research also followed. When the researcher actively participates in the activities of the group under investigation, it is known as participant observation. In the extreme level of participant observation, the researcher might conceal one's identity (Kawulich 2005). It can be called total participant observation. Such kind of observation is resorted to when the researcher intends to keep the natural setting intact, without any kind of disturbance. In situations in which one's role is confined to that of a researcher and it is openly declared, is known as quasi-participant observation (ibid). In case of the present study, quasi participant observation was maintained throughout the course of the fieldwork. Through the lens of anthropology and participant observer the study initially realized that water crisis has various dimensions that should be dealt from the interest of different stakeholders and hence local community should get most priority. Some male members showed their anger while talking with their wives. Participant observation allowed the study to look deep at the heart of the water problem and understand their sufferings directly.

3.3.3 Semi-structured and Open Ended Interviews

Semi-structured interview method empowers the respondents to express their ideas beyond structured frame. When a study is operated from anthropological tradition, it is believed to be either from emic or etic perspective. Emic emphasis on local view point, while etic is the opposite. Semi-structured interview can bring forth potential outcome from emic ground. Open ended questionnaire not only ensures open response but also it promotes open platform for the respondents to share their views openly and elaborately. In semi-unstructured interviews several questions were based on situation. The study targeted to query some occupational groups about challenges and issues of water management. Intensive endeavors were deployed to pick up the gender perspectives of problem ensuring an open ended environment. Some of the respondents were reluctant to

talk with the researcher. Many female respondents did not feel comfortable to talk about the matters in front of male member of the family. Sometimes, female respondents felt shy to talk with an outsider in front of their family member. The study purposively identified some people who have very negative experience of water crisis to account their untold sufferings. In-depth interviews have been taken to correspond their sorrows and coping strategies. These respondents supplied much information that was very insightful particularly in presenting the study.

3.3.4 Focus Group Discussion

Focus Group Discussion method is viewed as the least invasive method where the anthropologist minimally integrates themselves into the society they are studying and gathers data through verbal communication while attempting to remain non-intrusive of the culture. This method focuses on community interaction through language. It usually entails two way interactions with participants who are members of a group being studied (Roy 1995). The researcher strives to learn in order to gain a full understanding of how local perception about water crisis functions. Present study conducted five focus group discussion categorized on ground of socioeconomic position, educational status, occupation, religious belief, and civil society engagement. The village people at Char Ashariadaha employ local ecological knowledge for livelihood practices. The study expanded questions to discover the association between the Padma's Basin ecosystems and community livelihood.

3.3.5 Case Study

Case Study means intensive study of a case. Case is a social unit with a deviant bahaviour. It is a method of qualitative analysis. It aims at obtaining a complete and detailed account of a social phenomenon or a social unit, which may be a person, family, community, institution or an event (Reboli 2013). Case study method was one of the most important sources of data collection because it provided some substantial amounts of information relevant to the study. Case study helps internalize many perceptions,

practices and beliefs regarding water crisis. Single case provided enormous information so that the expression, emotion, and mental condition of the people were accounted. All the case studies putted down in the diary were used in explaining findings. The present research had an advantage of collecting cases from different targeted populations which provided in-depth information. In the particular setting of the study, case studies provided elaborated information of special respects.

3.3.6 Key Informant Interview

Key Informant provides detailed information about the research issue. In regard to the present study, key informant gave insightful data about the nature of the problems. Key informants were selected considering their wide experience, close connection with community and depth of knowledge. In order to do so, three key informants were selected for the detailed description. During the operation of KII, some issues get prioritized as per the objective of the research.

3.4 Sources of data collection

There were two sources of data collection: primary sources and secondary sources.

3.4.1 Data collection from primary sources

In primary level, data were collected from field by the methods mentioned above.

3.4.2 Study of secondary sources

Secondary data helped to collect insight into the entire study and particularly assisted in interpreting the primary quantitative and qualitative data gathered from the field. It provided a broader image of what the data generated means in the context of other presented developments in the water sector. In other words, it gave a foundation of comparative information to verify on the reliability of the data gathered from the primary qualitative research (Clark, 2005) and assisted in providing data on changes taking place in the water sector at the national policy level which is not available in the field. However, the secondary sources that have been used include:

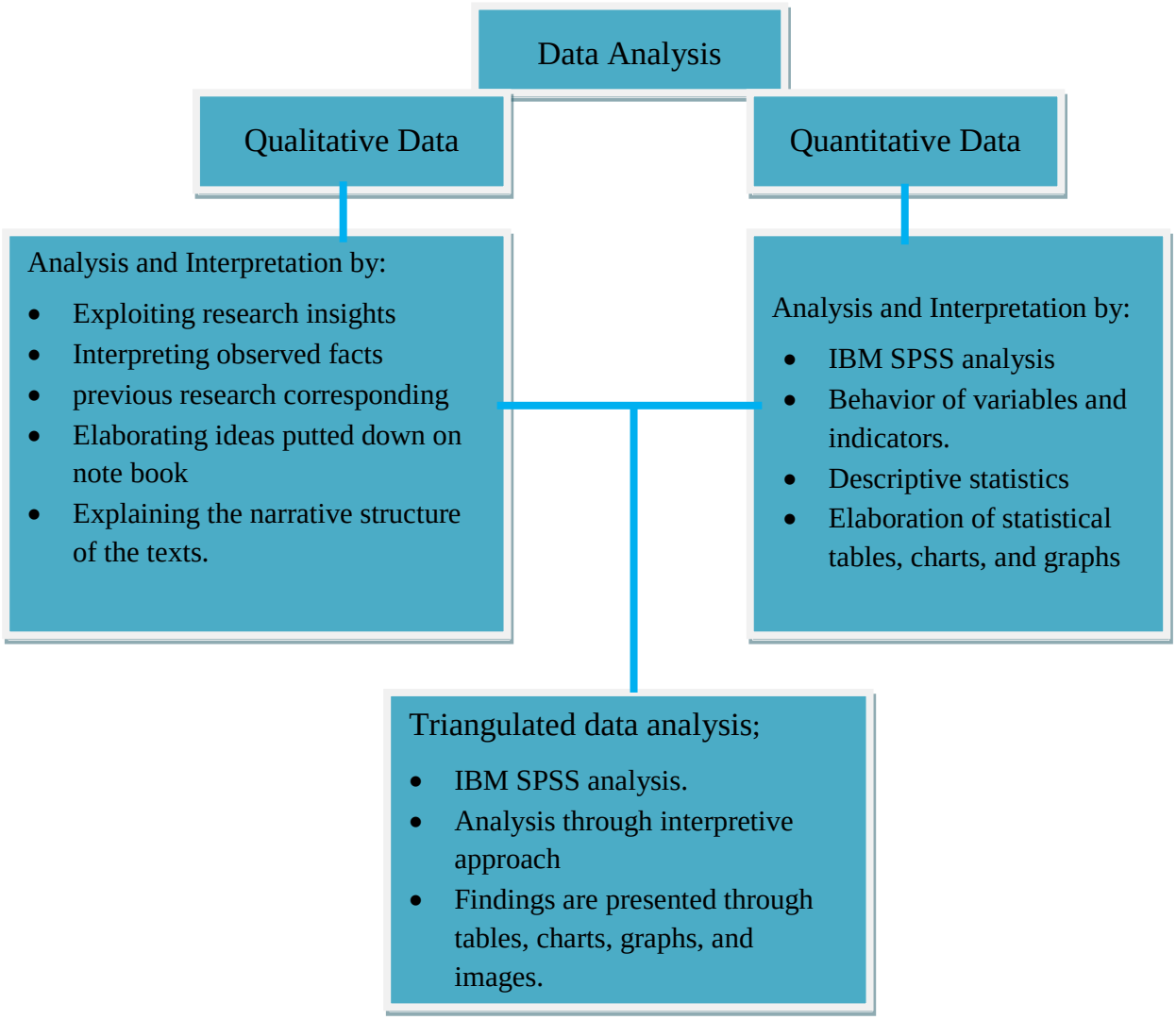
- Available literatures
- Website of water development board
- Ministry of Disaster Management and Relief
- Daily newspapers
- Monthly Magazines
- NGO
- Indo-Bangladesh Joint River Commission

3.5 Data Analysis

Triangulation approach of anthropology for data analysis was followed during the present study. Descriptive statistics using SPSS were used to analyze quantitative data and the qualitative analysis examined in-depth similarities and differences between the accounts of different groups, considering, for example, variability in the nature and dimension of water practices and problems, and different people's perception toward the challenges and issues of water management. The present study tried to consider how responses varied from individual to individual of different socioeconomic and educational condition. In this regard, present study used ethnographic qualitative technique of data analysis along with SPSS so that study could get a comparing aspect of findings. As well as being analyzed independently, the qualitative and quantitative data were also looked at together. For example, the qualitative data was used to elaborately analyze the whole findings and where quantitative findings raised questions, these were investigated further in the qualitative analysis. Present study emphasized more on the qualitative analysis because qualitative data provided such crucial information that was not possible to collect through quantitative questionnaires. But quantitative analysis was seemed to be most useful in analyzing and presenting data graphically because it provided basic information of the respondents, for example, education, gender, religion, marital status, and economic position of the respondents etc. Along with this, the study exploited quantitative analysis by coding some qualitative questions. The figure below shows the way how two types of data were intermingled and analyzed associatively. Triangulated data analysis helped not

to analyze data only through quantitative way rather it enabled to deploy qualitative ethnographic insights so that both qualitative and quantitative outputs might come.

Figure 3.4: Data Analysis



3.6 Ethical Issues

Ethical norms are important factors in anthropological research. In brief, the following ethical issues were maintained strictly during the present study:

- It did not coerce any informants to participate in field-study.
- The study disclosed about the aims of study.
- Present study did not cause any harms for the community.
- Informants' names were not asked.
- Participants had rights to decline participation whenever they wanted.
- This study did not provide any information to the people who are not directly or indirectly involved to this study.
- It obtained informed consent from all individuals participated in this study.
- Data were analyzed without being biased.
- It did not use any terms that could derogate informants.
- This anthropological study did not allure them by any monetary things.
- It had an importance over time management.
- General rules and regulations of the community were followed.
- Study assured them that research output would be available to them.

3.7 Data Reliability, Credibility and Reflexivity

Reflexivity is the awareness of the researcher of the effect they may be having on the research. It involves a constant awareness and assessment of the researcher's own contribution to and influence on the researcher's subjects and their findings (Patnaik 2013). Fieldwork in cultural anthropology is a reflexive experience. Anthropologists must constantly be aware that the information they are gathering may be skewed by their ethical opinions, or political standings. Even an anthropologists' presence in that culture can affect the results they receive. Reflexive fieldwork must retain a respect for detailed, accurate information gathering while also paying precise attention to the ethical and political context of research, the background of the researchers, and the full cooperation

of informants. In the present study reflexivity is used to better understand water problems from multifaceted dimensions with special focus on researchers' stance.

3.8 Conclusion

The key aim of the chapter is to show the ways that data have been generated and analyzed. The common of the data were gathered through both qualitative and quantitative approaches. A line that cuts transversely the data generated is the politics of water management and uses both at the household and community levels. The data consequently projects the voices of the unheard, especially marginalized women.

Chapter 4

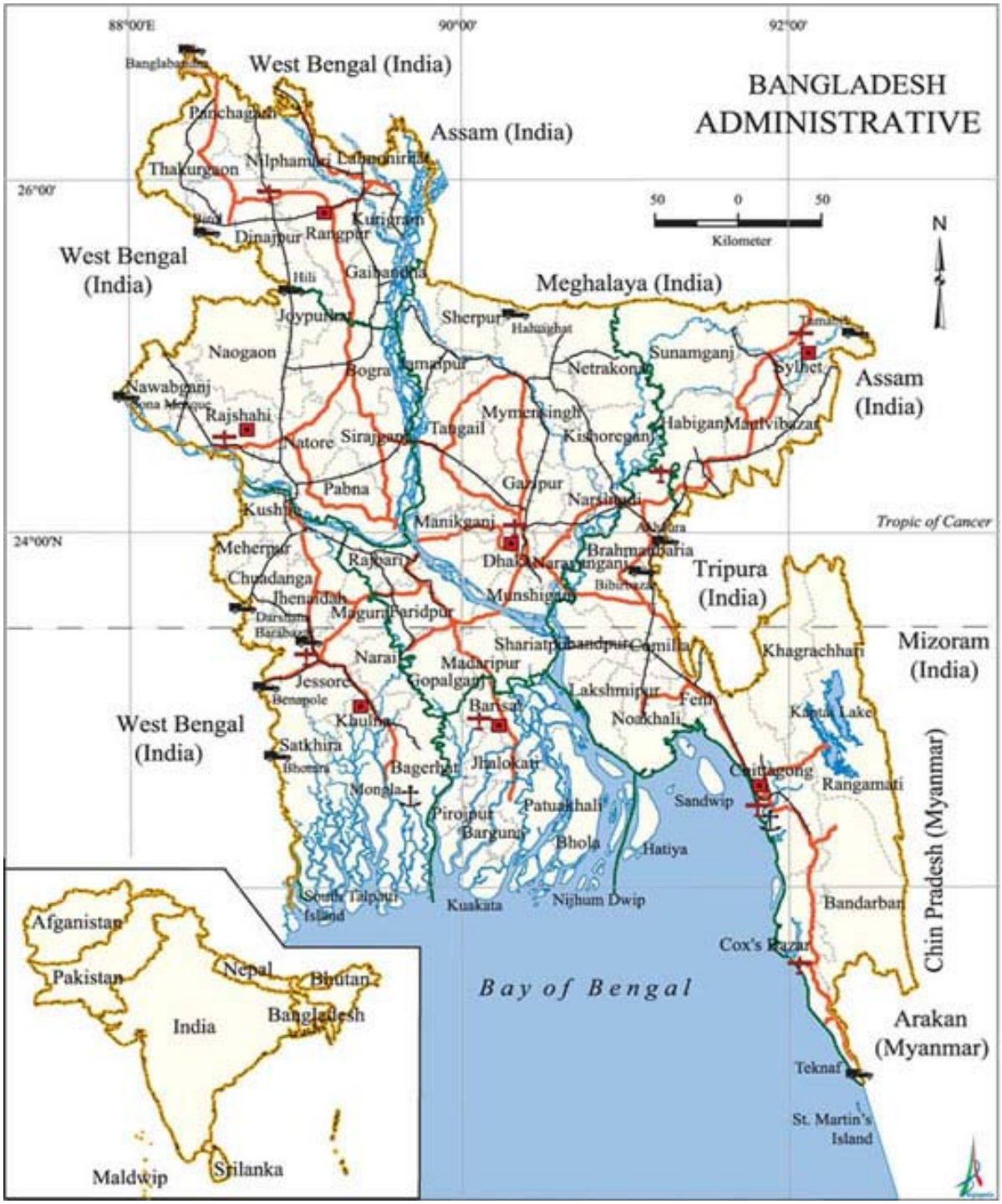
Place, People and Cultural Practice

4.1 Introduction

This study was done in nine wards of Char Ashariadaha Union, Godagari upazila of Rajshahi District. This chapter expresses the social and physical features of the Godagari Upazila of Rajshahi district. Social infrastructure incorporates here the structure and form of local governance, occupational status, cultural pattern, demographic features, level of human rights, educational services, health, legal and judicial services, as well as important features of society including religion that enhance people's quality of life (Kumar, 2008). The physical infrastructure incorporates location, relief, climate, as well as water resources and management.

The chapter highlights the existing water resources on which the demand-oriented community water projects rely on, in accordance with the international community and Bangladesh's development partners. The chapter also expresses the significant institutional arrangements, and social and cultural practices of the people of Char Ashariadaha Union of Rajshahi District. The argument in this chapter centers on social practices that play a significant role in shaping people's response to the new demand-oriented water facilities in the area. Derived from a review of literature in the district, present study reveals that Rajshahi District have surface water resources in the Padma river to be developed as domestic water supply for its increasing population. But proper management taking the issues of water management is urgent to consider for the cause of underground water is very limited and water layer is not constant in different seasons from January to December not only into the Rajshahi region but also all over Bangladesh the scenario is equal.

Map 4.1: Bangladesh Administration



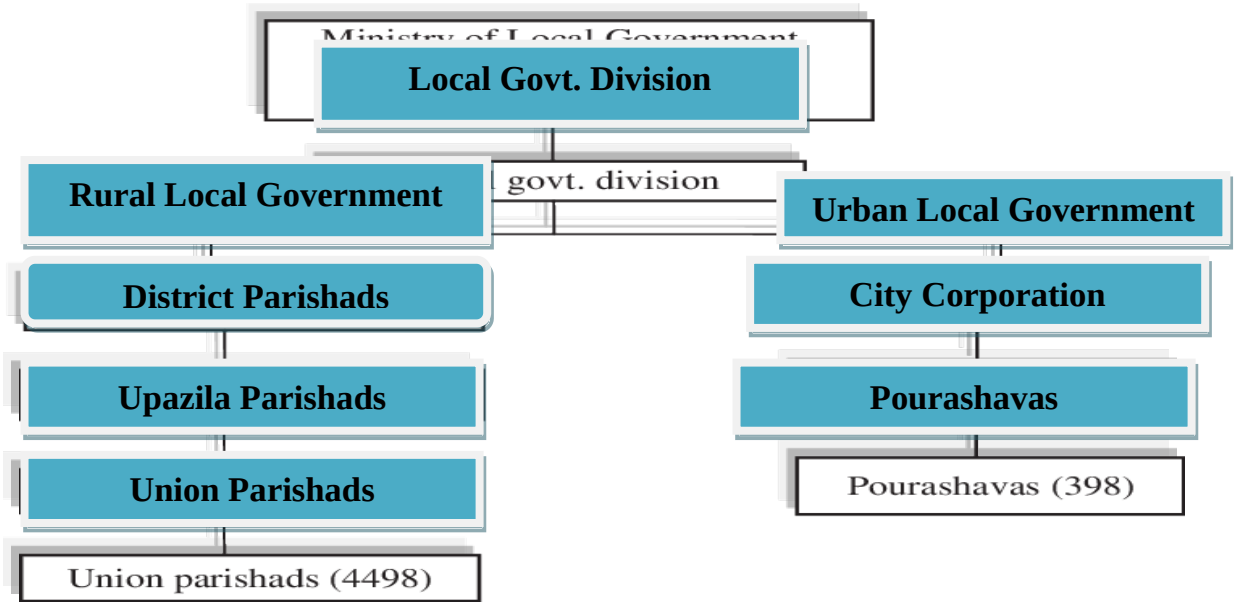
(Source: Banglapedia 2014)

4.2 Governance

This section of the chapter sketches the diverse levels of interaction between the main state institutions and local political institutions. The main state institutions are the district office (do), divisional office, board/ directorate, departments and agencies and ministries. The local political institutions are town/area councils, unit committees and traditional authorities. All these governance institutions confer significant frameworks and resources for the successful implementation and operation of water projects in the district.

4.2.1 Power Structure of Local Governments:

Figure 4.1: Local Power Structure of Bangladesh



(Ministry of LGED-2017)

The figure 4.1 shows that there are two types of local government in Bangladesh; one is rural local government and another is urban local government. Rural local government has three layers; district council, upazila council and union council. On the other hand, urban local government has two organs; city corporation and pourashava. Local political leader are the main decision-makers in local government institutions that execute top government decisions about agricultural policies, water management and safety net

programs. As outlined before, the political system in Bangladesh is significantly centralized and local-level government institutions at the Upazila Pasrishad (UP) levels are powered by local elites acting in concert with national elites, together with elected MPs, high-level bureaucrats and high-ranking officials of the political party in power. All UPs have related administrative departments, for example, the Department of Agricultural Extension (DAE) and the Local Government Engineering Department (LGED), which constitute the "street level bureaucracy" within this system (Heyman 2004:493). The DAE and LGED of Bangladesh are local govt. offices of national departments run partially by the UP. Innovation occurs almost entirely in the form of what Hayami (1981:169) calls "induced innovation," that is, as an outcome of the actions of external elites in harmonization with local elites, rather than as local grass-roots responses to local or regional issues. Local govt. institute like UPs also handle local social service agencies that manage issues akin to water management, seed and fertilizer distribution and subsidies and food, employment, education and health care programs. The Upazila Nirbahi Officer namely UNO is a UP staff administrator who serves as a manager among UP departments and committees, helping as the chair or sub-chair of the committees that manage the above service. These local elites are, consequently, the major power brokers between the marginalized people and the ruling elites who endorse the central government's power over local resources. Parallel situations have been described by Agrawal and Ostrom (2001) in the context of their study of the World Bank's decentralization approach in India. The UP is as well dominated by local elites other than; a lot of UP members are selected rather than elected. Local elites are capable to develop local power structures to make sure their control of UPs. Respondents of Char Ashariadaha has provided details about how this exploitation works at Char Ashariadaha, a small farmer with nominal landholdings, a wealthy farmer, desires access to safety net programs similar to health care or housing and government support to get seeds and fertilizer. A poor farmer needs to rent land from a rich farmer on occasion for sharecropping. As a sharecropper, he needs to vote in local elections consistent with rich farmer's preferences and failure to do so can produce the loss of sharecropping land or

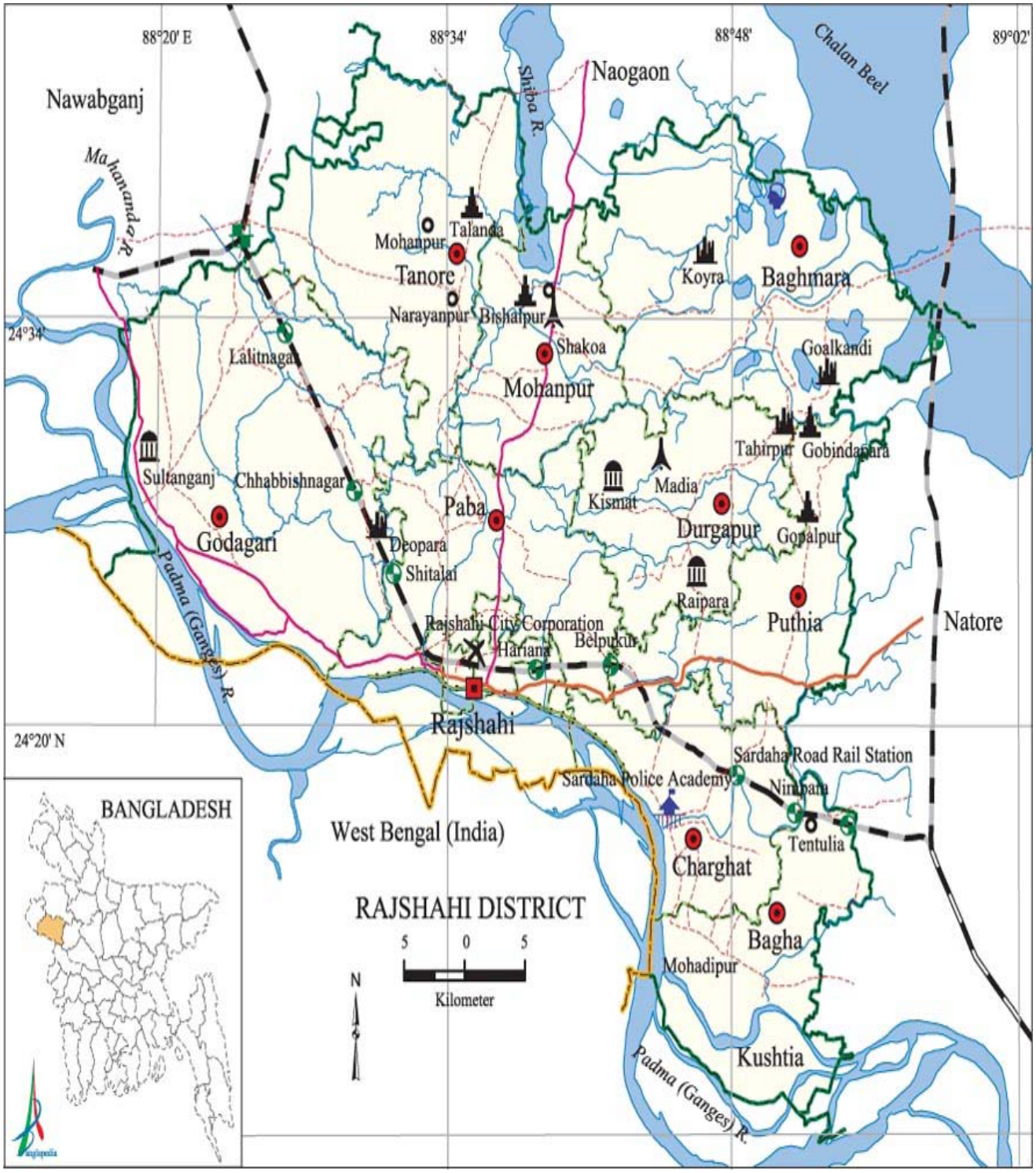
government benefits. Local Members of Parliament (MPs) also work out excessive levels of control over power structures at the local government level in ways that are not favorable to democratic practices or enclosure of marginalized people. They believe these bribes as investments that make profits for them later through local resource management decisions (Khan 2013). This system successfully keeps out marginalized people from receiving a nomination to run for UP positions. This top-down elite control corresponds to what Scott (1998:6) has termed the execution of a "high-modernist" agenda. Ferguson similarly (1994:15) argues that "a rural development project is a part of the expansion of the capitalist mode of production, which is often not so good at all for the poor peasants." Local government involvement in this type of capitalist expansion leads to what many researchers have termed the destruction of "local commons" (Bardhan 1993) and "sovereign selves" (Agrawal 2003).

4.3 Physical Features of community

4.3.1 Location and Area

Godagari is an Upazila of Rajshahi District in the Division of Rajshahi, Bangladesh. This is the place where Mahananda river fall to Padma or Ganges. Godagari is located at 24.4667°N 88.3306°E . It has 40011 households and total area 472.13 km² (Banglapedia 2014). Godagari Upazila is bounded by Chapai Nawabganj Sadar Upazila of Chapai Nawabganj district and Tanore Upazila on the north, Tanore and Paba Upazilas on the east, Lalgola, BhagawangolaI and Bhagawangola II CD Blocks, in Murshidabad district, West Bengal, India, all across the Ganges/ Padma, on the south, and Chapai Nawabganj Sadar Upazila on the west. According to 2011 Bangladesh census, Godagari had a population of 330,924. Males constituted 50.24% of the population and females 49.76%. Muslims formed 87.78% of the population, Hindus 7.14%, Christians 3.41% and others 1.68%. Godagari had a literacy rate of 46.34% for the population 7 years and above (Banglapedia 2014).

Map 4.2: Physical Feature of Rajshahi District



(Source: Banglapedia 2014)

As of the 1991 Bangladesh census, Godagari has a population of 217811. Males constitute 50.88% of the population, and females 49.12%. This Upazila's eighteen up population is 108869. Godagari has an average literacy rate of 27.6% (7+ years), and the national average of 32.4% literate (ibid).

Table 4.1: Godagari Upazila at a Glance

Upazila								
Municipality	Union	Mouza	Village	Population		Density (per sq km)	Literacy rate (%)	
				Urban	Rural		Urban	Rural
2	9	389	398	37631	241914	592	52.12	40.49

(Bangladesh Population Census 2001 and Banglapedia 2014)

Maiden archaeological heritage and relics are Buddhist Vihara (Pala period) at Uparbari Tila, tomb of Ali Kuli Beg at Kumarpur (eighteenth century), Padumsa Shiva Temple, dighi (pond) and stone inscription of Raja Bijoy Sen (eleventh century) at village Deopara, tomb of Hazrat Shah Sultan (fourteenth century, Sultanganj), Temple of Sree Sree Gaurangabari at Khetur (1582), Jaina Temple at Maguile. Religious institutions are Mosque 580, temple 21, church 9, sacred place 2. Noted religious institutions: temple of Shree Shree Gaurangobari at Khetur (1582), Ahle Hadith Jami Mosque (1949), Premtali Jami Mosque (1940), Faradpur Jami Mosque (1950), Kanthalbaria Sheikherpara Jami Mosque (1960), mazar of Premtali Shah Jangir, mazar of Jahanabad Shah Mohiuddin, mazar of Sultanganj Shah Nazar, Jaina Temple at Maguile, Shree Shree Kheturdham Tirtha.

Table 4.2: Union Wise Population

Union				
Name of union and GO code	Area (acre)	Population		Literacy rate (%)
		Male	Female	
Gogram 47	17362	13013	12469	43.32
Godagari 38	1993	6907	6690	32.13
Char Ashariadaha 19	9088	9214	8089	33.76
Deopara 28	13013	16666	15861	41.99
Pakri 76	15799	16108	15756	41.16
Basudebpur 16	4684	12291	12025	49.56
Matikata 57	9775	200562	19798	45.01
Mohanpur 66	23173	15780	15044	31.58
Rishikul 85	14659	15381	14985	40.43

(Bangladesh Population Census 2001 and Banglapedia 2014)

Main sources of income are agriculture 69.98%, non-agricultural labourer 3.95%, industry 0.57%, commerce 11%, transport and communication 1.99%, service 4.61%, construction 1.15%, religious service 0.16%, rent and remittance 0.27% and others 6.32%. Ownership of agricultural land is 42.39%, landless 57.61%; agricultural landowner: urban 42.92% and rural 42.31%. Main crops are paddy, jute, wheat, black gram, sugarcane, gram, masuri (lentil), and vegetables. Main fruits are mango, jackfruit, litchi, wood-apple, palm. This upazila have pucca road 520 km, mud road 413.77 km; railway 39.21 km. Hats and bazars are 26, fairs 10, most noted of which are Godagari,

Bidirpur, Premtali, Mahishalbari, Railbazar, Kankan and Rajbari hats; Premtali Khetur Mela, Sultan Shah Mela, Kankan Hat Mela, Lalitnagar Mela, Godagari Mela. Sources of drinking water are tube-well 93.53%, tap 0.71%, pond 0.78% and others 4.97%. Sanitation is 11.58% (rural 9.85% and urban 23.26%) of dwelling households of the upazila use sanitary latrines and 40.99% (rural 38.40% and urban 59.16%) of dwelling households use non-sanitary latrines; 47.43% of households do not have latrine facilities. Health centres are Upazila health complex 1, satellite clinic 1, family planning centre 9, hospital 2 (Banglapedia 2014, GoB 2019).

Map 4.3: Map of the Study Area

(Source: Banglapedia 2014)

4.3.2 Land Use

The core land utilize pattern of Godagori Upazila has been categorized into the following classes: agricultural land, infrastructural land, orchard, water bodies, fallow land, char land, char agricultural land, and river area. Total land area of Godagori Upazila is 119494.46 ha. Of this, agricultural land is 65396.32 ha, infrastructural land 10322.13 ha,

orchard 5310.10 ha, fallow land 15439.39 ha, water bodies 7312.07 ha, char land 9817.57 ha, and river area 7547.65 ha. Land use pattern changes in three different time periods have been examined for detecting the land use changes in Godagori Upazila. It is clear from the outcomes that the agricultural land, fallow land, river area, and water bodies have reduced, while the infrastructural area and char land have enlarged proportionately. The agricultural land of Godagori Upazila in 1977 was 186056.74 ha (i.e. 75.58% of the total land area) and in 2010 it became 159913.48 ha (68.31%). It has then been decreased to 14.02% during the last 33 years, signifying 0.46% decline per year. The infrastructural land was 16161.38 ha (6.91%) in 1977 and 47617.58 ha (20.28%) in 2010, telling that it has increased 194.63% during the period; that is 5.90% turn down per year. Likewise, the area under orchard was 3781.95 ha (1.62%) in 1977 and 4499.55 ha (1.93%) in 2010. The fallow land was 8666.05 ha (4.38%) in 1977 and 4482.09 ha (1.92%) in 2010. The area under water bodies was 10235.95 ha (4.38%) in 1977 and 8428.13 ha (3.44%) in 2010, suggests that they have been diminished 17.66% during the period. The river area was 6425.07 ha (2.75%) in 1977 and 3055. 72 ha (1.31%) in 2010. So, the river area has been declined 52.44% during the past 33 years, indicating a 1.60% decline per year. Conversely, the char land has been amplified because its area was 2071.20 ha (0.89%) in 1977 and 5377.25 ha (2.3%) in 2010 (BWDB 2012).

Char Ashariadaha union is one of the most affected areas of Bangladesh for the impact of Farakka Barrage. Respondents experienced flood and drought similarly. They reveal at the time of rainy season the land area has decline to 40%-50% as used for irrigation. Some elderly respondents memorized their long experience before and after Farakka Barrage impact on their locality. Before Farakka Barrage their life style was consistent. The respondents also reveal that before Farakka Barrage only a small portion of area was flooded. But now over 50% of area is being flooded every year. The consequences of it is a lot of people migrated to Godagori, Rajshahi Sadar and Dhaka for livelihood and safely and security. A great portion of respondents opined the same regarding the development initiative have taken by the Government. They reveal all the development activities are

not for the common people. Local elite especially political leader and government official are jointly managing it. The construction works till date has done not sustainable for the lack of transparency and accountability. Local participation is not democratic only those who are affiliated with political party or the relative of local elite or even the supporter of local elite get the chance to participate the respondents revealed.

4.3.3 Environmental issues

The heart of Bangladesh's transport network was seriously affected by Farakka barrage. Farakka Barrage has consequences on local fisheries; agriculture, livelihood, never flow, and biodiversity. The country have already lost about 15,600 km inland navigational route and another 3,300 km has become risky for navigation for the cause of upstream withdrawal of water, Currently Bangladesh has only about 6,000 km inland navigational route (Ahmed 2006).

Table 4.3: Affected sectors by Farakka Barrage

Affected Sectors	Degree of Affect/ Damage									
	1	2	3	4	5	6	7	8	9	10
River flow										
Crop production										
Natural productivity of land										
Ground water										
Crop variations										
Livelihood										
Local climate										
Flora										
Fauna										
River Bed Siltation										

Sources: Field Work-2017

Table 4.3 shows that Farakka barrage has affected various sectors in the study area (on ground of 1-10 scale). Local people of the study area point out that flow of the Ganges river water has changed badly at the time of post Farakka periods. Present study showed that crops were directly affected by Farakka Barrage since it has changed the agricultural pattern of the region wherein crops were died out because of lowering the ground water table, shortage of water, lowest access to rainwater, etc. and many crop species emerged for increasing char land, growing soil fertility for the employ of agrochemicals and the total crop production (including alternative crops such as corn) was enlarged. If the irrigation procedure entirely stops because of no accessibility of ground water, the rice production will approximately come to an end (Ahmed 2006). At the time of the dry season water is a lot needed in all areas of Bangladesh. More over a lot of project like GK project, Meghna Dhonakhola Project, are the largest irrigation project of Bangladesh. It supplies water from the Ganges to 3 lakh acres of land. Only The GK project consists of 120 miles long main canal, 292 miles Long Branch canals and 62 miles long sub-branch canal. But shortage of Ganges water has made the project unproductive. For irrigation the country has to depend solely on ground water, every year the ground water level will go down. At the time of dry season when water is needed in all areas of Bangladesh, water becomes almost unavailable (Ahmed 2006). Respondent has strongly represented the shortage of water at the time of cultivation period that is unfavorably affecting the irrigation due to the inadequate flow of water through their key sources. The most vital climatic elements of the district are temperature, humidity and rainfall. Temperatures are high and constant throughout the year with temperatures ranging between 10oC to 45oC. The lowest average monthly temperatures occur before, during and just after the major wet season between December and January. The respondents reveal that January is the lowest temperature month of the region. 7°C was recorded and the height 49°C was recorded. Relative humidity is constantly high between 65% and 95%. It is high during the mornings and at night but low at noon. Relative humidity averages 75-85% during the greater part of the year but may drop below 65% during the dry months (Ministry of Environment 2014). The major rainfall season begins in June and ends in August and the

minor one begins in September and ends in October. The mean annual rainfall total ranges between 900 mm and 1800 mm (ibid). Evaporation rates including the study area, suggest that annual loss from open water surface may be higher than rainfall. Huge variability exists in the annual and monthly total rainfall from year to year as shown in Figure below. There is consequently uncertainty in the rainfall pattern yet.

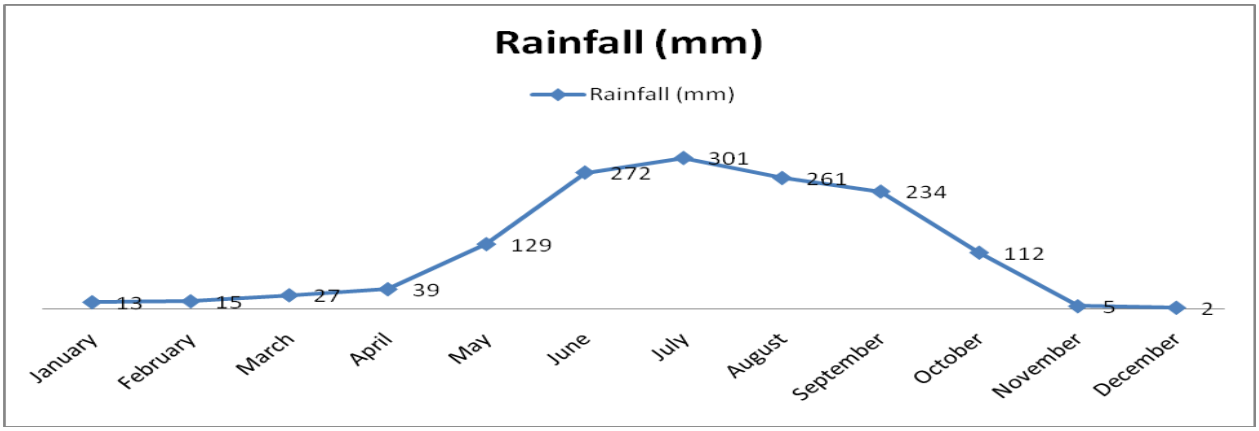


Diagram 4.1: Monthly Rainfalls in Rajshahi 2018 (Source: Regional Office, Ministry of Environment)

In Bangladesh every district and upazila there has a special committee of water management. Local government manages smaller scale water projects, similar to the shallow tube-well and deep tube-well projects, created as part of the country's Poverty Reduction Strategy (International Monetary Fund 2013:283). The large projects are therefore controlled by national bureaucracies, whereas the local projects are controlled by local elites. Respondents pointed out the community members have no chance to raise their voice in the decision-making process for any of these projects. Now their source of water for irrigation only river Padma, but at the time of dry season water is not available for irrigation, so BWDB has excavated Bathu Moddo Para canal for irrigation. But the respondents also reveal local projects are managed by water management committees at the district and sub district (upazila) levels formed on the basis of strategy provided by the top of the government. The UP and the UNO are the chair and vice-chair correspondingly of the irrigation management committee at the upazila level, ten of the

remaining 11 positions are filled by government staff from different other agencies and only one position is filled by a delegate from the farmers of the sub-district and the farmer who represent from farmer is not actually farmer, he is a rich elite of the locality, he has a little idea about the demand of the local people the respondent highlighted. The respondent added the selected representative farmer never communicate with fellow farmer regarding the decision of the committee.

Table 4.4: Irrigation Management Committees at District and Upazila Levels

District Level Members
Deputy Commissioner (Chair)
Executive Engineer, Bangladesh Agriculture Development Corporation or Senior Agriculture Engineer, Department of Agriculture Extension (Secretary)
Superintendent of Police
Deputy Director, Department of Agriculture Extension
Deputy Director, Bangladesh Rural Development Board
Representative of the Department of Environment
Executive Engineer, Local Government Engineering Department
Representative, Executive Engineer, Bangladesh Water Development Board
Executive Engineer, Power Development Board
Executive Engineer, Rural Electrification Board
Representative, Fisheries Department
Sub-District or Upazila Level Members
Upazila Parishad chairman (Chair)
Assistant Engineer, Bangladesh Agricultural Development Corporation or Department of

Agricultural Extension (Secretary)
Upazila Nirbahi Officer (Vice-Chair)
Upazila Agriculture officer, Department of Agricultural Extension
Upazila Engineer, Local Government Engineering Department
Officer, Upazila Rural Development
Representative, Bangladesh Water Development Board
Representative, Health Department
Officer, Upazila Fisheries Department
Representative, Power Development Board/Rural Electrification Board
Officer in Charge (OC), Police
Representative Farmer

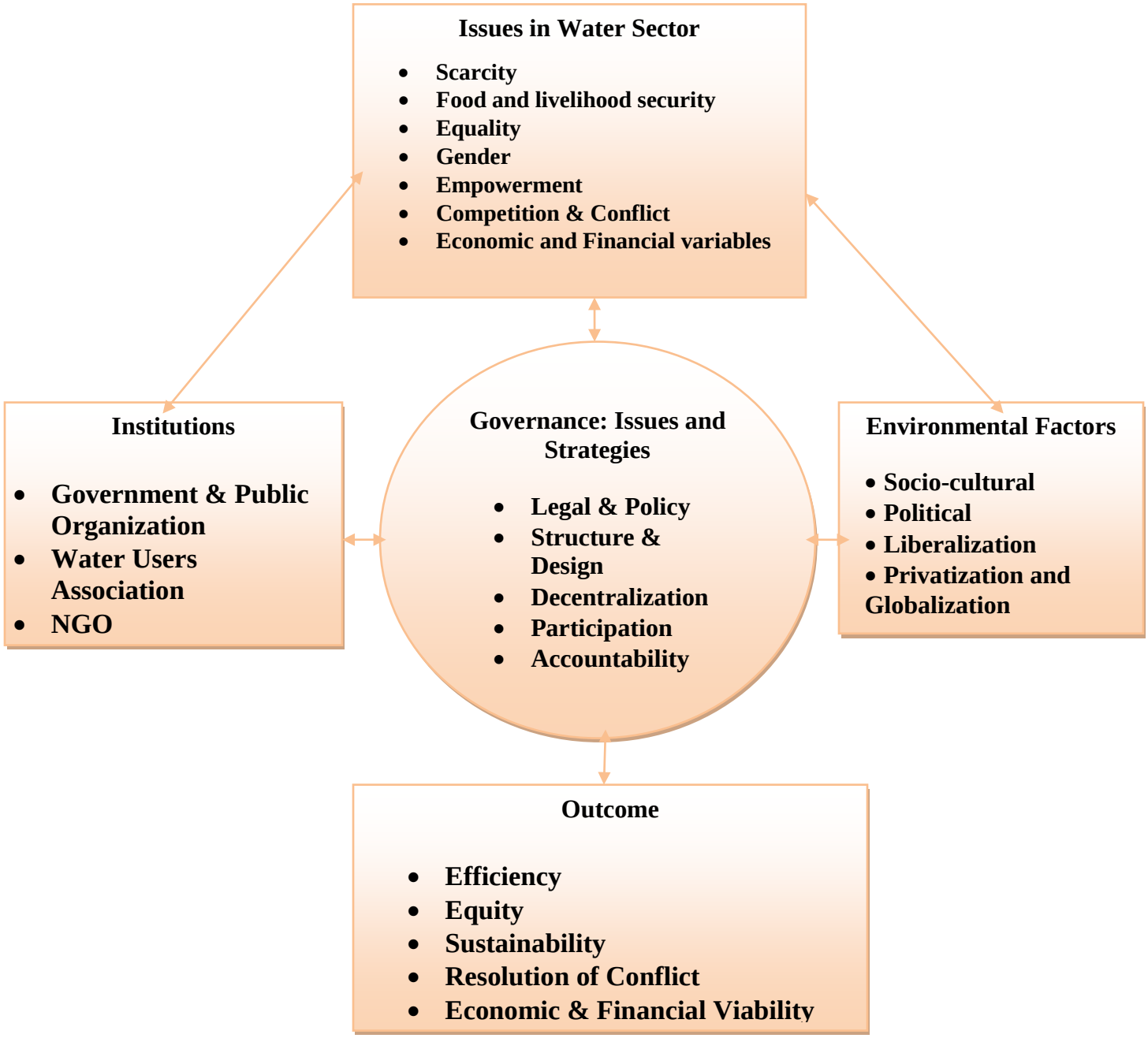
Source: Ministry of Agriculture 2016

The above table clearly shows that there is practically no participation from community members in local government irrigation management committees. The upazila committee merely implements the government's irrigation policy guidelines. This committee is formally accountable for coordinating with NGOs based on these guidelines. Respondents expressed that at the union council level there are no irrigation committees, even though unions and villages are the main focusing points for these irrigation management activities of the committees. None of the water management committee in the Char Ashariadaha is being successfully operated. The Respondents replied in Char Ashariadaha Union there have great environmental vulnerabilities similar to flooding and river bank erosion that the local upazila irrigation management committee does not have the capacity and strategy to take action even if they did have the political will. Respondents reveal that for irrigation at the time of dry season is unable to get sufficient water supplies due to reduced flows in the Padma River for Farakka Barrage and has not

harmonized their supply system with the agro-ecological system that comprises high, middle and low elevation croplands.

The upazila irrigation management committee is totally conscious of these challenges but they did not approach to the top of the government and finally does not get them with the means to find remedies. To resolve water drainage problems throughout the country, including Char Ashariadaha the government has recognized and attempted one more times but not fruitful for the lack of accountability and transparency. The respondents expressed local government officials and the irrigation management committees authority anything funds come to their region and, once again, project managers fail to confer with the community members about these problems.

Figure 4.2: Framework for Understanding Water Governance



Source: Adapted from the Silver Jubilee Symposium proposal Institute of Rural Management (IRMA) 2004

4.4 Socio-Economic Characteristics

The socio-economic setting of the Char Ashariadaha people of the Rajshahi District consists of the social and economic organization of production, distribution, forms of social discrimination and cultural milieu. It should be noted here that, Char Ashariadaha situated far from the Godagori Upazila. Between Char Ashariadaha and Godagori the main Padma River flows. They are some extent different from the rest of the area of Godagori. Their media of communication with Godagori only Boat. So water and people are intertwining here. Through this section a clear feature of the locality means livelihood, culture, water and culture all way of life will flourish.

4.4.1 Occupational structure of Char Ashariadaha dwellers

According to the field survey data agriculture is the main occupation (41%) of the community (table 4.5). The rest are correspondingly according to survey fishermen (12%), day labour (18%), businessmen (08%), carpenter (07%), Boatmen (06%), Service (03%), blacksmith (03%) and Cobbler (02). The respondents viewed that once fishing was the main occupation but after Farakka barrage a lot of people shift their occupation and even migrated to other places like Dhaka, Rajshahi and Godagori Sadar.

The respondents replied the people shifted their occupation most of them are Rickshaw puller of Dhaka and Rajshahi. And a lot of female also shift their household work to Garment worker in Dhaka. Now a portion of female mostly widow went to Middle East as midwife. Some respondents said they have casual occupation, at the time of rainy season they go to the Rajshahi and Dhaka as Rickshaw puller for 4 of 5 months. After getting some money they return home and spend this money for household purpose.

Table 4.5: Occupational Structure of Char Ashariadaha dwellers:

Occupation	Frequency	Percentages
Farmer	**76**	**41**
Business man	**15**	**08**
Service	**05**	**03**
Boatmen	**10**	**06**
Fishermen	**21**	**12**
Black Smith	**05**	**03**
Cobbler	**04**	**02**
Carpenter	**12**	**07**
Day-labor	**32**	**18**
Total	**180**	**100**

(Sources: Field Work 2017)

The majority respondents expressed that their occupational trend are no secure for volatile environment for the effect of Farakka Barrage. Majority respondents are engaged in duel profession. Some respondents reveal that at the day time they work as daily labour but afternoon they go to the river with fishermen to earn some extra money. Maximum female are engaged with household work. In addition to household work they have small farm of duck, hen and got. Some of them have one more cows in desire to sell it at the time of Edul-Azha. Some respondents do this for milk that they consume a portion and the rest to sell to earn some money so as to maintain their own expenses. Female respondents also have homestead vegetables garden. They do this for consumption as well as sell to the market.

4.4.2 Income structure of Char Ashariadaha dwellers

According to the survey the data, monthly income of the maximum resident (48%) of Char Ashariadaha is Tk.11000-15000 (table 4.6). The rest accordingly 23% income tk.50000-10000, 12% income tk 16000- 20000, 11% income tk. 21000-25000, 4% income 26000- 30000 and only 3% income from 30000 and above.

Table 4.6: Income structure of Char Ashariadaha dwellers

Income	Frequency	Percentage
Tk. 5000 – 10000	41	23
Tk. 11000 – 15000	87	47
Tk. 16000 – 20000	21	12
TK. 21000 – 25000	19	11
Tk. 26000 – 30000	7	4
TK. 31000 – above	5	3
Total	180	100

(Field Work 2017)

4.4.3 Educational structure of Char Ashariadaha dwellers

Five percent of the respondents have no formal education and they cannot write their name. 61 percent respondents have educational qualification ranging from class one to five. In addition to these 19% respondents have educational level from class six to eight, 8% have educational level class nine to SSC, 04% have educational level HSC (table 4.7), 02% have educational level BA/BSS/BSC, and only 01% has educational level MA/MSS/MSC. The respondents pointed out that they have desire to educate their children but their livelihood is unpredictable.

Table 4.7: Educational Status of the respondents

Level of Education	Number	Percentages
Illiterate	10	5
One- class five	109	61
Class six – Class Eight	35	19
Class Nine - SSC	15	8
HSC	06	04
BA / BSS/BSC	04	02
MSS/MA/MSC	01	01
Total	180	100

(Sources: Field Work 2017)

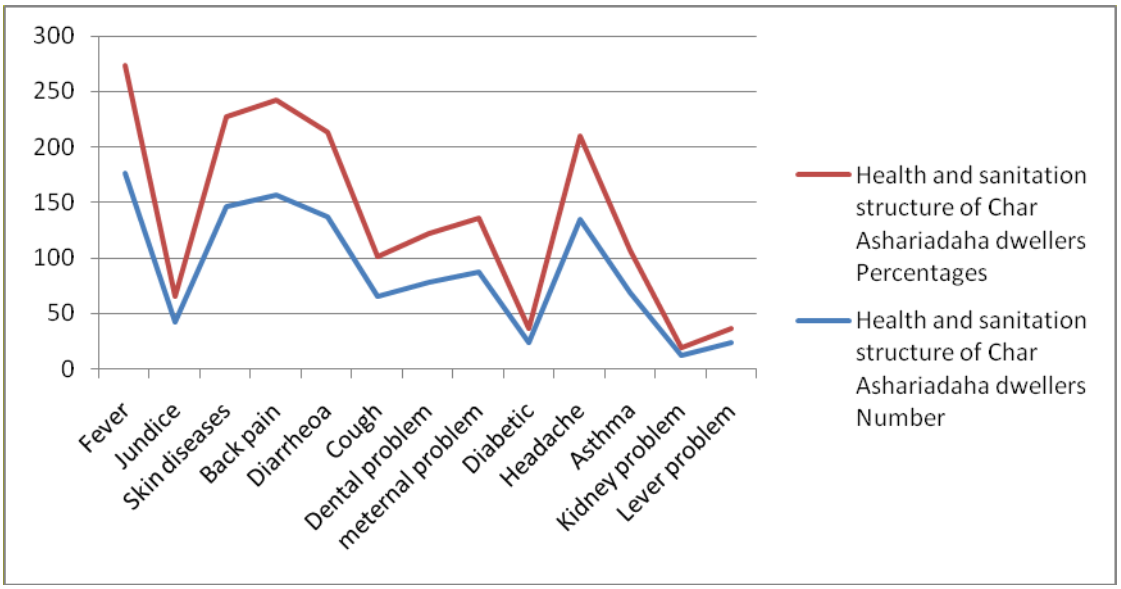
Moreover, the respondents replied now the education cost is very high. One respondent share he has a male child studying in class seven. But all time his son insists him for private tutor especially for English and math. For the well being of his son he contact with a teacher of his school. The teacher wanted three thousand taka per month for two subjects. So the respondent finally made the decision to postpone his study. So, economic situation and the state education policy sometimes makes obstacle for the poor people well being.

4.4.4 Health and Hygiene Practices

The rural areas of Bangladesh suffer from lack of quality drinking water. Surface water supplies are generally polluted and groundwater, which till now had been the best source of safe drinking water, is contaminated with arsenic in many parts of the country. Heavy withdrawals of groundwater for irrigation have also lowered the water level in many areas below the effective reach of hand tube-wells. Seepage of agro chemicals into shallow aquifers may also pollute water for human and animal consumption. Salinity

intrusions from seawater deep into the land in the southwest are rendering groundwater unfit for consumption. Cities and urban areas too are facing the problem of receding water level due to heavy groundwater extraction. These water supply and sanitation problems have obvious implications for public health. Diarrheal diseases, arising largely from drinking unsafe water, are a leading cause of death in the rural areas. Lack of proper sanitation and drainage facilities, inadequate water supply, and insufficient health and hygiene education are the primary causes of diseases in the rural areas. Lack of access to safe water supply in the rural areas is a special hardship for women who have to carry water over long distances, with significant impact on their health and productivity.

Diagram 4.2: Health structure and practices of Char Ashariadaha dwellers



(Sources: Field Work – 2017)

The above diagram 4.2 it is seen that a good number of people of Char Ashariadaha union were suffering from fever while many people were suffering from jaundice, skin diseases and diarrhea respectively. For detail information regarding health structure and services facilities, people's awareness and practice to take the services, respondents have elaborate a clear picture of health status. Respondents pointed out that there are one community clinic and two health care service means satellite clinic powered by USAID

and directed by *Shisu Polli* namely *Surjer Hashi Clinic* as well as two quack doctor services centre are exist there in association with folk medicine and Kobiraj are also available. Most of the respondents rely on folk medicine and Kobiraj. For minor problem like headache, back pain they took medicine from local pharmacy of folk medicine from Kabiraj. One respondent shares that-

Two years ago I was suffering from Jaundice, the local folk Kobiraj took me to his treatment centre; firstly he washed her head with green coconut water and next dry it through soft cloth and wear a belt of Kochiri lata (local name) over my head and the belt gradually downing towards feet and it was spreading as well as taking the yellow colors from the body. It is astonishing that everyone believes it and I visited the place and found a lot of people came and took the position in line.

So health care services exist there mostly primary health care services. Some respondents share they visited one more times in Rajshahi Medical College Hospital for better treatment.

Table 4.8: Sanitation Practice of the Respondents

Type of Toilet Use	Frequency	Percentage
Open space	5	3
Tin/ Bamboo made toilet	139	77
Paka/ Brick made toilet	35	19
Others	1	1
Total	180	100

Field Work 2017)

Local inhabitants have changing hygiene practice with regard to use moderate sanitary latrines. Maximum percent (77) of the respondents use tin or bamboo made toilet that is

semi hygienic (table 4.8). Nineteen percent use brick made sanitary latrine with some modern facilities. Different information had been accounted where 3 percent respondents still evacuate in open space. But this practice has been changing as various NGO is working on promoting health and hygiene in the locality.

Table 4.9: Hand Cleaning Practice after Toilet Use

Hand Cleaning after Toilet Use	Frequency	Percentage
Yes	103	58
No	77	42
Total	180	100

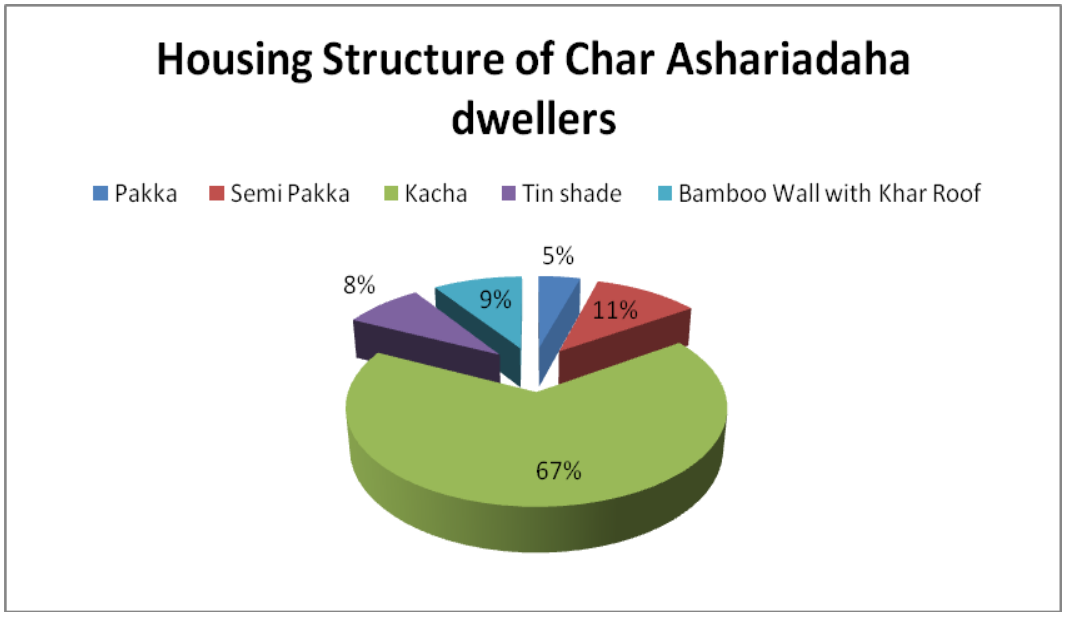
Field Work 2017)

Generally, 58 percent of the total 180 respondents claim to wash hands after toilet use (table 4.9). Forty two percent say they do not practice cleaning up hands after toilet use. Some respondents wash hands with modern hand wash/ soup available in market while many people use mud or sand for cleaning hands after using toilet.

4.4.5 Housing Pattern

Housing pattern expresses social status in many respects. Most of the respondents (67%) of the locality dwell in kacha house with minimal facilities (chart 4.1). Second highest number of respondents (11%) live in semi pakka house while nearly equal number of respondents lives in tin shed and bamboo walled house.

Chart 4.1: Housing Pattern of the Respondents



(Sources: Field Work 2017)

4.4.6 Pastime and Recreation

Most of the Respondents reveal that major cultural events are Eid Ul Fitor, Eid-Ul-Azha, Pahela Baishakh, State days like 26th march, 16th December, etc also add joy to their recreation. But the local people observe mainly Eid-Ul-Fitor, Eid-Ul-Azha, Pahela Baishak, Durga Puja and their local marriage ceremony. At the time of this occasion people wear new dress both male and female and children. The respondents share that at the time of Eid-Ul Fitor they arrange boat race competition at the river Padma. It is their most interesting recreation of that moment. More local song Bangira they sing that time. Respondents share 30 years before at the time of Bangla nabanno (September time of Amon Paddy) they arranged a lot of cultural festival like Lati Khala (Strict play) Kabaddi, Dari Khala (local name). They arrange a Mela at the time of Durgapuzza where the children specially elderly children feel recreation through Nogor Dola, circus, a variety of sweets they can take. A lot of people migrated to Godagori and Rajshahi for better livelihood. Most of the respondent share they eat rice three times a day with fish and vegetables daily and with meat once in a week. They wear most of the time lungi for

male and shari for female and for occasional and visiting for outside like Rajshahi then wear Pant and shirt. They spend their leisure time to see TV now.

4.4.7 Family Size

The table 4.10 shows that highest percent of the respondents' family are consist of five to six members. This kind of family is also nuclear where unmarried children live with their parents.

Table 4.10: Family Size of the Respondents

Size of the Family	Frequency	Percentage
1-2 Person	24	13
3-4 Person	35	19
5-6 Person	64	36
7-8 Person	41	23
9 Person - Above	16	9
Total	180	100

(Source: Field work 2017)

Some households were noticed where more than nine members dwell together (table 4.10). Some of these families are extended and some are joint. A very nuclear family with only 1-2 members were also recorded where only spouse dwells without their offspring. However, the average size of the family is five while national average family size is 4.06 (CEIC 2019).

4.4.8 Religious Affiliation

Bangladesh is Muslim inhabitant dominant country where other religious groups have equal rights to practice their own religion. The study area is not exceptional from the

general scenario of Bangladesh. Hence, Muslim people comprise most of the inhabitants having highest percentage among the respondents (92).

Table 4.11: Religious Affiliation

Religion	Frequency	Percentage
Muslim	165	92
Hindu	13	7
Buddhist	2	1
Total	180	100

(Source: Field work 2017)

The second highest religious group is Hindus who are mainly Sanaton. Beside these two dominant religious groups, one percent Buddhist people add diversified perspectives in the data collected on ground of religious experience (table 4.11).

4.4.9 Private Property Ownership

Property ownership is a key symbol of power practice in rural society of Bangladesh. Land is an important asset in rural area that defines people's social status. Land ownership is a maiden source of power that ensures social status with authority. Local landlord play role as focal point in political decisions. In case of the present study, forty nine percent respondents have less than 21 decimal land property. This land includes homestead, fertile and fallow land (table 4.12).

Table 4.12: Private Property Ownership

Property	Frequency	Percentage
0-20 Decimal	89	49
21—40 Decimal	42	23
41- 60 Decimal	27	15
61—80 Decimal	12	7
81 to 100 Decimal	7	4
101- Decimal	3	2
Total	180	100

(Source: Field work 2017)

Twenty three percent respondents have property ranges from twenty one two forty decimal. Fifteen percent respondents have land asset ranges between forty one to sixty decimal where seven percent, four percent, and two percent possess land property of sixty one to eighty decimal, eighty one to hundred decimal, and hundred one to above decimal accordingly.

4.4.10 Marital Status

Present study collected data diving up respondents on ground of marital status so as to collect diversified data from marital experience. Marriage as an institution takes place in Char Ashariadaha from religious mandate. Muslims of the community do marry from Islamic rues and regulation. But folk Islamism is practiced in the community where various rituals are performed along with Islamic system of marriage ritual. Similarly, Hindu and other religious groups do marry from both religious and local customs. Thus, there is amalgamation of marriage customs among all religious groups living harmoniously in the community.

Table 4.13: Marital Status of the Respondents

Marital Status	Frequency	Percentage
Single	30	16
Married	140	78
Separated	3	2
Divorced	2	1
Widow/ Widower	5	3
Total	180	100

(Source: Field work 2017)

The above table shows that majority percent (77) of the respondents are married where second major group is single or not married. The study endeavored to pick up marginal views so that it came closer to different marital status people. Thus, two percent respondents were separated from their partners/ spouse while one percent was divorced and three percent were widow/ widower (table 4.13).

4.4.11 Age Wise Distribution of the Respondents

Proper age is related with the mature information required for the insightful study. In anthropological in-depth study on public issue like water crisis and management, age matters. With regard to present study sixteen percent respondents belong to 15-24 age group who are mainly young group. Fifteen percent respondents stay in 25-34 age group while fifty four remains 35-44 age group. Among the respondents fifty percent are senior citizens having age more than forty five table (4.14). Thus, average age is thirty six years old.

Table 4.14: Age of the Respondents

Age of the respondents	Frequency	Percentage
15-24 Years	28	16
25-34 Years	27	15
35-44 Years	98	54
45 Years - Above	27	15
Total	180	100

(Source: Field work 2017)

Fifty six percent respondents view that their (first) marriage took place when their age was between 15-24 years old (table 4.15). Thirty six percent respondents' marriage took place between 25-34 years old followed by 35-44 years of six percent respondents and 45 years to above age of two percent respondents.

Table 4.15: Age at First Marriage

Age at first marriage	Frequency	Percentage
15-24 Years	102	56
25-34 Years	65	36
35-44 Years	10	6
45 Years - Above	3	2
Total	180	100

(Source: Field work 2017)

4.5 Conclusion

Rajshahi district is a densely populated area in the northern Region of Bangladesh. Its economy is seriously dependent on rain-fed agriculture for the production of food crops like rice, wheat, vegetables, fruit etc. About 60% of the population of the district is described as poor and 67% are in the rural areas (BBS 2015).The chapter has shown that Rajshahi District is directly or indirectly affected by the Farakka Barrage that impacts socio-economic and environmental milieu. Farakka Barrage is like to distort the natural environment in many respects is explored in this chapter. The people of Rajshahi once self sufficient regarding their needs even they help the other district but now the situation has change for frequent flood at the time of rainy season and drought at dry season as well as river bank erosion. The result they are at the edge of losing occupational hierarchy, biodiversity, tradition fishing body, local species that was rich in Rajshahi. Now the people of Rajshahi those who faced the Farakka Barrage problem are shifting their occupation, migrating to Dhaka.

Chapter 5

Water Policies and Stakeholder Mapping

5.1 Introduction

Water is fundamental to the lifestyle in Bangladesh and the absolute most significant asset for the prosperity of its dwellers. It continues a very delicate indigenous habitat and gives employment for many individuals. Lamentably, it isn't interminable and can't be treated as an unending unconditional present of nature to be utilized in any way picked. The unitary idea of water makes its utilization in one structure influence the utilization in another. Its accessibility for sustenance of life, in both quantitative and subjective terms, is a fundamental human right and commands its proper use without risking the enthusiasm of any individual from the general public.

However, public policy is the fundamental printout of completing the entire general responsibilities of any independent state in order that each and every prime sector of a state should have explicit policy by which a state can run increasingly (Kabir and Das 2015). As many other countries of the world, Bangladesh has many sector-specific public policies for doing welfare activities for the people such as agricultural policy, water policy, energy policy etc. The water policy provided hereunder, lays down the broad principles of development of water resources and their rational utilization under these constraints. It helps guide both public and private actions in the future for ensuring optimal development and management of water that benefit both individuals and the society at large. As life in riverine Bangladesh is based on water, physical availability and accessibility of water are essential human rights which are anticipated to be done through the National Water Policy.

Regrettably, Bangladesh did not have any water policy at the beginning stage after independence. Every activity used to be conducted by reason of the country’s knowledge and expediency at that period. Nevertheless, after realizing the fact that, water is not an endless bounty of nature, rather it is a fixed and limited resource, the urgency of a sound water policy then came in the presence of the political authority of the state. Then the first national policy was initiated in 1999, after 27 years of the independence. Consequently, water law, management policy and policy options for a variety of

important sectors were enacted by the government. Because water is one of the most essential natural resources for a particular country of agriculture like Bangladesh, the issue of sustainability comes piercingly in this explicit matter. Fundamentally, water sustainability means fulfilling the requirement of usable water for the current generation without compromising the requirement of future generation. But the present scenario is not so indistinguishable with the concept of sustainability. Therefore, it is extremely significant to unite the water policy performs with the sustainability issue for the sake of long-term development.

5.2 Historical Background

India and Bangladesh marked the Ganges Treaty on Riverine Water Sharing in 1996 – a milestone in reciprocal relations between the two nations. It was the result of a longstanding disagreement about sharing of the Ganges waters following development of the Farakka Barrage by India in West Bengal around 10 miles (16 km) from the Bangladesh fringe. There are a few, for the most part in Bangladesh, who request a survey of the arrangement, guaranteeing that it neglected to verify their national advantages. Coming up next is a depiction of the Ganges water treaty, the issues that offered ascend to it and the following discussions encompassing it. The Ganges (or Ganga) is a significant waterway in South Asia streaming eastwards through the fields of northern India into Bangladesh and releasing into the Bay of Bengal. It starts from the Gangotri ice sheet in the Indian province of Uttarakhand in the focal Himalayas and voyages south and south-eastwards in India for around 1,400 miles (Bhattacharjee 2013).

The waterway shapes a typical limit among India and Bangladesh around 11 miles downstream from the Farakka Barrage in India, and proceeds around 63 miles before at long last entering Bangladesh close Rajshahi. Prior to the division of British India, there was no doubt of sharing of water, as the whole stream bowl was a piece of one nation. The segment of India in 1947 made the Ganges a universal stream. In the years following the parcel of India and Pakistan (by which present-day Bangladesh turned out to be East Pakistan), there was no contention over the sharing of Ganges stream waters. It was the

development of the Farakka Barrage by India (finished in 1974) that offered ascend to strife between the two nations over riverine water-partaking in the Ganges. The flood upset the common progression of the waterway, influencing the lower riparian, Bangladesh. The Ganges being a significant wellspring of water for the two nations, the two sides needed to have control of the flood. This prompted inquiries, for example, how the torrent would be controlled, and how much water would be shared among India and Bangladesh. To determine the debate, an understanding between the two nations got essential, with India and Bangladesh first consenting to an arrangement in 1977. The settlement was at long last marked in 1996 (Rahman N.D).

The construction of the Farakka Barrage is the principle wellspring of contention among Bangladesh and India over Ganges stream water. The torrent was worked at a point where the primary progression of the waterway enters Bangladesh, and the stream Hooghly, a tributary of the Ganges, proceeds into West Bengal and through Kolkata. The blast was worked for two purposes: a) to keep up traversability of this waterway and flush out sediment stored in Kolkata port, and b) to guarantee a saline free water supply for Kolkata city (IDSA 2010). The Farakka strife began before the introduction of Bangladesh (East Pakistan). In 1951, Pakistan fought India's proposition to develop a blast, however genuine dealings begun distinctly in 1960. From 1960 to 1970, at any rate ten gatherings occurred at different levels among India and Pakistan, however little progress was made. In any case, an achievement was accomplished during the fifth meeting of the India–Pakistan secretary-level chats on the Ganges water-sharing issue held in July 1970 (Hossain 1998). It was chosen at the gathering that the purpose of conveyance of water into East Pakistan would be the Farakka Barrage. It was likewise concurred that a council would be built up to guarantee the conveyance of water. Bangladesh achieved freedom from Pakistan in 1971, and with the introduction of another country another stage began in the Ganges water-sharing arrangements. At first, India and Bangladesh moved toward the discussions with another point of view, focusing on the huge open doors for far reaching improvement of the locale's water assets. Be that

as it may, this positive thinking was fleeting, as contrasts between the two nations rose, fundamentally on the measure of water to be partaken in the dry season (ibid).

One of the significant advances taken to figure a thorough arrangement was the marking of the rule of the India–Bangladesh Joint River Commission (JRC) by head administrators Indira Gandhi of India and Sheik Mujibur Rahman of Bangladesh. In the interim, development of the Farakka Barrage was finished in 1974. During his visit to India in 1974, Sheik Mujibur Rahman raised the issue of the Farakka Barrage. Albeit no significant achievement was accomplished, a joint statement of the two gatherings recognized the requirement for an understanding (Karim N.D). Ensuing discourses neglected to gain ground as the two sides contrasted on a very basic level on how to enlarge the Ganges water, and furthermore on the measure of water to be assigned to Bangladesh during the dry season. Bangladesh proposed to enlarge the Ganges by building stockpiling offices and recommended that Nepal be incorporated into the talks. Conversely, India focused on a plan to occupy water from the Brahmaputra River to the Farakka, which Bangladesh protested because this would adversely affect the lower-riparian nation. The exchanges proceeded without results. In April 1975, the Indian water serve Jagjivan Ram also, the Bangladeshi Abdur Rub Serniabat met however with no positive result (ibid). It was significant for India to discover an answer, as the Farakka Barrage was prepared for authorizing. India was not ready to begin activity of the Farraka Barrage without the assent of Bangladesh. The halt was broken just when Sheik Mujibur Rahman interceded and an interval understanding was marked between the two nations that would empower India to operationalize the Farraka Barrage incidentally from 21 April to 31 May 1975, and see what the effect would be. The ensuing death of Sheik Mujibur Rahman changed the elements of the respective relations by affecting on the water-sharing dealings. India began pulling back water singularly, and when President Ziaur Rahman moved toward India for dialogs, the Indian government stayed lethargic (IDSA 2010).

Bangladesh at that point attempted to internationalize the issue by bringing it up in the United Nations General Assembly in September 1976, and on 26 November 1976 the General Assembly embraced an accord articulation guiding India and Bangladesh to start arrangements to speed up reasonable goals. It was a direct result of the UN bearings that India and Bangladesh in the end marked the 1977 treaty. The 1977 treaty for sharing of the Ganges water in the dry season was to be substantial for a long time (1977–82). A portion of the significant arrangements of the 1977 bargain are as pursues (Nishat and Pasha 2001):

1. The treaty fixed Bangladesh's share of the Ganges water during the lean period, which is from January to May.
2. The amount of water allocated for Bangladesh was to be calculated on the basis of the amounts of water available at the Farakka Barrage from 1948 to 1973.
3. There was a guarantee clause under which Bangladesh was promised 80% of the available water at Farakka during the lean season.

5.3 The 1996 Ganges Water Treaty

In 1996 Indian Prime Minister Deve Gowda and Bangladeshi Prime Minister Sheik Hasina marked the Ganges water-sharing settlement, which depends on the standards of value, reasonableness and concordance. A portion of its significant highlights are (IDSA 2010):

- The bargain is legitimate for a time of 30 years from the date of its marking.
- The settlement would be available to either gathering to look for the primary audit following two years to survey the effect and working of the sharing plan as contained in the bargain.
- The quantum of water consented to be discharged by India and Bangladesh will be estimated at Farakka.
- The sharing will be by ten-day time frames from 1 January to 31 May each year.

- The sharing of water will be on a 50-50 premise if the accessibility of water at Farakka is 70,000 cusecs or less.
- Bangladesh will get 35,000 cusecs of water if the accessibility at Farakka is somewhere in the range of 70,000 and 75,000 cusecs. If there should be an occurrence of accessibility of 75,000 cusecs or more, India will get 40,000 cusecs and Bangladesh will get the rest.

The treaty also states that the two parties; Bangladesh and India - to the treaty are to meet at regular intervals to audit the arrangement and make modifications whenever required. Without a common understanding, India will discharge water to Bangladesh at a rate at least 90% of Bangladesh's offer as charged in the settlement. A board of trustees involved an equivalent number of individuals delegated by the two governments will be established. The joint council will set up a group at Farakka and Hardinge Bridge to watch and record at Farakka the day by day stream beneath the Farakka Barrage, in the Feeder trench, at the Navigation Lock, just as at the Hardinge Bridge. The Joint Committee will submit to the two governments every one of the information gathered by it and present a yearly report to the two governments. Based on the reports, the legislature will meet at proper levels to choose further activity if vital (Nishat and Pasha 2001).

5.4 Existing Water Policies in Bangladesh

There are numerous policies and acts for preparing the rules and regulations on common usage on water. The main policies and acts are as follows;

- National Water Policy (1999);
- Coastal Zone Policy (2005);
- Coastal Development Strategy (2006);
- National Water Management Plan: Development Strategy (2011); and
- Bangladesh Water Act 2013.

5.4.1 National Water Policy (1999)

The National Water Policy was kicked off at 1999 as the vital principle of the water usage for the first time after the birth of the state in 1971. Ministry of Water Resources generally implements all the activities co-ordained with the water policy for ensuring the proper usage of the inadequate water resources. National Water Policy has several particular sector-oriented goals which are truly the core to accomplish segmented victory as a part of sustainable water usage. In this guideline, a number of distinctive features of present water device together with some most strong challenges are noted by the authority. The realistic features recognized are as:

- Private users of water as core agents for development;
- Essential of the vigorous promotion of private sector for developing water management;
- Development of water resources through huge and lumpy capital investment
- Economies of scale validates public sector involvement;
- Necessity to satisfy multi-sector water needs with limited resources; &
- Explaining public and private responsibilities.

National Water Policy (1999) has developed six major objectives, such as:

a) Development of all forms of surface and ground water management through equitable manner;

b) Ensuring the availability of water to all level people of the society emphasizing on women and children;

c) Accelerating sustainable public and private water delivery systems with legal and financial measures;

d) Bringing institutional changes to decentralize the water management and to enhance the role of women;

e) Formulating a legal and regulatory environment in water management systems;

f) Developing a state of knowledge to design future water resource management plans with economic efficiency and social justice. (MoWR 2005)

5.4.2 Coastal Zone Policy (2005)

The coast of Bangladesh is recognized as a zone of vulnerabilities as well as opportunities. It is horizontal to natural disasters akin to cyclone, storm surge and flood. The mixture of natural and man-made hazards, for instance erosion, high arsenic content in ground water, water logging, earthquake, water and soil salinity, diverse forms of pollution, risks from climate change, etc, have harmfully affected lives and livelihoods in the coastal zone and hindered the speed of social and economic developments in this region. The Government, consequently, has formulated this coastal zone policy (CZP) that would offer a universal direction to all concerned for the management and development of the coastal zone in an approach in order that the coastal people are capable to pursue their life and livelihoods inside safe and favorable environment. The CZP, was passed by the cabinet meeting on January 17, 2005 (MoWR 2005). This policy manuscript was formulated through a procedure of multi-level consultation over a period of two years. The coastal development procedure aims to convene, on an overall basis, national objective for economic growth, poverty reduction & social development, code of conduct for responsible fisheries, code of conduct for liable mangrove management and other international conventions and treaties together with to accomplish the targets of the Millennium Development Goals (MDGs) (Unnayan Shamannay 2015).

5.4.3 Coastal Development Strategy (2006)

It is put up on diverse sector policies of the Government of Bangladesh. The policy states that the coastal development procedure aims to obey with the national target for Accelerated Poverty Reduction (PRSP); the Millennium Development Goals (MDGs), the Code of Conduct for Responsible Fisheries and with other international conventions and treaties. The main goal of the CDS management is to make conditions, wherein the diminution of poverty, development of sustainable livelihoods and the incorporation of

the CDS into national procedures can take place. The fundamental development strategies are following- economic growth, fundamental needs and opportunities for livelihoods, diminution of vulnerabilities, sustainable management of natural resources, impartial distribution, empowerment of communities, women's development and gender equity, preservation and improvement of critical ecosystems etc (Unnayan Shamannay 2015).

5.4.4 National Water Management Plan: Development Strategy (2011)

Bangladesh embarked upon equipment of a National Water Management Plan (NWMP). In connection with this, a development strategy for the NWMP was consequently adopted in June 2001. In line with Policy and the development strategy, this National Water Management Plan has been geared up to offer a outline at national and regional level inside which line agencies, local government and other stakeholders may preparation and employ their own activities and projects in a harmonized approach, consistent with overall national and sectoral objectives.

5.4.5 Bangladesh Water Act 2013

The act is to formulate provisions for development, management, abstraction, allocation, employ, security and preservation of national resources in an integrated manner. It is the act to relevant for the surface water, ground water, rain water, sea water, and water in the atmosphere in the area of Bangladesh. For the reason of this act a small council that is called "National Water Resource Council" headed by the Prime Minister has been constituted. Into this act, a number of exchanges can be possible at government level. Those are as follows;

- Exchange and review any information of common water resources;
- Combined research on international rivers; Prevention measures for chemical and organic pollution;
- Measures for the allocation of the water of international rivers;
- Organization of educational and training programs on water resources.

5.5 Actors in Water Management Policymaking

Some regulatory authorities are to employ and manage the noted activities in line with a variety of policies and acts on water. A number of the regulatory bodies are- Ministry of Water Resources, Bangladesh Water Development Board (BWDB), Water Resources Planning Organization (WARPO), Joint Rivers Commission (JRC), River Research Institute (RRI), Dhaka WASA etc. These are briefly presented at this point.

Table 5.1: Four eras of evolution of water policies in Bangladesh

Era	Laying the Foundation of Water Institution (1947–1988)	Establishing the Flood Action Plan (1989–1994)	Restructuring the Water Sector (1995–1998)	Evolution of Water Governance (1999 to Date)
Main Concerns/Goals	Establishment of key institutions (e.g., BWDB) of water management	Strategy formulation for controlling and managing floods	Overhaul the water management systems, particularly, decision making process	Developing calibrated policy instruments to face water challenges
Main Issues	Increasing agricultural production	Controlling floods, particularly saving crop cultivation	Integrated planning and management and preserving water resources	Managing water demand and crisis by leveraging science and technology
Main Instruments	A 20-years Water Master Plan (WMP)	The Flood Action Plan (FAP)	The Guidelines for People's Participation	The National Water Policy and National

			(GPP) for water development projects	Water Management Plan (NWMP)
Key Features	Preparing WMP was the initial step of water planning. It overemphasized surface water interventions and overlooked ground water management. In this era, water management was followed mainly "sectoral approaches" and "structural engineering solutions" that raised much criticisms. Broadly, water management was based on flood control and drainage and irrigation management, and decision making was BWDB-centric	Due to the devastating floods in 1987 and 1988, flood controlling received international attention and donors' support. However, NGOs, civil societies criticised FAP, since it discouraged decentralized decision making. Minor irrigation (e.g., shallow tube wells) was flourished in this time owing to privatization of irrigation technology business and substantial reduction of government taxes.	Water management was based on flood control and drainage, albeit water crisis in the dry season and droughts were becoming an increasing concern. Enacting Upazila (Sub-district) Parishad Act 1998, formulating LGED guidelines on how to involve local people in water projects, strengthening local government institutions and provisioning impact assessment and applying EIA practice in approving	Several strategic initiatives were taken such as facilitating partnerships and devolutions of power. The government had approved a 25 years NWMP and developed other instruments, namely BWDB Strategic Plan 2009–2014, National Water Act 2013, and Haor (flooded tectonic depressions) Master Plan 2012–2032. However, the challenges lie in implementation of these instruments as the country has shortage of resources and

			projects were main issues of this era	political will.

(Chan et al 2016)

Table 5.1 describes four eras of water policy evolution in Bangladesh from the 1950s to present and illustrates that relatively few policy instruments have been created to address water governance. In addition, several existing policies are out-of-date in terms of addressing rapid environmental change, and although Bangladeshi water policies are partly integrated with environmental issues such as agriculture and sanitation, issues of climate change are utterly ignored. Environmental and climate policy integration is essential for IWRM planning and implementing to effectively address the water-energy-food nexus and to advance toward sustainable development.

5.5.1 Ministry of Water Resources

It is noted that the Ministry of Water Resources is the top body of the Government of Bangladesh for development and management of the whole water resources of the country. The ministry prepares plans, policies, strategies, guidelines, rules, instructions and acts, regulations, etc. It has four wings: that is (i) Development Wing accountable for preparation, implementation and monitoring of the aided projects; (ii) Administrative Wing accountable for the administration of the Ministry and the organizations reporting to it; (iii) Planning Wing liable for dealing out all projects for approval by the Planning Commission and preparation, implementation and monitoring of projects solely funded by GoB, and discharge of all funds of the development projects under ADP; and (iv) Budget & Audit wing.

5.5.2 Bangladesh Water Development Board (BWDB)

Bangladesh Water Development Board (BWDB) started its operation in 1959 as the water wing of the erstwhile ‘East Pakistan Water and Power Development Authority’ (ibid). As the main agency of the government for organizing water resources of the

country, the Organization was given the liability of carrying out the tasks of implementing flood control, drainage and irrigation projects to amplify productivity in agriculture and fisheries etc.

5.5.3 Water Resources Planning Organization (WARPO)

The tasks of WARPO have further been amplification through the implementation of National Water Policy in 1999. During 1998 to 2000, WARPO carried out the groundwork of National Water Resources Management Plan (NWMP), a structural Plan to translate the National Water Policy into 84 programs inside the structure of Integrated Water Resources Management (IWRM).

5.5.4 River Research Institute (RRI)

River Research Institute (RRI) is a part of Ministry of Water Resources of Bangladesh working as a constitutional public authority. The institute consists of three directorates: Hydraulic Research, Geotechnical Research, and Administration & Finance.

5.5.5 Joint Rivers Commission (JRC)

Joint Rivers Commission (JRC) was established on 19 March 1972 in Dhaka. The occupations of JRC are: to keep up liaison between the participating countries so as to ensure the most efficient joint efforts in maximizing the benefits from general river systems to both the countries; to coherent flood control works and to suggest implementation of joint projects; to prepare detailed proposals on advance flood warnings, flood forecasting and cyclone warnings; to study flood control and irrigation projects.

5.6 Actors in Policy Implementation

At the point when the administration of Bangladesh structured its first National Water Plan in 1985 with the assistance of global advancement offices, it perceived the requirement for increasingly complex apparatuses for arranging and investigation of the

effects of ventures dependent on scientific displaying. In 1986 the Surface Water Modeling Program (SWSMP) was propelled by MOWR to systematize displaying capacities as a necessary piece of the National Water Planning Process. SWSMP was bolstered by UNDP and the World Bank, and later DANIDA. The Surface Water Modeling Center (SWMC) was built up in 1996 and was renamed as the Institute of Water Modeling (IWM) in 2002. IWM is currently a focal point of greatness for the advancement of pressure driven and hydrologic information in Bangladesh, giving ability to improving the arranging and plan of the nation's water the board (Kolas 2013).

The Bangladesh University of Engineering and Technology (BUET), a noticeable foundation for higher research in Bangladesh, houses another significant focal point of information on hydrology and water. The Institute of Water and Flood Management (IWFM) conducts research and limit improvement in the field of water and flood management, and gives government and non-administrative associations in Bangladesh with warning and consultancy administrations. Research exercises at the institute center around water the executives with significant accentuation on water resource management in floodplain situations, waterway and beach front hydrodynamics, wetland hydrology, risk the board, urban water the executives, water system and water the executives and water assets strategy.

The Flood Forecasting and Warning Center (FFWC) was set up in 1972 as a perpetual element of the Bangladesh Water Development Board, and works as a middle for flood data regarding calamity management. Notwithstanding satellite symbolism, the middle gathers data from thirty conjecture stations and delivers day by day rainstorm releases, stream circumstance reports and figures, cautioning messages and extraordinary flood circumstance reports, month to month and yearly flood reports and a dry season week after week notice. The Local Government Engineering Department (LGED) is one of the biggest open division associations in Bangladesh depended with arranging and execution of neighborhood level and little scale water assets framework advancement programs. LGED works intimately with nearby partners to guarantee individuals' support and base

up arranging in all phases of undertaking execution. The wide targets of LGED's advancement exercises are to improve financial conditions through supply of neighborhood level foundation and limit building (PRIO 2013).

The Bangladesh Agricultural Development Corporation (BADC) is an independent corporate body under the Ministry of Agriculture, with an across the nation system of peripheral field workplaces down to the sub-area (upazila) level. After Bangladesh picked up its autonomy, BADC started improvement projects, for example, expansion of water system offices and profound tube well establishment extends in the whole nation, except for the Barind region, which is a generally stranded tract between the Padma and Jamuna (Brahmaputra) covering the regions of Rajshahi, Bogra, Rangpur and Dinajpur. In 1985, BADC propelled a task called the Barind Integrated Area Development Project (BIADP) to advance farming improvement in the Barind zone. In 1992, the service established the Barind Multipurpose Development Authority (BMDA), prevalently known as Borendro, to execute further improvement extends in this area. Already charging for water system through a coupon framework, Borendro is the main association in Bangladesh to have begun a modernized prepaid meter framework for gathering water system charges. In this framework, the water privileges of a rancher are built up by reviving a prepaid card at an organized distributing station for charging the card or transferring the meter data accessible at each sub-locale office (ibid).

5.7 Stakeholder Analysis

Stakeholder analysis included assurance of every respondent's capacity to impact policymaking and the perspectives (positive and negative) and cost/advantage desires for every interviewee concerning the key water management strategy in the study area. Respondents' were gotten some information about their perspectives on the Farakka Barrage at Char Ashariadaha of Rajshahi. Interviewees were requested their perspectives on the Farakka Barrage and the Ganges settlement of 1996. To distinguish the stakeholders it began with composed sources and meetings with key government organizations, for example, the local authorities of Bangladesh Water Development

Board (BWDB). It asked the accompanying key inquiries during the distinguishing proof procedure: Who is affected by changes in water management and/or river water supply? Who has existing rights to use river water? What (if any) are the groups or organizations challenging existing water management policies? Which groups or organizations have pushed for recognition of their own (or others') demands for access to river water? Who is responsible for river water management and policymaking, and whose policy decisions/actions determine changes in river water management? Based on preliminary stakeholder identification, stakeholders were divided into two main categories and some subcategories:

- Government and Non-government Officials
    - Local Water Development Officials
    - Public Health Officials
    - Agricultural Extension officer
    - Upazila Disaster Management Committee
    - Fisheries and livestock Officials
    - NGO Officials
- Local People
    - Farmers
    - Fishermen and Fish farmer
    - Wage Laborer
    - Women (who mainly collect drinking water)

While mapping the stakeholders, present study perceived the obvious imbalance of stakeholders regarding their ability to impact water management policies and practices. Though a few gatherings are increasingly powerful concerning policymaking, others can impact the execution of approach, even now and again having a more prominent state in the way river water is managed. A few groups might be authoritatively amazing, while others without an official job may impact policies by deciding how arrangement is actualized on the ground. There are additionally contrasts in how interests are shared

inside groups and how significant water accessibility is to the people and its individual members. Finally, there are differences in the ability of interest groups (or groups of stakeholders) to mobilize support for their agenda and their ability to form alliances with other groups. Based on these considerations, present study classified each stakeholder according to their presumed power to influence policymaking and implementation.

5.7.1 Government and NGO Official

As national-level stakeholders in trans-boundary water management in the study area, interviews were conducted with members of key government agencies, and with local people who mainly are sufferer of water problems in the study area. Worries about trans-boundary river water management as communicated by respondents incorporated the requirement for more contribution from water specialists in policy making (raised by an administration official), absence of correspondence among policymakers and specialists, absence of master autonomy in basic leadership, the inclination of policymakers to ponder political and profession gains, the shortcoming of Bangladeshi negotiators versus their Indian partners and absence of universal help in dealings, the propensity of legislators to challenge anything done by an adversary party, absence of fields where common society from India and Bangladesh can trade sees unreservedly and past governmental issues, and innate shortcomings in existing water-sharing understandings. Stakeholders communicated a scope of perspectives on trans-boundary water management. As per one government worker, water shortage isn't really brought about by insufficient arrangements, however is fairly a result of worldwide environmental change. Another government official contended for the need to improve the information on Bangladeshi policymakers. An administration official expressed that local water emergency is a national issue as opposed to a matter of gathering legislative issues, expressing that politicians ought to be caused mindful of water issues with the goal that they can attempt to unravel them. These stakeholders saw that water shortage issues were brought about by one-sided government basic leadership. As anyone might expect, a local NGO worker contended that individuals from common society ought to have more

extension for communicating their feelings and assume an increasingly noticeable job in arrangement making. A few interviewees concurred that the job of ideological groups was risky. An administration officer expressed that he might want to see a conclusion to the theoretical utilization of water issues for political gains. A local government official kept up that in spite of good strategies, resistance groups would consistently deceive individuals. Another point of convergence of consideration was the connection among India and Bangladesh. While lawmakers kept up that the two nations had 'committed errors' identifying with trans-boundary water-sharing, another asked for a solid remain by Bangladesh against water settlement infringement, contending for the structure of an inflexible stance globally to make powerful charges against infringement. A society member would prefer to make more open doors for the common social orders of the two nations to talk about water-sharing issues. As contended by another common society entertainer, nonetheless, the favoring of India by some ideological groups was a significant issue, and that ideological groups ought to rather offer priority to the welfare of Bangladesh. As to the Ganges Water Treaty, a few respondents communicated their help for and fulfillment with the bargain, while other communicated disappointment with the arrangement itself, its usage (for example infringement by India) or both. The vast majority of the adversaries contended for an amendment or renegotiation of the arrangement. Policymakers ought to likewise remember national interests and stay away from one-sided choices that supported the restricted interests of specific gatherings, ideological groups or even certain administration organizations.

Table 5.2: Water Treaty 1996 and Official Stakeholder Mapping

Water Treaty 1996					
Stakeholders	Role of Stakeholders	Comments on Water Receiving	Evaluation of Government Negotiation	Understanding/ Causes of Problem	Comments/ Recommendation
Bangladesh Water Development Board (BWDB) Officials	Local water management and water resources supervision	This treaty cannot ensure sufficient amount of water for the people of Char Ashariadaha especially in dry season	This treaty provide potential support for Bangladesh Government to negotiate with India but the outcomes are likely negative	The agreed amount of water to be shared by India and Bangladesh mentioned in this treaty could not be properly estimated	Bangladesh government negotiation with India should be more strong
Public Health Officials	Look after health, hygiene and sanitation in the study area and the Upazila	Insufficient water received by people of Char Ashariadaha	Governments have been reclaiming for proper distribution	India's dominance in treaty	Some provisions of the treaty should be revised for ensuring equal distribution
Agricultural Extension officer	Work for local agricultural development	Farmers cannot get important water for irrigation	Governments focus in negotiation should be more agriculture specific	Barricade of water stream by India	Negotiation should be more strong

Upazila Disaster Management Committee (UDMC)	Supervise and coordinate hazard and disaster happens in the upazila	Very little water is received than the agreement	Governments are likely to maintain friendship with India instead of claiming proper distribution	Political instability in Bangladesh	Governments should be national interest specific
Fisheries and livestock Officials	Work for the Betterment of local fisheries and livestock	Fisheries is facing tremendous problems due to water shortage	Respective department of government is trying for the improvement	Poor negotiations and lack of international pressure for equal distribution of water	Bangladesh government with international communities should pressurize India for equal water discharge
NGO Officials	Work on socio-economic development of the local people	People of the Char Ashariadaha get very less water	Government is not looking at local people's water crisis	Governments have been emphasizing on political interest of the party instead of national interest	Local people's need should assessed and water treaty should be implemented properly

Fieldwork 2017

Table 5.3: National Water Policy 1999 and Official Stakeholder Mapping

National Water Policy (1999)					
Stakeholders	Role of Stakeholders	Comments on policy	Strength	Weakness	Comments/ Recommendation
Bangladesh Water Development Board (BWDB) Officials	Proper supervision of local water resources	This policy promotes private engagement in water management	Various sector oriented goals	Necessitates multi-sector water needs with limited resources	Private public partnership in water resource management should be evaluated
Public Health Officials	Provision of drinking water supply and waste management	This policy does not include public health directly	Explain public and private responsibilities	Less focus on local water resources	Should be public health centered
Agricultural Extension officer	To provide eco-friendly, safe, climate resilient, sustainable productive good agricultural practices	This policy has not include water management in terms of types of the agricultural lands	It encourage small scale to large scale partnership in water management	Poor implementation plan	Impose force to implement the policy
Upazila Disaster Management Committee (UDMC)	Look upon disaster and estimate damage	It is well designed for water management	Ensures legal framework for water management	Lack of social justice	Should include all stakeholders related to it
Fisheries and livestock Officials	Increase fishery resources	Its arrangement is luxurious	includes almost all things related	Lack of coordination	Should focus on local fish resources

	and production		to water management		
NGO Officials	Local development	Comprehensive policy	make sure local people's participation	Local needs is underrated	Should be more inclusive

Fieldwork 2017

Table 5.4: Bangladesh Water Act 2013 and Official Stakeholder Mapping

Bangladesh Water Act (2013)					
Stakeholders	**Role of Stakeholders**	**Comments on Act**	**Strength**	**Weakness**	**Comments/ Recommendation**
Bangladesh Water Development Board (BWDB) Officials	Develop and manage water resources projects	This act is formulated for development and management of water	It talks about all kinds of water	No clear statement about distribution	-
Public Health Officials	Provision of drinking water supply and waste management	Though all kinds of water mentioned, public health issues are not uttered	it includes management, collection, and distribution of water resources	failure to implement ion local area	Should be implemented properly
Agricultural Extension Officer	Enhancing export fish, fishery and livestock products	It also talks about sea and river water management	Essential issues about water use and management are discussed	Agricultural dimension of water use and irrigation is not mentioned	Agriculture should be prime focus

Upazila Disaster Management Committee (UDMC)	Diffuse warning and prepare upazila disaster plan	Potential act	Emphasis on well management	It does not talk about water management during and after disaster	Crisis moment water use should be addressed
Fisheries and livestock Officials	Prevent and control diseases of fisheries and livestock	It talks about all kinds of water use and management	Water management and usages is well accounted	Fisheries and livestock are merely focused	Maximize water use through promoting reservation
NGO Officials	Development of local lives and livelihood	Effective act	Provision of water use and management	Unable to prevent water pauperization	Should be implemented beyond local political interest

Fieldwork 2017

Table 5.5: National Water Management Plan 2011 and Official Stakeholder Mapping

National Water Management Plan: Development Strategy (2011)					
Stakeholders	**Role of Stakeholders**	**Comments on Plan**	**Strength**	**Weakness**	**Comments/ Recommendation**
Bangladesh Water Development Board (BWDB) Officials	Local dam and embankment building	Modern plan	Ensures coordination with various authorities	Lack of clear statement	It should be more precise for better outcome
Public Health Officials	Water and hygiene management in local area	It prioritize water development strategies	It has development al strategies	Poor actions	Public health should be prioritized
Agricultural Extension officer	Improve agricultural	Timely plan	Follows harmonized	Scattered objectives	Irrigation should be emphasized

	production		approach		
Upazila Disaster Management Committee (UDMC)	Risk identification and mitigation	Easily Implementable	Crisis situation water management focus	Local elite empowered	Should be poor people friendly
Fisheries and livestock Officials	Improvement of fisheries and livestock	Effective for water resource utilization	Regional and local level issues are addressed	Lack of implementing strategies	It must be consistent with SDGs and MDGs
NGO Officials	Local development	Local development focused	Various aspects is included	Lack of proper implementation plan	

Fieldwork 2017

5.7.2 Local Level Stakeholder Analysis

The key concern expressed by the great majority of respondents was the decreasing water levels in the Padma River. While there are sometimes floods in the wet season, frequently there are droughts in the dry season and fisheries have been discontinued as there are no longer any fish to be caught. A large number of respondents highlighted the severity of the situation for agricultural production. They told that lack of water for irrigation and decreased soil fertility had led to significantly decreased yields and left large areas of farmland uncultivated during the dry season. Some said that the area was turning into a desert. As they tried to cope, farmers were faced with two major challenges. In their efforts to compensate for decreased fertilization from flooding, farmers need to increase their use of chemical fertilizers, but because of their rising price as well as the increased demand, poor farmers are unable to afford them. Consequently, their yields decrease. At the same time, farmers are faced with rising costs of irrigation water. As the river water continues to decrease and the use of shallow machines becomes insufficient, farmers

have to pay for semi-deep or deep tube wells to be installed. Installation and running costs of deep tube wells are high, and there is a serious shortage of electricity.

Table 5.6: Water Treaty 1996 and Local Stakeholder Mapping

Water Treaty 1996					
Stakeholders	**Livelihood**	**Risk/ Comments of Water Receiving**	**Evaluation of Government Negotiation**	**Understanding/ causes of Problem**	**Comments/ recommendation**
Farmers	Mainly depends on agricultural production for subsistence. There are some farmers who have small scale farm in Char Ashariadaha	Very insufficient water is flowing in Bangladesh.	Governments are not sincere enough to look at the water problem	Reluctance of Indian government to rectify the provisions of the treaty	All necessary arrangements should be taken by Bangladesh Governments for equal water discharge into Bangladesh
Fishermen	Subsistence depend on fish production and collection	Water bodies dry up due to inadequate water	Poor negotiation	Various dams are constructed in India's end to control Padma/Gange's water flow	Bangladesh governments should compel India to abide by the treaty
Wage Laborer	Sell physical	Lack of essential	Do not know about the	Barrage construction	Barrage should be removed

	labors in terms of cash in agricultural and non agricultural sectors	water dry season	treaty	makes water problem	
Local Politicians	Have various sources of livelihood options	People of Char Ashariadaha get less water	Running government is improving the situation	India look at only own interest	Mutual discussion for equal distribution
Civil Society Members	Various sources	Little water is received by local community during dry season. But over flow of the river in rainy season causes flooding	Bangladesh government cannot cope with Indian government in diplomacy	Top ranked government bureaucrats cannot understand local needs	Provisions of the treaty should keep fore front during diplomatic discussion

Fieldwork 2017

Table 5.7: Bangladesh Water Act 2013 and Local Stakeholder Mapping

Bangladesh Water Act (2013)					
Stakeholders	**Livelihood & Settlements**	**Comments on Act**	**Strength**	**Weakness**	**Comments/ recommendation**
Farmers	Most of the inhabitants of Char Ashariadaha are mainly farmers who cannot be termed as 'closed corporate community' (concept of Wolf 1957 & 1986)	Many people heard about the act but no practical implementation is observed in local level	Formal legislature for protecting water resources	No manpower to enforce the act	The act should be abided by all people despite socio-economic and political identity
Fishermen	Traditionally fishermen community live in a corner of Char Ashariadaha subsist on fish catching in natural water bodies	Do not hear about the act	-	-	Any act regarding water use should be implemented properly
Wage Laborers	A good number of	Some people heard about	Put importance	No proper action is seen	Should be imposed neutrally

	local inhabitants are wage laborers who work in agricultural and some non agricultural fields like brick field, motor vehicle driving	the act that emphasis on country's water resource protection and proper use	on proper use and management of water		
Local Politicians	These people are powerful in local area whose source of power depends on communicat ion with other senior leader	Running government passed the law for wellbeing of the countrymen	Its provisions encompasses local water management strategies	Inadequate manpower	Increasing of law enforcement
Civil Society Members	made of various people from different socio-economic and educational orientation	Timely act	Thoughtful about both natural and manmade water resources	Biasness in enforcement	Equal treatment during enforcement

Fieldwork 2017

Table 5.8: Local Official's Activities in Water Related Crisis

Local Officials' Activities in Water Related Crisis					
Stakeholders	**BWDB**	**Agricultural Extension and Barind**	**Public Health**	**Fisheries and livestock**	**UDMC**
Farmers	▪ Officials look after natural water bodies and estimate flow in Padma river ▪ Notify people before flash flood by measuring water height	▪ Help in crop selection in semi moisture and dry land ▪ Organize centralized irrigation system in the lands ▪ Guide during crisis moment through block officer	▪ Increase awareness regarding water borne disease ▪ Insist on pure drinking water ▪ Provide medicine during flash flood	▪ Provide support for the betterment of livestock and fishes ▪ Recommend medicine and vaccine for fish and livestock	▪ Identify risky area and vulnerable people and take action to minimize the risk ▪ Ensure safer location during flood and provide food, sanitation etc
Fishermen	▪ Their role is to ward natural water bodies for fish production but they are	▪ Ensure irrigation water for farmer but no strategies for protecting	▪ Look upon local health, water, hygiene and sanitation system	▪ Support fishermen in providing guide, direction and indication in fish	▪ Inform about hazardous event ▪ Miss information causes damage of

	somewhat callous to do so in the locality	fishermen community	▪ Fishermen community is neglected in some cases	cultivation ▪ No direct support for traditional fish catcher in natural water bodies	lives
Wage Laborers	▪ Laborers with whom present study talked never see such officials and do not know their activities	▪ Block officers provide guidance for local farmers and supervise irrigation system	▪ Disseminate health and hygiene awareness program	▪ Advise how to keep livestock and poultry safe during dry season and flash flood	▪ Announcement of signals and aware people about upcoming jeopardy

Fieldwork 2017

Also, groundwater levels are diminishing and wells must be bored further and more profound. With diminishing benefits because of higher costs, numerous ranchers can't bear the cost of new well establishment costs when old wells evaporate. There is likewise a deficiency of drinking water, which messes up their lives. Practically, respondents referred to the blockage of water at the Farakka Barrage as the primary explanation behind the present water crisis in Char Ashariadaha. According to local people, water was copious in the Padma before development of the Farakka Barrage, yet after development the waterway stream diminished. The flood was in this way observed as the essential driver of the present water shortage. When requested their conclusion on the Farakka Barrage, none of the respondents respected it emphatically, just six were neutral,

while the staying 174 were disappointed with the barrage. When requested to give their view on the Ganges Water Treaty of 1996, many respondents expressed that they had no information on the arrangement. A few respondents who knew of the treaty expressed unequivocally that India did not fulfill its obligations under the treaty, or that the treaty was not being implemented 'in reality'. Another portion of respondents made a clear distinction between the treaty and its implementation to the effect that the treaty itself was not to blame. A respondent said that-

"The treaty states that India will give us a particular amount of water when there is required amount of water flow in the Ganges. But the weakness of the treaty is that the mentioned amount of water flow is impossible to get. The Ganges River never reaches that level of water. The reason behind this is that there are many other barrages on the river Ganges before Farakka. This is the tricky part of the treaty"

All of those who had heard about the project stated their view as negative, some describing it as 'a disaster' for Bangladesh. Many farmers in this area expressed concerns about future water scarcity in the dry season. Unless river water was available for dry season irrigation, farmers would have to turn to rain-fed agriculture, with far-reaching and potentially devastating consequences for the livelihood of farmers. There were also concerns about loss of sediments from the river due to decreased water flow, water pollution, dam breakage and sudden release of water during the wet season causing more severe flooding. The following table presents a review of water policies in Bangladesh.

Table 5.9: Review of water policies in Bangladesh

Policy Instrument	Inclusion	Consistency	Weighting	Reporting	Resources
National Water Policy	Explicitly discusses as water for the environment	Protection of the environment states a fair consistency	Importantly presented, signifying an efficient and equitable water use	Reporting and evaluation systems are weaker. Poor monitoring systems	Lacking of resources, e.g., financial and technological
Development Strategy of the National Water Management Plan	Carefully includes measures for environment protection and improvement.	Indirectly, as it creates avenues for efficient management	Health and environment strategy is a major strategic choice of this document.	Weaker reporting provision. Suggests applying evaluation tools, e.g., EIA	States challenges. GOs, IOs and DOs provide supports
National Water Management Plan	Protection of the natural environment states as a major goal.	Partly. Economic development is a prime issue	Considerably significant as water pollution is a pressing issue.	Includes a detailed plan for coordination, monitoring and reporting.	States a brief funding plan (donor-dependent), indicating challenges
National Water Policy 1999	-	-	The Term Climate Change is Not Used.	-	-
Water sector Development Strategy 2001	Climate change issue inadequately includes	Broadly consistent	States only the sea level rise concern and reports more	Weaker reporting systems due to financial and	No. However, it reports caveats such as flood,

			researches are needed on it.	technical limitations.	arsenic contamination, and natural calamities.
National Water Management Plan 2004	Inexplicitly.	It only states in the baseline of the plan.	Climate change problems insignificantly presented	Knowledge gaps on climate change impacts are acknowledged.	No

(Source: Fieldwork 2017 and Literature Review)

5.8 Gap between Policy and Practice

The water policy kicked off in 1999 which is roughly 20 years ago from this moment. Since the bigger framework problems always modify those mechanisms, updating the policy by keeping velocity with the time is must. However in this case, this matter is missing. The Quick Diagnostic Study (QDS) that was conducted mainly under Sustainable Development Investment Portfolio (SDIP) has acknowledged a variety of issues such as diminishing water flow in the river, short of water supply infrastructure in the rural vicinity, preventing water pollution in every level, conservation of water bodies, irrigation management that are roofed by the National Water Policy (1999). The issue of integrated river basin management is correctly identified in policy but it has a number of specific problems in execution level. This are-

- Poor co-operation among different institutes;
- Gap in the knowledge sharing procedure among the SAARC countries;
- Ineffective co-operation of the river sharing countries.

For another important issue, proficient use of water, the surveillance from field level is that general people are not conscious enough about the significance of it. A very much essential concern, short of money to buy irrigation equipment, is not correctly addressed

in the present policies and strategies. It is the suitable time to comprise these issues into the policies. Consequently, harmonization among the demand-specific programs to speed up the accessibility of necessary water is an obligation from the side of relevant authority.

5.9 Conclusion

A few key conclusions can be drawn from the stakeholder mapping and analysis. Whether water projects help a large section of the local population or contribute to disastrous conditions, those who are facing the consequences of these projects are largely ignorant about the policies made or the treaties signed by government actors. In spite of the fact that conceivably hurt by or profiting by these approaches and settlements, influenced population are not educated about plans and proposition, nor are their suppositions over viewed before their destiny is chosen by the structure of barrage or floods, or the marking of water-sharing treaties. Be that as it may, because of advancements in the media, individuals living in riverine territories are presently getting increasingly mindful of the issues, however their insight is as yet restricted. During interviews with government representatives it found that they were exceptionally hesitant to discuss these issues, and for the most part attempted to abstain from responding to any inquiries in regards to this. With respect to ideological group individuals, they didn't appear to express their very own conclusion yet rather the perspectives on their gathering. In spite of the fact that numerous common society associations are working in the nation and chipping away at water-related issues, no noteworthy measures can be started by them to definitively impact policymaking. Therefore, most policymaking on water management is affected by political interests if not contention among legislators.

Present study distinguished a few essential lacking in information and mindfulness among locale. One gap is between policymakers and affected population whose perspectives are not looked for by policymakers. The possible outcome is that policymakers come up short on a satisfactory comprehension of nearby difficulties, perspectives and interests. A further anomaly exists among policymakers and knowledge producers, while there is additionally an absence of master association in policymaking.

Finally, there are also barriers to civil society contributions to decision making. As a result, it appears that policymaking on riverine water management in Bangladesh is insufficiently grounded in a comprehensive understanding of local needs, and is often decoupled from scientific assessments of water-related challenges. There is thus an urgent need for collaborative research and programming that incorporates local coping strategies and knowledge**.**

Chapter 6

Riverine Ecosystem, Lives, Livelihood and Development Interventions

6.1 Introduction

The Padma River is probably the longest waterway and it is accepted to be a significant bringing forth and nourishing ground for riverine fish species of Bangladesh. The area of the landward limit of the waterfront zone is an element of three essential geophysical procedures: tidal changes; saltiness; and hazard for twister and tempest floods. The waterfront zone of Bangladesh, influenced by these procedures, covers a territory of 47,201 km, or 32% of the total land, being the landmass of 19 regions. Around 35 million individuals, speaking to 29% of the populace, live in the coastal belt. A considerable lot of the river basin occupants are poor, and the population is presented to both catastrophic events and man-made perils. Customary agricultural livelihoods in this locality are sound adapted to seasonal variations in rainfall and to usual episodes of *Borsha* (wet) and *Khora* (dry), which make a diversity of freely obtainable ecological services. These services include river fisheries, the seasonal accessibility of wild foods, animal forage, soil replenishment through siltation and construction materials, for example wood and bamboo. The political culture and national political structure of Bangladesh permits elites at the local, national and international levels to set up programs that offer them manage over natural resources that endorse scientific and technological knowledge at the cost of local knowledge, and endorse the privatization and commoditization of water and agriculture. In place of a expectable and controllable difference of rainfall during every season, cultivator currently face more severe and less expectable episodes of extreme flooding and drought.

6.2 Development Initiatives in Padma Ecosystem

The char-lands development endeavors in Bangladesh are truly immaterial. Verifiably there were not many endeavors completed in Bangladesh. There are two improvement ventures were started in by the Government of Bangladesh in a decade ago. The main government venture it was Char Development and Settlement Project (CDSP) from stage I to IV were executed during 1994 to 2010 (Islam 2011). The goal of this venture is poverty decrease through progress in monetary circumstance and living states of

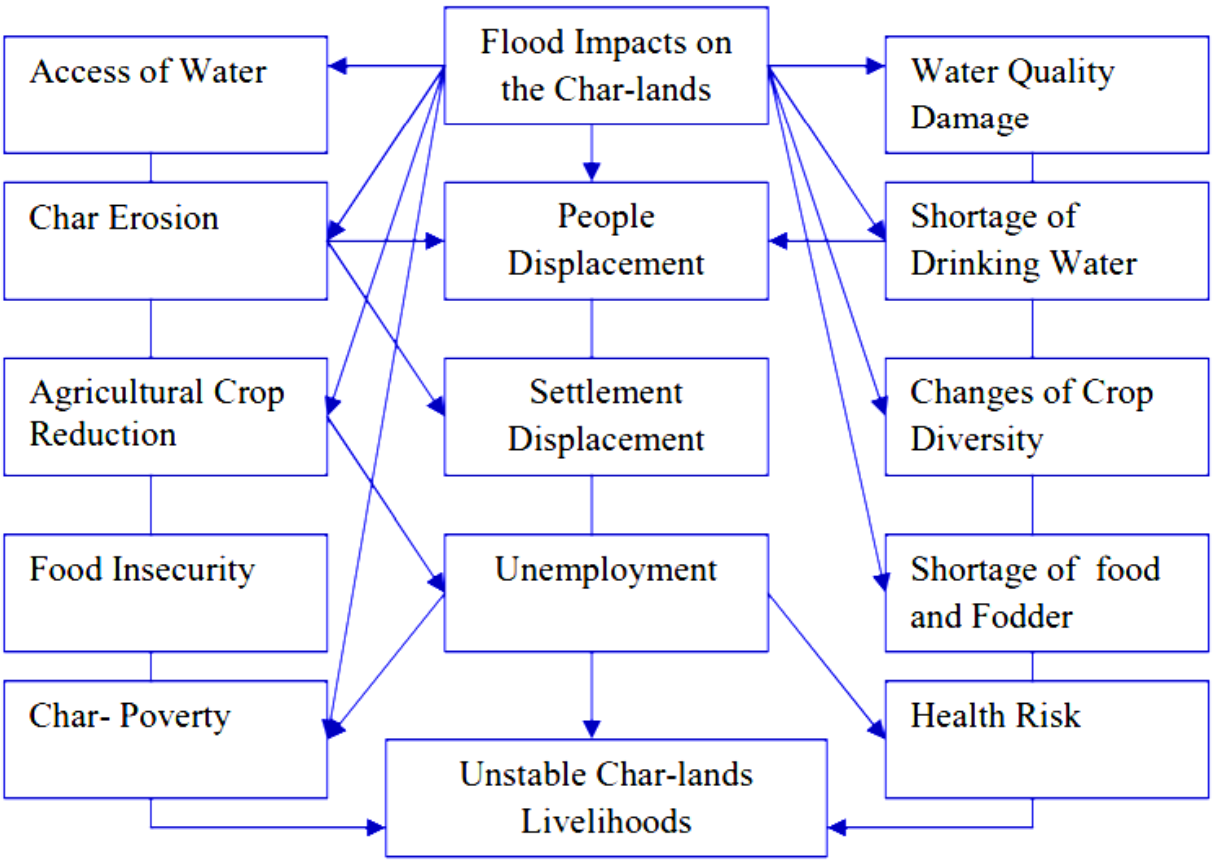
individuals in the focused district in the riverside locale where 30,773 hectares land was the situation regions of the CDSP venture. This CDSP project covered 6 districts char lands with 112,393 char people which is very minor considering the total char people is 12 million in Bangladesh. These undertaking exercises were neediness, social capital and rustic destitution data examination including sexual orientation issues of the task territory. This venture additionally talked about the neighborhood administration and institutional issues, political and financial issues. The undertaking doesn't pursue structure rule or work system. Different undertakings to be specific Jamuna Char Integrated Development Project (JCDP) and Char Livelihood Program (CLP) of DFID (Department of Foreign and International Development of UK) were started in 2003, in spite of the fact that this task pursued the vocation system however it was anything but an ideal structure for economical work manageability in the Char-lands. Also the undertaking was done in a little case premise even not a tremendous venture for the entire nation.

Elahi (1987, 1989; 1991), Baqee (1993, 1997), and Mamun and Amin (1999) examine the endless battle of the individuals for endurance in Rajshahi division and depicted how they adapt to the conditions and resettled on the banks after disintegration. Wiest (1987; 1991; 1998) talked about the social capital of the floodplain and char lands disintegration in Bangladesh. Zamman's (1988; 1989; 1991) in his anthropological study argued that response to natural hazards varied in accordance with the background of the family. It is perhaps somewhat surprising that more people do not choose to resettle on the char. However, it is a commonly held view in Bangladesh that char people are different and have their own distinct culture. Haque and Zaman (1994) stated that the effects to migrate the impacts of riverbank erosion in Bangladesh have been largely structural and technologically, to the exclusion of non-structural measures which might migrate the impact of riverine hazards at the individual and community levels. Baqee (1993) talked about that the settlements start through the sponsorship of amazing elites and unavoidably develop through a filtration procedure. These situations portrayed the current financial

relationship in the char lands which become progressively perplexing. Mamun and Amin (1999) talked about the view of individuals in the powerless char lands and recommended various techniques to lessen their sufferings. Haque (1999) gave a review of indigenous knowledge and practices of individuals while adapting to waterway disintegration and floods. Currey (1986) recorded the general changes in an overwhelmingly char settlements in Bangladesh. Ali (1980) endeavored to diagram the advancement of the laws that work in the char lands. Schmuck (2001) talked about in her examination on indigenous designing information on char people in Bangladesh. The particular writing recommended that, the assessment of Sociologists, Economists, Anthropologists and Geographers are nearly the equivalent. As a rule, the Geographers gathered information and broke down on socio-statistic and physical issues of stream bowls. In this manner, the issues of char lands are not understood because of absence of appropriate research in these regions.

In figure 6.1 there are important issues these are severely affected by water problem and as a whole it is the treats for stable char-lands and livelihoods.

Figure 6.1: Issues Faced in Char Lands



(Source: Islam et al 2011 with modification according to the present study)

Figure 6.1 shows the livelihood framework model where eight potential assets have been considered. Figure 4 shows the eight livelihood capitals such as physical capital, political capital, social capital, natural capital, human capital, financial capital, indigenous knowledge capital and cultural capital. All these capitals are the asset of livelihood sustainability. These 8 strengthen social –economic and cultural capitals were shorted out by the Char Ashariadaha dwellers through participatory rural appraisal (PRA) practices. The char dwellers believe that their traditional knowledge is using from generation to generation and they are living with floods and erosion and adapting the vulnerable situation in the river channels in Bangladesh. *Choura* culture (the culture of char people) and society is very important for them they love their culture and it is the cultural identity of the char dwellers. Therefore psychologically they are weak for their native culture and

heritage. It is the attraction for them when the new lands emerge in the river channel and they come back to the native char again and become the owner of the land. They start to new life and make a small community over there. Therefore for any kind of livelihood sustainability the newly reformed livelihood sustainability framework with 8 potential capitals are necessary for sustainability. This frame work could a potential framework that could be implemented in any other rural areas in Bangladesh as well as in any other places in world (Islam et al 2011).

In Bangladesh there are few char-lands related projects have been carried out. Most of the char-development projects were built out based on foreign fund collection. All most all the Char-land related project fits very well with the government's secondary poverty reduction strategy (National Strategy for Accelerated Poverty Reduction 2009-11). In this strategy water management, agriculture, forest, rural roads, land policy and disaster management are all focal areas for pro-poor growth to which the project will contribute. Supporting strategies include actions to reach extreme poor groups, support for better water and sanitation, especially where groundwater conditions are unfavorable (such as the saline coastal area), and adapting to climate change. Usually the resource available on char-lands are cultivable lands, green field, natural vegetation, grazing, various indigenous trees, open-water fish resources and domestic animals (Chowdhury, 2003). Moreover the successful uses of these resources are highly limited by the restricted mobility of the char-land dwellers because of the isolation which is further increased during disasters and natural hazards (Chowdhury, 2003). The selection of crops in the Char-lands is dependent on the quality of new land and is targeted to minimize food insecurity. High species and varietals diversity is therefore needed to secure production. Both flood and drought resistant varieties of crops/vegetables have importance in terms of biodiversity in char areas. The selection preparation of food is therefore hunger towards providing food security in the lean period and highly related to the available resources (Chowdhury, 2001). For example women dry pat shak (edible leaves of jute) as they are the only leafy item that can be dried in the sun and preserved for a long time.

Another nutritious food called shidol is made from the heads of indigenous small weed fish or with whole fish if there is a surplus. It is also contains a vegetable locally called Kachu. After the fish and Kachu, and Fen Kachu are pounded together, garlic and turmeric are mixed in for both flower as well as preservation. Moreover some other popular demandable foods are processed within their indigenous knowledge which was using and practicing from generation to generation. The char-lands livelihood improvement and sustainability the newly formatted framework could be a suitable livelihood framework for poverty alleviation and socio-economic improvement in the rural Bangladesh (Islam et al 2011).

According to the sustainable livelihoods framework of DFID (1999), a livelihood comprises the capabilities, assets (including material and social resources) and activities required for a means of living (Scoones, 1998). From this livelihood definition there are six major potential livelihoods assets (Figure 6.1) have been found to be considered as the capital for char-land livelihood sustainability model. In the previous all model and framework has considered only 6 potential assets those are the important capitals. The DFID operated and implemented one project in Bangladesh where they considered six assets of livelihood framework. Based on the DFID framework of livelihood sustainability in the rural areas in Bangladesh the major and important two assets are not considered in the frame work. Present anthropological study found two potential assets that should be incorporated in the framework. Present study thinks culture and indigenous can be another important asset.

6.3 The Dependency of Local People on Padma Hydro-ecology

Bangladesh is a riverine country with more than ninety four percent of its river water is deriving from international rivers come from India. The Padma Dependent Area (PDA) occupies the whole southwest area of Bangladesh and is sorted out by government agencies since one of eight major hydrological zones in the country. The southwest hydrological zone of Bangladesh is dependent on the water that initiated from as far as 2600 kilometers away in the Himalayan Mountains and streams through the four

countries of China, Nepal, India and Bangladesh before reaching the Bay of Bengal. The entire Ganges Basin has a catchment area of 33,520, 147,480, 860,000 and 46,300 square kilometers respectively inside each of these countries (Ministry of Water Resources n.d.). The study highlights the PDA but more particularly on the Padma River, one outlet of the Ganges in the western zone, and on Char Ashariadaha of Rajshahi district, which is located alongside the Padma.

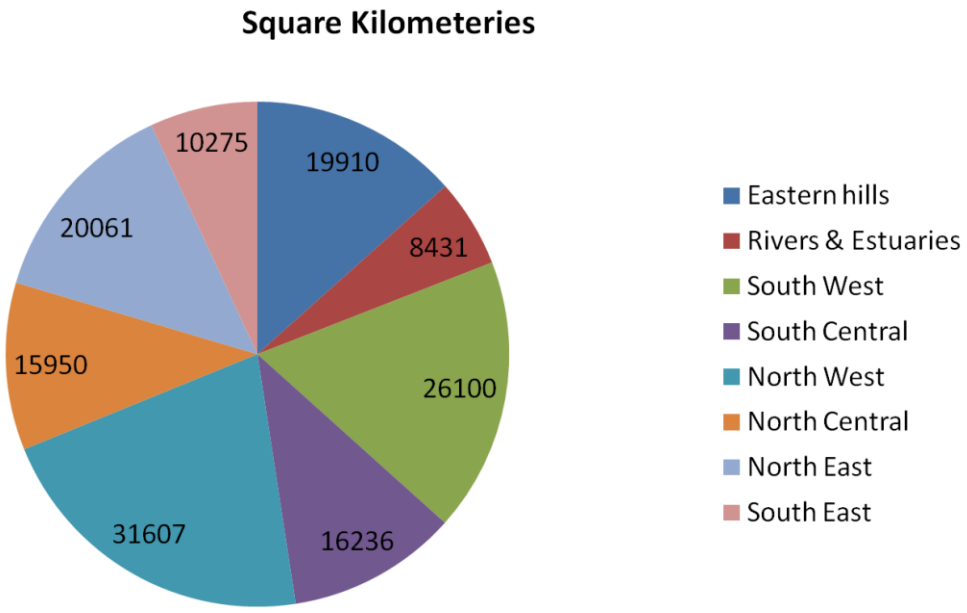


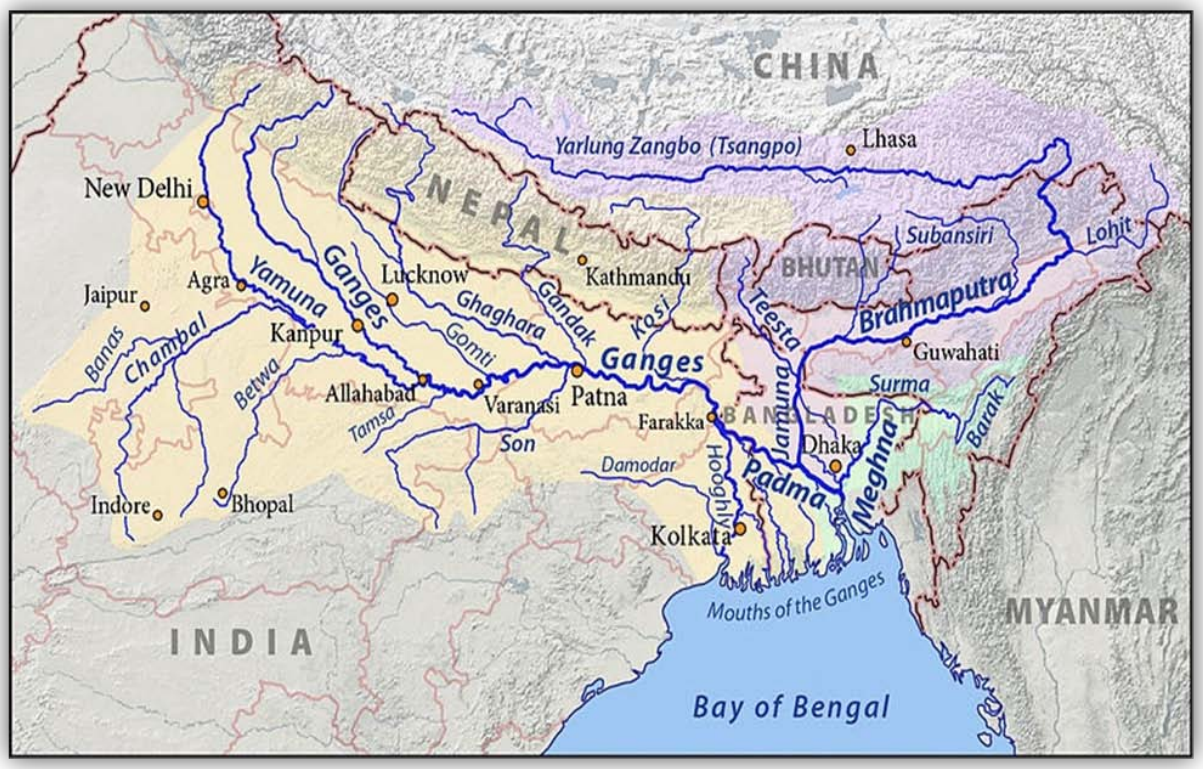
Chart 6.1: The Major Hydrological Zones in Bangladesh (in square kilometers).

(Source: Ministry of Water Resources 2001: 28)

The Padma dependent area in southwestern Bangladesh comprises river floodplains, peat basins, estuaries and the mangrove dominated Sundarbans. Nearly 80 percent people of Bangladesh, together with those who live in the PDA, live in rural areas and are reliant on water and agricultural practices for their livelihoods. The communities like Char Ashariadaha, the rainy season carries regular water flow locally called *Borsha* from the Padma Basin. The rainy season transports siltation onto agricultural lands so as to supportive for promoting soil fertility and agricultural production. Farmers of the locality sometimes do not require employing chemical fertilizer due to this natural fertility

source. The season is the vital productive time of the year for both crops and for other natural resources, akin to the water-borne wild vegetables, fisheries and vegetation that are also a key foundation of occupational practices. People of the locality in some instances do not require purchasing these from markets since they are freely obtainable from wild sources. Earlier than the rainy season, communities of the locality get a dry season that is supportive for producing various crops and getting different wild-vegetables, fish and fruits. Though, the Farakka Barrage in India is regulated in such a way that additional water is released during the rainy season which causes flooding and drives away a usual rainy season. Drought is also made to a large extent worse during the dry, pre-monsoon spring season that time water is diverted for employ in India and the downstream flow to Bangladesh is significantly reduced. Nevertheless, this technology-driven structure has created extra vulnerabilities for the marginalized basin communities at the western hydrological region in Bangladesh including Char Ashariadaha of Rajshahi.

Map 6.1: The Path of Gangas and other Rivers



(Source: Banglapedia 2014)

The Padma River is the major distributaries of the Ganges River in Bangladesh. This river originates in Chapainababgonj District and supplies ecosystem services akin to fresh water to the western hydrological region and has defended the Sundarbans mangrove forests from salinity intrusion for about 500 years (Islam and Gnauck 2001). The Padma bank communities at Godagari of Rajshahi are about 23 kilometers away from the Ganges River and are fully dependent on the Padma River for defending agricultural practices and livelihoods. The Padma River flow area is 120 kilometers in length with a catchment area of 15,160 square kilometers that comprises the districts of Rajshahi, Chapainababgonj, Pabna, Chuadanga, Kushtia, Rajbari, Faridpur, Gopalganj, Jessore, Jhenaidah, Magura, Narail, Perojpur, Barguna, Bagerhat, Khulna and Satkhira (Islam and Gnauck 2001).

The Padma Basin offers key water services for Char Ashariadaha households together with some respondents, who represent rich, intermediate, small, and landless laborers correspondingly. According to a senior respondent, the basin ecosystem offers "*pukur vora mach, gola bhora dhan, goal bhora goru*" (a pond full of fish, a household store room full of rice paddy and a domestic animal shelter full of animals). The water bodies of Padma basin are naturally developed derived from the Padma River stream. At the time of rainy season stream of Padma basin transport water to these water bodies and make sure a vigorous atmosphere for the whole year. Derived from this stream, the rich farmers make marketable agricultural crops as well as the marginalized farmers grow a number of their subsistence food and obtain service opportunities and environmental actions. The respondents said, the majority female member of the locality utilize local water bodies for household activities. The basin stream is the precondition for vital livelihood activities for instant producing crops and catching fish however is also crucial to a variety of social activities like visiting relatives, sailing boats, arranging water sports and providing resources for festivity. The residents of Padma basin realize the seasonal dynamics of winter, summer and rainy seasons and their relationship with the Padma Basin stream.

Derived from these seasonal outlines, the local people of Char Ashariadaha carry out the three major cropping patterns of *Kharif-1, Kharif-2* and *Robi* for agricultural production. *Kharif-1* happens at the time from March to May, from mid-spring to midsummer. *Kharif-2* happens at the time from June to October, from the mid-summer rainy or monsoon season to autumn. November to February is the *Robi* cropping season, that is, from late autumn, during winter to early spring. The people of Padma basin including Char Ashariadaha cultivates, such as, onion crops at the time of winter season as a *Robi* crop as this plant cannot be grown at the time of rainy season. In addition, they cultivate *Aman* paddy at the time of the rainy season as this crop entails a higher level of water accessibility. The people of Char Ashariadaha developed this structure of crop scheduling over a number of generations.

The Marginalized farmers of Char Ashariadaha have a rich knowledge of the local ecosystem services and employ this understanding to prepare crop lands for planting. At the end of rainy season local farmer of Padma basin including Char Ashariadaha visit crop lands directly and appraise the siltation intensity. The farmer picks up a piece of soil and examination it to realize moisture levels and readiness for crop production opening. The farmer can also find out what type of crop production is appropriate derived from the type of soil. They grow crops similar to pulse in muddy areas and opening other crops derived from the condition of land on ground knowledge which anthropology terms as indigenous knowledge.

Respondents explain how local land utilize patterns differ due to cropland altitude. The land of mid-level is naturally developed croplands that differ from the higher and lower croplands. This Mid-land can generate single, double or triple harvests in a year depending on the basin stream. At the time of rainy seasonal stream, the higher land can also generate triple crops during *kharif-1*, *kharif-2* and *robi*. To defeat challenges of water stagnation and flooding vita the term is employed to refer to perform of mounding up soils. *Maacha* is the term used to refer to a new method for agricultural production that engage in building of an infrastructure on higher elevation lands with bamboo sticks, rope and other local materials; vegetables akin to cucumbers or potatoes are then planted inside this constitution.

Many people at Char Ashariadaha use this method to make best use of their agricultural production. The Padma River is a key source of fertilizer for farmers at Char Ashariadaha. Respondents revealed, the usual rain flow produces siltation and algae in croplands and develops sustainable environments. Respondent deposits water hyacinths on croplands during the rainy season, as fertilizer, to endorse cropland fertility. In addition, for almost eleven months in a year, respondents with their family member, gather domestic animal dung and rot it in a pit at farmhouse. Respondent replied, they relocate this fertilizer onto his croplands instantly after the rainy season for the winter and summer seasons' crop production. A rich respondent, the land owner, hires a person, a

traditional day laborer to get ready this fertilizer and hires extra laborers to spread them on his crop fields. Additionally, they obtain earth-worm generated fertilizers. This is a lengthy worm locally called *Kecho* that hole into croplands at the beginning of rainy season; the burrowing methods pick up cropland fertility. A marginalized farmer explores a precise cropland's elevation, temperature and soil quality for producing crops like rice, onion, ginger and turmeric. He does not require wasting much money to plant these crops as he is capable to make the seeds himself through careful use of his own local knowledge. It is observed that the female household members plow local crops similar to bean or watermelon. They also add by preserving a number of the seeds from these crops. Respondents demonstrate deep ecological understanding about temperature and humidity through their seed conservation performs. They conserve onion seeds in an earthenware jar locally name *Kolosh* to make sure an ecologically sociable environment that permits no severe hot or cold. Occasionally, they replace these seeds amid trusted neighbors or relatives and build up community bonds. A Rich farmer respondent administers seed production and, other family member, supervises seed conservation. Derived from his management, day laborers harvest the seeds as soon as they are prepared. Subsequent to bringing the seeds habitat, respondent's family member especially female member supervises her maid servants who preserve them in a appropriate place following local understanding.

Char Ashariadaha community people rear domestic animals like cattle, hens, chickens, ducks, goats and sheep derived from river-dependent ecosystem services resources. People said that the female member of the majority family look after domestic animals like chickens and ducks they puts them the animal in crates every evening and brings them out every morning. They send ducks to the river Padma and beels or wetlands every day. Male members of majority family take care of cows and calves, feeding them local plants. Rich farmer hires person to take care of their domestic animals. In addition, their domestic help, take maid servant, they take care of these animals under the supervision of rich farmer wife. During the rainy season, local people at Char Ashariadaha employ

reserved paddy straw, water hyacinths, banana plants and bamboo leaves like fodder for bullocks or goats. Derived from these efforts, they frequently get eggs and meat from chickens and ducks and create young chicks every four months. They plow croplands amid bullocks and obtain fertilizer, biogas and fuels from these domestic animals. The cows supply milk every day and make calves every year. They trade extra domestic animals, eggs or milk, which assists to shell out for school fees and household items.

One respondent gets bullocks from their domestic cows and effectively produce agricultural crops. They employ cattle bones, horns and hooves for producing agricultural materials similar to plows, building houses and for healing purposes. Respondents informed that the occupational groups akin to boatmen, fishermen, blacksmiths, potters, thatchers and basket makers as well depend on agricultural production. The boatmen carry agricultural goods and services, fishermen give fish and blacksmiths build agricultural materials akin to hoes for farmers. The potters build household cooking materials and children's toys. The Thatcher constructs homes for community members. The basket makers supply various types of baskets for community people. Respondent employs these baskets for gardening and gathering fuel woods. The local knowledge they practice mostly transmits from one generation to the next. The respondents speak out children from respective families start learning this knowledge in early childhood when they observe older generations' occupational practices.

Elderly member's of the family tell a lot of stories about seasonal patterns, local cropping practices, agricultural production materials, and housing and transportation practices. One respondent point out that adolescent would habitually turn into knowledge experts themselves by the age of twelve. Respondents specified that local natural resources are requisite to make a variety of essential agricultural materials. At the time of rainy season, boatman uses G*aab*, a boat prepared with locally available natural resources similar to trees, bamboo and coating materials for transportation. At the time of field crops harvested, wife of farmer contributes by paddy husking and winnowing. Those who are marginalized woman, work at the rich farmer house under their wife's direct supervision

to winnow the rice plant, boil them and make rice. The winnowing fan is domestically called *Kula* and is made with bamboo and the paddy husking machine is locally called *Deki* or 'husking pedal'. The respondent make out they spend their leisure time to make ploughshares, frames, ladders and sticks from freely available natural sources akin to bamboo and trees as well as make other agricultural equipments such as hoes, sickles and cleavers from the same natural resources. Respondents replied wild vegetables are a traditional natural resource in Char Ashariadaha. At the times of food scarcity, they gather and consume water lily fruits to defeat hunger. Along the Padma River bank wild banana trees also exist close to their homesteads, in forested areas. The local people eat wild bananas from roadside trees and nobody protests about this perform. The local people also gather midribs and inflorescences from the wild banana trees for household vegetable use and also the leaves and roots of arum plants as well as these vegetables, local people gets other vegetables like jute leaves, onion flowers and pulse leaves from rich farmer's crop fields.

In the rainy season the local inhabitant get more than sufficient fisheries in local water bodies of Char Ashariadaha beels, ponds and river. The respondent said these fisheries are liberally available to all community members prop up bonds by sharing them. For example, one respondent point out, his father caught a seven-kilogram hilsa fish and distributed the key portion to neighbors. This fish distribution develops community bonds and defeats the risk of loss through rotting. It is traditional practice common for Char Ashariadaha communities. The Padma Basin ecosystems are a key source of these fish, which are a hub feature of socioeconomic foundations at Char Ashariadaha as well as in Bangladesh.

6.4 Intervention Activities

6.4.1 The Farakka Barrage

The Ganges is one of the largest rivers in the world. It covers an area of 1.095 million square km of which India covers 79%, Bangladesh and China share 4% each and

remaining 13% belongs to Nepal (Zaman 20141, Ahmed et al, 1994, Mirza, 2005). Once regular flooding and drought were regular phenomena in India and the Government formed 'Verduin Commission' to figure out mitigating measures to solve the issue in 1950. The commission formulated a plan of two parts, the Himalayas River Development (HRD) and Plain River Development (PRD). Based upon the PRD India has constructed 947 dams and barrages since 1956. Among them 40 barrages are near India-Bangladesh border and the Farakka barrage is the largest one (Abbas, 1988; Chakrawardi, 1995). The Barrage was commissioned on 21st April 1975 with the diversion of water to the feeder canal in a bid to safeguard Kolkata port (Abbas et al, 1988).

The Farakka Barrage on the Ganges River has caused destruction in all parts of human life spaning from financial to ecological effects. Expansive has changed entire situation of the Ganges basin of lower riparian territories in Bangladesh (Adel, 2001; Mirza 2004). The wide spread negative effects of the barrage is seen by neighborhood and territorial level the equivalent is confirm by the world commission on dams report on 2000. Be that as it may, the principle three waterways, the Ganges/ Padma, the Meghna and the Jamuna and their distributaries have framed deltaic formation of Bangladesh. These streams bolster work of countless individuals. For a considerable length of time the Padma and its distributaries have been the primary wellspring of water for more than 33% of absolute populace of Bangladesh (Abbas, 1988; Gain and Giupponi, 2014).

The Ganges waterway is the significant wellspring of water for dry season water system, route, fisheries and lessening saltiness interruption just as keeping up biological system of south-western area in Bangladesh including Sundarbans. Farakka barrage was developed on the primary stem of Ganges stream by India at 18 km upstream of India–Bangladesh border. The barrage was appointed in 1975 to redirect water for improving traversability of Kolkata port and giving without saline water to Kolkata city. Hydrological examinations have been completed on verifiable releases and water levels information (1935–2015) at Hardinge Bridge station in Bangladesh to see if huge changes have happened in the hydrological stream of Ganges waterway during pre-Farakka

(1935–1975) and post-Farakka (1976–2015) periods. The effects of Farakka barrage on releases and water levels have been set off a sudden change in Bangladesh since 1975.

During post-Farakka period, month to month most extreme, normal and least releases have been decreased fundamentally in February–May, December–May and February–April. Ganges water sharing settlement has been marked among Bangladesh and India in 1996. In correlation with pre-Farakka period (1935–1975), it has been seen that during post-Ganges water sharing bargain period (1997–2015), the most extreme, normal and least releases have stay decreased around 23, 43 and 65% in dry season (January–May). Because of long haul noteworthy decrease of the Ganges stream at Farakka for around 40 years, south-western area of Bangladesh has been experiencing natural degradation (Rahman et al 2018).

Image 6.1: Farakka Barrage

(Dhaka Tribune 2018)

Since its origin in 1975 the Farakka barrage has redirected a huge number of cusec of water from the Padma (Adel, 2001). In March 1995, the base stream was 9200 cusec while it was 75000 cusec in a similar time in 1974, preceding the torrent (Bashar and Rasheed 1995). Radical decrease of the Ganges stream in the downstream has come about perpetual change in the rearing and raising ground of a large number of its sea-going creatures. Thus Gangatic dolphin, pabda fish and hilsha fish have turned out to be uncommon in Padma (Animesh et. al, 2014; Chaudhury, et. al, 2012). The Ganges basin is a particularly powerless for environmental change and numerous human intercessions like dams and other intervention exercises (Gain, et.al, 2011). Notwithstanding, the effects on vegetation and fauna specifically as a contextual research in Rajshahi area were only considered previously. Bangladesh situated in Ganges Basin have failed to build up effective river management agreements and have thus created major ecosystem failures and livelihood challenges for basin communities like Char Ashariadaha of Rajshahi. The central Government in India was able to build the Farakka Barrage unilaterally in 1975 because of their hydro political dominance of the region (Turton and Henwood 2002; Zeitoun and Warner 2006). Farakka barrage was constructed mostly with the aim of diverting extra water into the Hoogly River, a branch of the Ganges that streams through Kolkata and pour out in the Bay of Bengal. The diverted water guarantees that the port of Kolkata can stay open year round rather than bear closures because of sedimentation. India has also built a small hydroelectric facility at the barrage and makes some of the stored water available for industrial and irrigation uses within West Bengal (Khan 1996; Iyer 1997:4; Swain 1996). Iyer (1997:4). The government of Bangladesh was not capable to stop the construction of this barrage because of disparities of geographic size, economic potentiality and political and military unrest.

Two water treaties have concluded till today between the governments of Bangladesh and India, one in 1977 and the other in 1996 as well as two Memoranda of Understanding,

(MOU) in 1983 and 1985. Table 6.1: Ganges River Flow Data Before and After Construction of the Farakka Barrage.

Table 6.1: Water Flow Rate in Farakka

	Flow rates at Hardinge Bridge in Bangladesh in cubic feet per second (cusecs)									
Year	**Khora (March-April) seasonal flow (cusecs)**					**Borsha (Jul-Sept) seasonal flow (cusecs)**				
	Average	Max	Month	Min	Month	Average	Max	Month	Min	Month
1960	2326	2480	Mar 07	2170	April 30	39794	48000	Sept 04	25800	Aug 02
1964	2320	2600	Mar 10	2180	April 15	39733	48300	Sept 10	29200	Jul 28
1970	2360	2640	Mar 01	2030	April 24	32917	40800	Aug 18	24400	Aug 30
1976	780	1130	Mar 01	657	Mar 29	33569	50000	Aug 31	19100	Jul 31
1980	927	962	Mar 02	874	Mar 30	48350	57800	Aug 22	37500	Aug 02
1985	823	1020	Mar 05	701	April 04	37373	48000	Aug 29	24200	Jul 25
1990	828	1030	April 29	698	Mar 01	40444	51000	Aug 21	23100	Sep 09
1995	509	769	Mar 01	363	April 26	35219	48800	Aug 19	18800	Jul 30

2001	766	997	April 27	456	April 21	34390	44004	Aug 30	22095	Aug 19
2006	828	1092	April 07	418	April 22	26271	35079	Aug 31	21887	Aug 15
2010	743	970	Mar 20	475	Mar 31	25190	40276	Sep 25	8701	Jul 05
2015	813	1054	Mar 07	457	Mar 11	24360	42159	Aug 19	10115	Aug 02

Source: Bangladesh Water Development Board 2016

The Ganges Treaty of 1996 is the most recent treaty with the aim of signing for a thirty-year period, is to allow water allocation of the Ganges River, particularly at the time of dry season. Nevertheless, the specific ecological concerns does not address into the treaty reported above as regards rainy season failures, flood, drought, river bank erosion, water stagnation and embankment collapse. As well as, even with its stated intent, the 1996 Ganges Treaty has also not resulted in optimistic results for drought at the time of dry season.

At the Hardinge Bridge Station on the Padma Ganges River stream data measured in Bangladesh, how the basin stream modify at the time of rainy and dry summer seasons. At the time of summer season the stream of water in the Ganges is abridged drastically because of shortage rainfall and flow decrease at its place of origin in the Himalaya Mountains. The Farakka Barrage authority diverts sufficient flow for India's require into the Hoogly River at the time of dry season other than is capable to limit the flow of water into the Hoogly at the time of wet season. This limits of water flow flooding in West Bengal but worsens it in Bangladesh at the time of rainy season. The Table 6.1 figures out that the average daily water stream into Bangladesh at the time of dry season has been declined two-thirds while the Farakka Barrage began operating in 1975. At present, one

more rivers like, Mohananda, Gorai, Arialkha, Gomoti are at the verge of extinction due to this basin flow decrease. The respondents argued that decrease to river flows at the time of rainy season are the most general cause of crop production decreased and employment failures in Char Ashariadaha of Rajshahi. The rainy season happen every year at the time of the months of July, August and September, among water levels reaching their peak in August. Table 6.1 data reveals that the lowest flows are considerably lower on average at the time of rainy season. This decrease causes collapse of *Aman* rice production, a main crop on which households depend for the total year along with that cannot grown-up with no adequate water. The reduction of seasonal flow also most important causes of ecological service breakdown as a result revealed that the whole biodiversity system has been encountering challenge in Bangladesh.

6.5 Conclusion

Anthropologically, lives and livelihood of river side people depends on riverine ecosystem in many respects. Traditional life stories in char lands flow with river and people's pains and pleasures are embedded with river. Riverine ecosystem supplies foods, shelters and many things for char people's subsistence. Local people have to suffer enormously if changes in river happen. The people of Char Ashariadaha were not different which has been explored in this chapter. Changes in Padma River caused by Farakka barrage have brought about many changes in the lives and livelihood of local inhabitant at Char Ashariadaha.

Chapter 7

Challenges of Water

7.1 Introduction

Water is one of the most stressed resources in Bangladesh. Water Resources Management System (WRMS) comprise of diverse components of the natural system, human made infrastructure, and the institutional arrangements so as to regulate and control the availability and access of all types of users to these components. Water basin management gives the most balanced premise of improvement of water assets. Worldwide stream basin, in any case, for example, the Ganges basin, the Brahmaputra basin, and the Meghna basin present exceptional issues. Because of its area as the lower-most riparian, Bangladesh has no power over the waterways entering through its outskirts. The unfavorable impacts of this are the floods and water shortage, which happen as often as possible. In spite of the fact that the 1996 Treaty on sharing of the Ganges waters with India has brought some help to the dry season inclined region of the southwest, the water lack issue during the dry season is probably going to irritate in the Ganges and different basins with rising requests of the expanding population. It might require some investment for Bangladesh to work out joint designs for various stream basins with other co-riparian nations (Zaman 2014).

The Government attempts to go into concurrences with co-riparian nations for sharing the waters of international rivers, information trade, asset arranging and long haul the board of water assets under ordinary and crisis states of flood, dry spell and water contamination. While moving towards the fulfillment of basin wide designs over the long haul, it will likewise be fundamental for Bangladesh to focus on the advancement of individual hydrological regions to meet short and middle term necessities. The major issues lies regarding water management in Bangladesh are increasing vulnerability to severe events, unrestricted extractions, climate change, allocation problem of existing supplies, land-use changes and environmental requirements. For resolving diverse problems and issues water resources management in Bangladesh faces enormous challenges. The most critical of these are the scarcity of water in the dry season, and floods in the wet season and ever increasing water needs of a rising economy and

population, providing of safe drinking water and sanitation, arsenic problem, water pollution, immense river sedimentation and river bank erosion. There is a increasing require for maintaining the ecosystems mainly in the fish resources and wetlands. The water management is more and more facing challenges of exogenous developments of a global nature, for example climate change and sea level rise, together with of upstream river basin development outside the border of the country. As well there is the issue of competitive demand of diverse water uses.

In Bangladesh, the traditional approach to water resources system management has been derived from structural interventions in flood control, drainage and irrigation (Wiest 1987). Lately rising emphasis is given to other kinds of management interventions for example flood warning system, flood proofing and adopting responses to hazardous conditions. In concise, for sustainable water management in Bangladesh the key challenges essential to face for instant: increasing vulnerability to extreme events, unrestricted extractions, climate change, land-use changes and environmental requirements in connection with some non material for instant financial challenges, immoral political atmosphere, India Bangladesh negotiation challenges and human behavior motivational challenges.

7.2 Facets of Local Water Use

Local inhabitants of Char Ashariadaha use various water sources for drinking, sanitation and irrigation purpose. Char Ashariadaha is located at the heart of Padma River where flood takes place almost every year. Arsenic and iron problem are issues that bring about lot of sufferings for local people. Once the lives and livelihood of local people was river centric before the construction of Farakka barrage, people had to change source of water use after Farakka period.

Table 7.1 shows that majority number of respondents drink water from tube-well which is less than 100 feet deep. Mainly this kind of water source is contaminated with iron and arsenic due to low depth.

Table 7.1: Source Domestic Water use

Major source of domestic water	Frequency	Percentage
Deep Tube-well	10	6
Tube-well	160	88
River	3	2
Pond	7	4
Total	180	100

Fieldwork 2017

Six percent of the respondents use deep tube-well for drinking water. Setting up deep tube-well with private effort is sometimes not possible due to high installation costs. On the other hand, tube-well installation is somewhat cheaper than deep tube-well. Some deep tube-wells are installed by union parishad from government fund. Various NGOs are working in this area who are trying to ensure safe drinking water through installation of deep tube-well. Two percent local people use river water for drinking while four percent drink pond water.

In the context of Bangladesh, Char Ashariadaha is not distinct in terms of domestic water collection where female members of the household collect domestic water. Eighty three percent of respondents said that female adult member of the family, mainly married women collect domestic water from nearby sources (Table 7.2). Female offspring play pivotal role in household water collection in the locality. Present study has identified that six percent of the local adult male collect domestic water. In some poor families, adult male or husbands do not allow wives or female children to collect water from nearly distant place due to security reason. Beside these, some rich farmers have maid-servants who also collect domestic water for drinking.

Table 7.2: Collector of Domestic Water

Collector of domestic water	Frequency	Percentage
Adult Female	150	83
Adult Male	10	6
Female Child	17	9
Others	3	2
Total	180	100

Fieldwork 2017

People of the Char Ashariadaha are river dependant in many respects; their subsistence activities room around Padma River particularly for water supply. Table 7.3 shows that sixty nine percent respondents use the water of Padma River in their agricultural lands. Char Ashariadaha is located in a nearest place of Padma River which is mainly a char of this river. Agricultural produces like paddy are cultivated from the water of Padma River in dry season. Due to some decades, amount of water in the river decreases in dry season for various reasons, one is for impeding flow in the river through the construction of Farakka barrage.

However, Seventeen percent of respondents said that they use shallow machine for supplying water in farming lands. Rain water harvesting is another mainstream mechanism of water reservation in many parts of Bangladesh and Char Ashariadaha is not different here. Some people use pond water or *Khari* water for irrigation purpose. Padma River in dry season is not free every farmers as it is controlled by local elite in some instances. Access to river water in times of water shortage comprises of various issues directly linked to the Hydraulic Despotism of Karl Witfugel (1950).

Table 7.3: Source of Agricultural Water

Source of Agricultural water	Frequency	Percentage
Padma River	125	69
Shallow Machine	30	17
Tube Well	7	4
Rainwater /Reservoir	5	3
Pond	13	7
Total	180	100

Fieldwork 2017

Hence, local rich farmer collaborating with local political parties play despotic role in controlling over natural water during crisis seasons. Marginalized and poor farmers have to have good connection with rich farmers and member of union parishad to get irrigation water from the river. Agricultural lands of rich farmers are irrigated on priority basis where poor and marginalized farmers get less priority in irrigation. Moreover, poor and marginalized famers have to obey rich farmers and local elite for getting irrigation water in dry seasons.

Thus, there are some public ponds which are also dominated by influential persons in the locality. Water of these ponds is mainly used for domestic use, but powerful people sometimes use this water to irrigate their agricultural lands. Despite having natural water, poor and marginalized farmers cannot avail natural water due to lack of accessibility which is regarded as lack of entitlement by Sen (1981). Present study identifies two types of entitlement on ground of dimension; local entitlement and national entitlement. Despite having available water in natural water bodies, local poor and marginalized people have limited access to water which is lack of local entitlement. Contrasting to this, Padma River has natural water availability in dry season, but India impedes water flow

and control over Bangladesh's accessibility to water which is lack of national level entitlement.

Table 7.4: Conflict over natural water use and managements

Conflict over natural water use and managements	Frequency	Percentage
Yes	145	80
No	21	12
Don't Know	14	8
Total	180	100

Fieldwork 2017

Table 7.4 shows that eighty percent respondents view that there are conflicts over natural water use and management in Char Ashariadaha. This conflict ranges from internal collision to communal tension that sometimes takes place in the locality. This conflict produces social unrest and distrust which is detrimental to social harmony and cohesion.

Table 7.5: Control over water bodies

Control over water bodies	Frequency	Percentage
Local political elite	155	86
Local leader	19	12
Local service holder	3	1
Other	3	1
Total	180	100

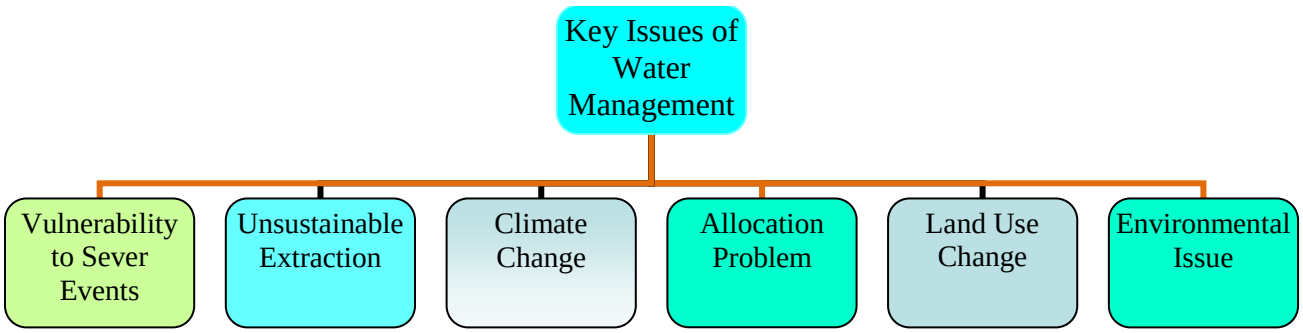
Fieldwork 2017

Some years ago, a conflict happened between two paras of Char Ashariadaha where lot of people got engaged and finally *Gram Adalat* (local conflict settlement authority) settled down the crisis. One party approached to case a file against opponent party in nearby police station but members of union parishad mitigate the situation and make arrangements.

7.3 Key Issues of Water Management in Bangladesh

The ownership of water doesn't vest in an individual yet in the state. The Government maintains all authority to apportion water to guarantee evenhanded appropriation, proficient improvement and use, and to address destitution. The Government can divert its utilization during times of dry spells, floods, violent winds, and other common and man-made debacles, for example, tainting of groundwater springs that undermine general wellbeing and the natural uprightness. Portion rules will be the formal component for choosing who gets water, for what purpose(s), how much, at what time, for to what extent, and under what conditions water use might be diminished. Allocation strategies is produced for in-stream needs (natural, water quality, saltiness control, fisheries and route) during low-stream periods; for off-stream withdrawal (water system, civil and modern, control), and for groundwater revive and deliberation. In general, the priority for allocating water during critical periods in the water shortage zones are in the following order: domestic and municipal uses, non-consumptive uses (e.g. navigation, fisheries and wild-life), sustenance of the river regime, and other consumptive and non-consumptive uses such as irrigation, industry, environment, salinity management, and recreation. The above order of priority could however be changed on specific socio-economic criteria of an area by local bodies through local consensus (NWP 1999).

Figure 7.1: Issues of Water Management in Bangladesh



Fieldwork 2017

7.3.1 Vulnerability to severe events and climate change

Water management in Bangladesh faces versatile problems from various events that are increasing day by day. Top of them, climate change as a catalyst is influencing other resources like water in the rural areas of Bangladesh. Islam and Shafie (2017) discussed about the drinking water quality deteriorating day by day in coastal area of Bangladesh. Climate change induced salinity intrusion was identified as core agent of water crisis in their study that is also present in Char Ashariadaha. Higher temperatures and more extreme, less predictable, weather conditions are projected to affect availability and distribution of rainfall, snowmelt, river flows and groundwater, and further deteriorate water quality. Low-income communities, who are already the most vulnerable to any threats to water supply are likely to be worst affected. Ethno climatologist warns that climate change is expected to aggravate water shortage situation in Asia including Bangladesh, with significant multiple socioeconomic stresses.

7.3.2 Unrestricted extractions

The growth in groundwater extraction via simple wells and boreholes is contributing to an increased use of dryland natural resources, to competition for resources, and to environmental changes. Frequently, there is neither a management plan nor boundaries on water extraction from inadequate resources. Water being the ultimate ‘commons’, and while water resources are no longer unlimited, communities need to study water systems and re-define use. Changes in human values, and ideas of ethics, are require of the day as

regards water treatment to avoid a condition where coherent pursuit of individual self-interest can direct to combine damage. Local inhabitants of Char Ashariadaha extract ground water without proper monitoring of authority. Any individuals can extract ground water installing tube-well in their private property which indicates unsustainable use of ground water that results ground water level get down in dry season. Uncontrolled extraction of irrigation water in dry season makes the crisis situation worse.

7.3.3 Allocation problem of existing supplies

A classic water-supply scheme to an area either urban or rural involves structures such as reservoirs, canals, pumping systems, pipes, etc.; which are normally designed and allocated due to past accessibility and existing demands. The present and/ or future accessibility does not frequently form a part of the system of things. This makes a lot of water supply systems over-allocated. Studies confirm that, usually, lower the data length, higher is the probability of over-estimating water resources accessibility in Bangladesh. Uncertainties regarding flood potential appraisal too amplify. Such factors deserve review of distribution of water supply systems and security aspects from flood hazards occasionally in Bangladesh.

7.3.4 Land-use changes

Due to alterations in physiographic and social-economic conditions, climatic changes, adaptation and population growth, the land use pattern of Bangladesh is changing very rapidly. The land use pattern of the country is changing at a great momentum. Every year the country is losing 1% arable land due to the population growth and its infrastructure development (Islam and Hasan 2017). Land use alteration is a certainty, with more forest/ arid/ marshy/ fallow areas paving way for actions such as mining, agriculture, tourism-related activities and transportation development. For example, a large number of mega power projects coming up Bangladesh. Increasing plantations and decreasing forest cover also play a key part in this scenario. Changes to land use, even within agricultural lands, have considerable implications for both water accessibility and use in the study area.

7.3.5 Environmental issues

Protection and preservation of the natural water is essential for sustainable development. Given that most of the country's environmental resources are linked to water resources, it is vital that the continued development and management of the nation's water resources should include the protection, restoration, and preservation of the environment and its bio-diversity including wetlands, mangrove and other national forests, endangered species, and the water quality. Accordingly, water resource management actions will take care to avoid or minimize environmental damages.

Water quantity and water quality issues are uniquely linked. Poor water quality affects the availability of fresh water for different uses. Contamination of surface water bodies and groundwater aquifers by agricultural pollutants, industrial discharge, domestic pollution, and non-point source urban runoff exacerbate water quality problems and endanger both natural ecosystem integrity and public health. Other environmental problems include: excessive soil erosion and sedimentation, water logging and salinization of agricultural land, groundwater depletion, watershed degradation and deforestation, reduction of biodiversity, wetland loss, saltwater intrusion, and coastal zone habitat loss (ibid).

Water bodies like haors, baors, and beels are precious assets of Bangladesh with unique regional characteristics. Apart from their scenic beauty, they have great economical and environmental value. Even during extremely dry seasons, when the smaller beels turn into quagmires, the haors and the baors retain considerable amount of water. These water bodies account for a large share of the natural capture fisheries and provide a habitat for a wide variety of aquatic vegetation and birds. They also provide sanctuary to migratory birds during winter. The haors and the beels usually connect to some adjoining river through khals. In the past, many beels have been drained through engineering interventions and turned into cropland for immediate gains. The adverse effects of such interventions have been deleterious to the environment. They have destroyed the fish and

aquatic vegetables that thrive in these wetlands and are important in the diet of the rural poor. They have also blocked the flow of wastes, discharged from the flood plains and domestic sources, which naturally move out of the beels through the khals into the river's drainage system. Only submersible dikes have provided tangible benefits in certain haor areas by enabling cultivation of high yielding variety boro rice.

Environmental concerns are leading on the minds of administrators, planners and the common masses; with the result that there is a progressively increasing consciousness and emphasis on the necessities of environmental flows in any river system towards maintaining ecosystems such as wetland and in-stream environs. We have begun allowing the rights of nature, treating rivers, estuaries, forests and the like not as simply properties, but entities who have their individual right to thrive. The day is not far of wherein this right would be put into law, which would permit a vigilant citizen to file a suit in support of, say the injured watershed, arguing that its physical condition is vital to the frequent good. In the above context, the consequent sections detail the ability to defy the issues by sustained scientific and technological initiatives in the hydrological services regime in Bangladesh.

7.4 Challenges of Water Management in Bangladesh

Management of water resources has become a crucial necessity in Bangladesh with the ever-growing demand for water and the escalating conflict over various uses of water over the decades. The challenges in water sector in Bangladesh are multi-dimensional and multifold. Each parameter or driver has effects on several other parameters. So integrated water resources management (IWRM) and planning is one of the finest tool to overcome several challenges. The population growth of Bangladesh will increasingly stress the water resources management of the country. Thus, it has the potential to be the dominant environmental and possibly the most important development challenges in the coming half of the century (Ahmed 2019). Salinity intrusion becomes one of the severe challenges for water sector in Bangladesh. Low-lying areas of coastal zone are highly vulnerable to cyclones, which poses serious threat to life and livelihood of millions of

people. Bangladesh has a very opulent and diverse ecosystem, which provides a high quality of life in terms of eco-balance. This ecosystem has come under stress with increase in population. Preserving this ecosystem is a major development challenge to move forward. Freshwater availability is key to an effective, affordable water supply service to the population of Bangladesh. The SDGs 6.1 and 6.2 aims to tackle challenges related to drinking water, sanitation and hygiene for population of Bangladesh. The following figure explore key water management challenge in Char Ashariadaha representative to Bangladesh-

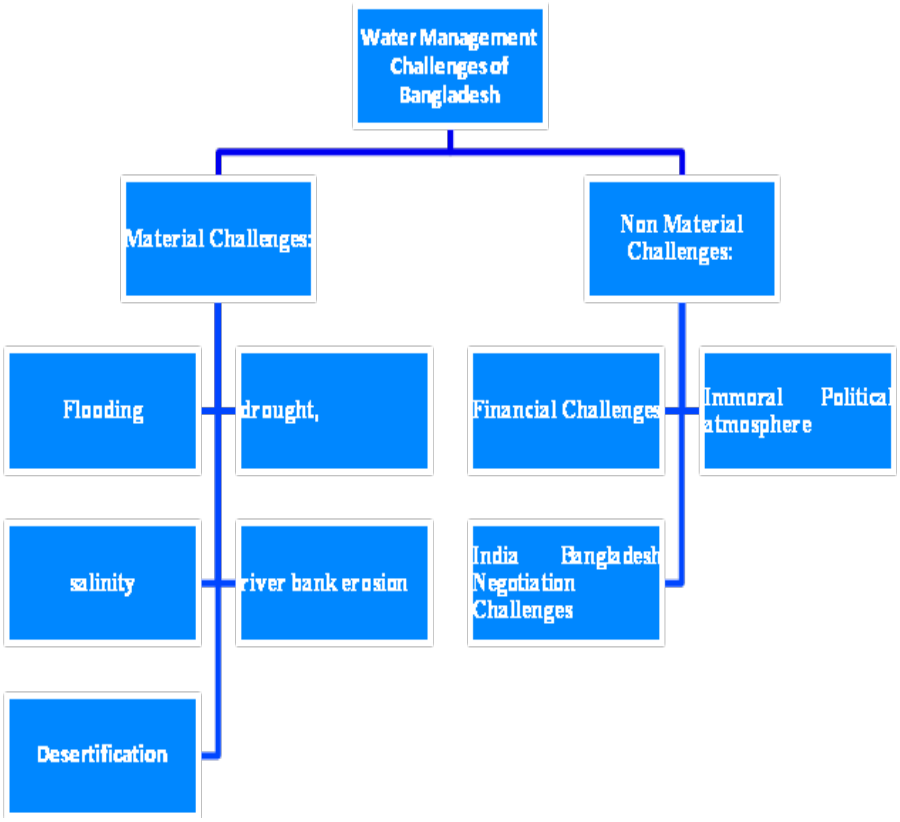


Figure 7.2: Challenges of Water Management in Bangladesh

Major material challenges of water resources development in the study area are flood at the time of rainy season, drought at the time of dry season, river bank erosion, salinity increased etc.

7.4.1 Drought

Drought is defined in Bangladesh as the period when moisture content of soil is less than the required quantity for satisfactory crop-growth at the time of the normal crop-growing season. Droughts are familiar in the northwestern districts of Bangladesh. A number of these droughts usher in famine. Drought has become a recurrent natural phenomenon of northwestern Bangladesh (i.e. Barind Tract) in recent decades. Barind Tract covers most parts of the greater Dinajpur, Rangpur, Pabna, Rajshahi, Bogra, Joypurhat and Naogaon districts of Rajshahi division. Drought mostly affects Bangladesh in pre-monsoon and post-monsoon periods.

Table 7.5: Impact of Water Shortage in Dry Season

Impact of water level decrease in dry season	Frequency	Percentage
Create Water crisis for crop production	19	10
Severe Navigation problem	15	9
Local fish decrease	17	9
Local medicinal species decrease	39	22
Migration to other places specially Rajshahi Sadar and Godagori Upazila	22	12
Crop land decrease	21	12
Occupation shift Fishermen and Boatmen to Day labour	25	14
Seasonal Migration	22	12
Total	180	100

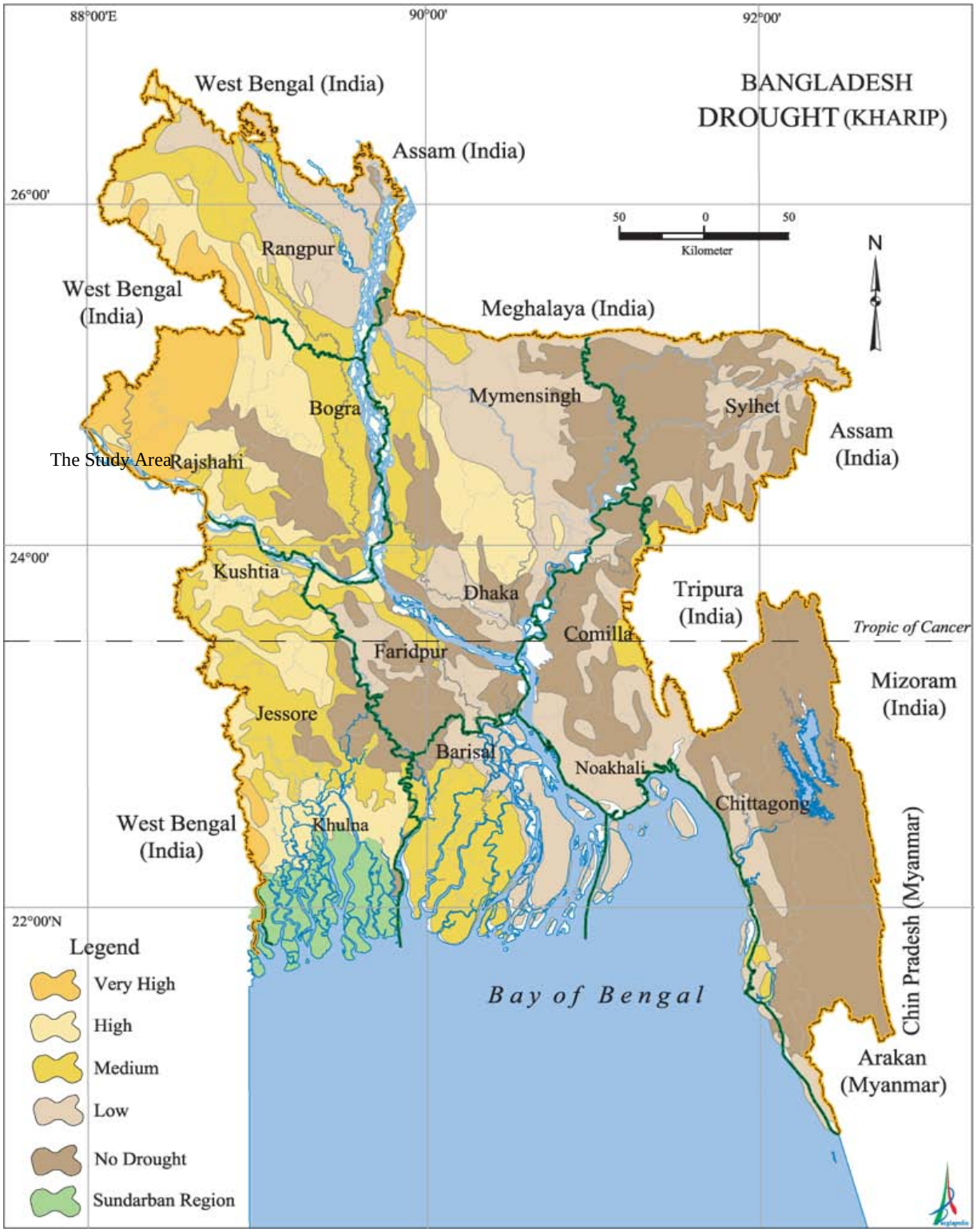
(Fieldwork 2017)

During the last 50 years, Bangladesh suffered about 20 drought conditions (ibid). The drought condition in northwestern Bangladesh in recent decades had led to a shortfall of rice production of 3.5 million tons in the 1990s. If other losses, such as, to other crops (all rabi crops, sugarcane, tobacco, wheat etc) as well as to perennial agricultural resources, such as, bamboo, betel nut, fruits like litchi, mango, jackfruit, banana etc are considered, the loss will be substantially much higher (Banglapedia 2016).

Table 7.6 shows that ten percent respondents view that water shortage in dry season results crisis crop production in the locality. Water crisis in dry season has forced many farmers to change the crop lands or either to change crop seeds. Decreased water in Padma River also causes navigation problem for the local boats and streamers which room around the river. It is very common to find out a close connection between water scarcity and traditional fish reduction in dry season. Local people think that absence of necessary water in dry season adversely impacts the abundance of traditional fish in the river and nearby natural water bodies. Soil needs necessary moisture to nurture plants and species which comes from rain water and nearby river. Due to drought, soil cannot get essential moisture to feed the plants that local people identified during fieldwork. Forty percent respondents said that traditional fisherman and boatman communities are now shifting their occupation and moving forward to sell day labors in exchange of cash.

The natural flow of these rivers is interrupted by upstream withdrawal of water for economic and household uses as well as for construction of water management structures by the concerns countries. The effect on these structures obstructs the normal flow of water in rivers such as the Ganges (at Farakka). These structures mostly divert dry season flow of the rivers, which create not only a scarcity of surface water in northwest and southwest Bangladesh, but also tend to affect negatively the recharge of groundwater in these regions. Ultimately it leads to moisture loss in a vast area and contributes to drought condition in the study area.

Map 7.1: Bangladesh Drought Prone Area



(Banglapedia 2014)

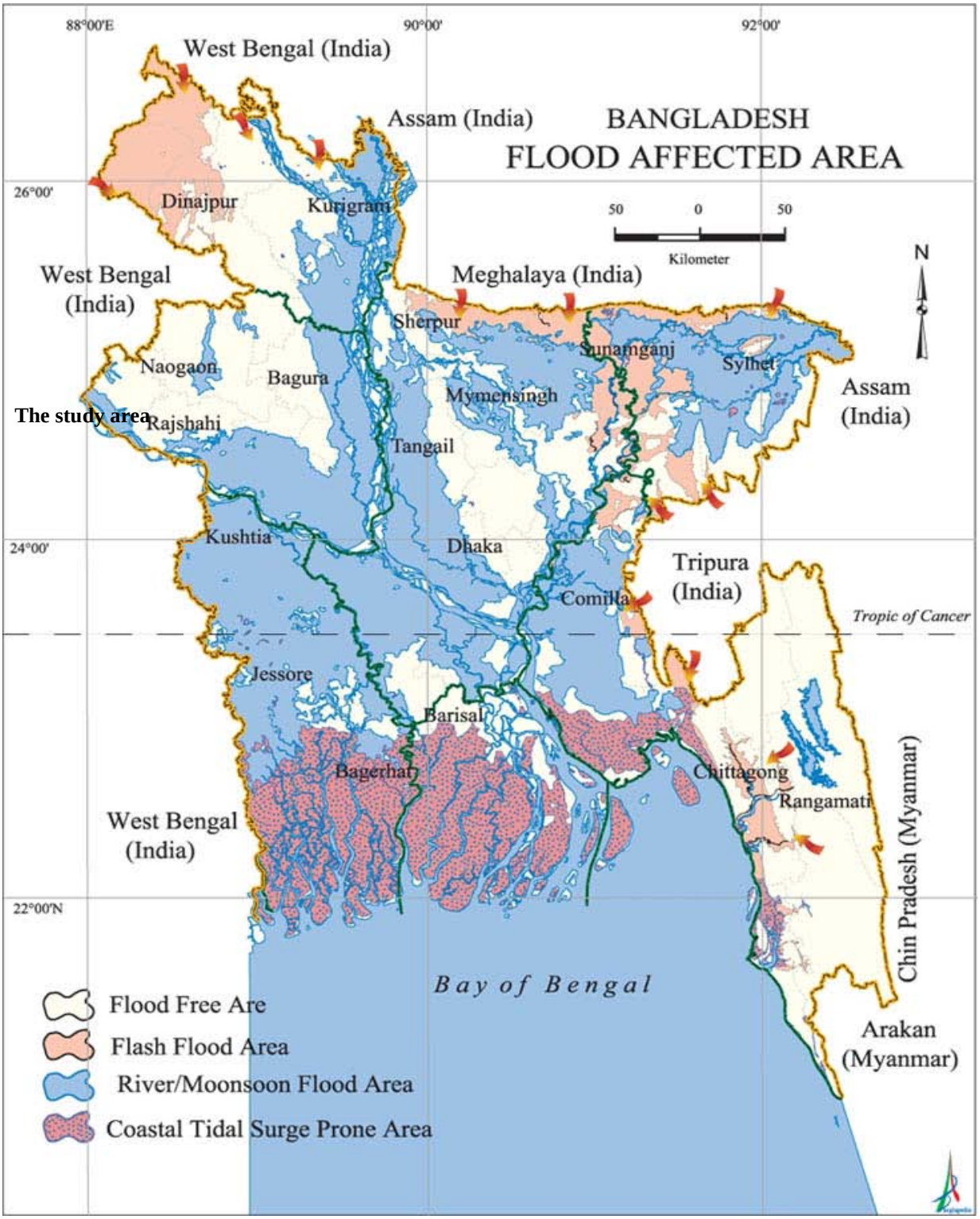
The hydrological and climatic conditions of Bangladesh are characterized by too much water in the wet monsoon and too little in the dry months. The drought environment is further aggravated by the cross boundary anthropogenic interventions. About 58 rivers that flow through Bangladesh actually come through India and Myanmar (India 55 and Myanmar 3). Most of these trans-boundary rivers enter into the country along the northwest and southwest regions. Map 7.1 shows that Char Ashariadaha lies in national map of drought prone area with high intensity.

7.4.2 Flood

Flood is a common phenomenon of all over Bangladesh particularly in the study area. In Bangladesh, the definition of flood appears differently. During the rainy season when the water flow exceeds the holding capacity of rivers, canals (khals), beels, haors, low-lying areas it inundates the whole area causing damage to crops, homesteads, roads and other properties (Banglapedia-2016). In Bangladesh flood can be classified in to three categories: (a) monsoon flood- seasonal, increases slowly and decreases slowly, inundates vast areas and causes huge losses to life and property; (b) flash flood - water increases and decreases suddenly, generally happens in the valleys of the hilly areas; and (c) tidal flood - short duration, height is generally 3m to 6m, blocks inland flood drainage (World Bank 2014).

The geographic location of Char Ashariadaha makes it more vulnerable to flooding during rainy season as it is located inside the river. Downpour in precipitation season results flood in every year brings about horrible sufferings for the local inhabitants. Respondents reported that some parts of the locality get inundated in rainy season in medium to heavy rainfall. Heavy rainfall coupled with river water causes flood in early rainy season to late rainy season. Water logging driven by flood cause massive damage for the local people. Map 7.2 explores that study area lies in river and monsoon flood area.

Map 7.2 Flood Prone Area of Bangladesh



(Banglapedia 2014)

Table 7.6: Impact of water level increase in rainy season

Impact of water level increase in rainy season	Frequency	Percentage
Flood for increased water	90	50
River Bank Erosion	22	12
Unable to crop production	31	18
Migration to Godagari Upazila and Rajshahi Sadar	11	6
Food shortage	14	8
Damage houses and homestead property	12	6
Total	180	100

Fieldwork 2017

Fifty percent respondents report that monsoon flood happens in almost every year during rainy seasons that causes detrimental impacts on local lives and livelihood (table 7.7). Sometimes, when India open all the doors of Farakka barrage, heavy water within a shorter period of time inflows Bangladesh that also causes flood and brings about lot of sufferings for the local people. Twelve percent respondents said that flood results river bank erosion and eighteen percent regarded flood as a threat to crop production.

7.4.3 River bank erosion

In Bangladesh, riverbank erosion is an endemic and recurrent natural hazard. When river enter the mature stage it become sluggish and meander or braid. These oscillations cause massive riverbank erosion (Banglapedia 2016). Millions of people are affected by erosion every year, which wipes out standing crops, farmland and homestead land. BSS Report (2015) reveals that about 5% of the entire flood plain of Bangladesh is openly affected by erosion. Now, riverbank erosion has turn into roughly a regular feature. Local people are

brutally affected dislocation is the instant impact of riverbank erosion. The displaced generally move to nearby areas but migration to remote places is not rare. The majority families of the study area have witnessed a dislocation in their lifetime in erosion-prone areas. A respondent said that

River erosion is the most dangerous disaster we have been encountering in Char Ashariadaha since it erodes everything. Fire burins materials, flood damages crops and cattle, but river erosion even does not let homestead undamaged. River erosion makes us pauper and it ultimately turns people impoverished.

7.4.4 Immoral Political Atmosphere

The Peoples' Republic of Bangladesh is a parliamentary democracy comparable in structure to many other British Commonwealth nations. It is separated into seven administrative divisions and those divisions are extra sub-divided into 64 districts. Local elections are held to inhabit a number of the positions on sub-district level (upazila) councils and the union councils that represent a group of villages, but other members of these councils are appointed by the central government. There are 64 District Councils, 483 Upazila Parishads and 4500 Union Councils in Bangladesh (Bangladesh Bureau of Statistics 2010). Under the union level there is as well a ward level with nine wards in very Union Council. There are no government institutions at ward and village levels except villages particularly sort out a large number of events through traditional familiar mechanisms. They arrange religious events, sporting events and diverse kinds of meetings to converse events that might need collective action for instance an erosion problem or help to a neighbor in require. As the authority of upazila, union and village councils is very narrow by comparison to that of the central government, and as no formal government exists under the union level, the structure is systematically one that allows for a great deal that anthropology calls top-down control. Local leaders represent political-economic elite with very little responsibility to the grassroots interests of local communities like Char Ashariadaha of Rajshahi. MPs, in addition to having the chance

to be appointed to a ministerial position, may also be nominated for an advisory position at a local resource management committee at the district and sub-district levels derived from this official position, they manage local power structures based on their political party organization. They nominate party candidates for local government elections at Upazila Parishad (UP) or Union Council (UC) levels. These local elections run separately and are held at special times of the year than national elections (Ahmed 2013). The Zila Parishads or District Councils are composed of both elected and appointed members. The elected members comprise all the MPs from that district, the Upazila Parishad Chairmen, the Union Council Chairmen and the Mayors of all municipalities inside the district. Upazila Parishads of Sub-district Councils is made of one Chair and two Vice-Chairs who are elected openly to their positions, and all the union council chairs inside that sub-district. The Union Councils be made of one Chair and twelve other members who are also elected openly by local citizens. Usually these positions are all filled by elite members of the local communities. The government party is thus able to manage the actions of District Councils by appointing only party supporters to the non-elected positions. This is not the case at the sub district and union council level except even when a bulk of the members of those councils are from opposition parties, they tend not to openly resist the government over local development activities but rather assist as best they can, protecting their class position while waiting for the next national election. Besides their extraordinary power on local levels of government, the central government MPs and ministers are key power brokers for the foreign development agencies and corporations that initiate latest technologies into the water and agricultural management structure. Respondents said that political elites are capable to income by exploiting the Ganges flow decreases, a few; for example, make money by mining sand from the river at times of low flow and selling the sand to building industries. However, lack of accountability and transparency in local political system coupled with factionalism are important factors in local water management in Char Ashariadaha.

7.4.5 India Bangladesh Negotiation Challenges

Bangladesh is a downstream country. Bangladesh has been negotiating for a long time with India for harnessing, developing, and equitably sharing trans-boundary river water, which has been a major cause of dispute between them. As India is a big country in terms of economic militarily, size and population it is difficult for Bangladesh to challenge in any spare of component. Moreover, Bangladesh is geographically fence with India in three sided and only south east is Myanmar. India and Bangladesh are brotherly country historically. From the very beginning of India's emergence as independent country, relation between Bangladesh and India was not good even after independent to 2006 the relation between was volatile. In 2008, when Awami league came to power, the India Bangladesh relationship comes to a strategic level. But it is very unfortunate that despite being Bangladesh's most close friend, India have been showing callousness to resolve the water problem between two nations. In before the major problem was started in 1975 when India started to utilize Farakka Barrage. Water sharing of Ganges is one of the most serious and disputed issues that have bedeviled relations between India and Bangladesh. Conflict regarding the sharing of the water resources in the Ganges-Brahmaputra river system between India and Bangladesh can be traced back since the birth of Bangladesh.

Water is a natural resource, and natural resources in general have an impact on conflict/cooperation dynamics. First, they are embedded in a shared social space. Actions undertaken by one individual or group or country may generate effects far off-site. Second, natural resources are subject to increasing scarcity, which is complicated by issues like unequal distribution. From the perspective of the above characteristics, trans-boundary waters are important in the development of patterns of conflicts or cooperation. Regrettably, despite sharing fifty-four rivers with India, Bangladesh has only one water sharing treaty with it, on the River Ganges, which was signed in 1996. But India removed the guarantee and arbitration clauses regarding minimum water from the treaty. On sharing of common rivers, Article 9 of the 1996 Ganges Water Treaty makes it obligatory for India to conclude water sharing agreements with Bangladesh on principles of equity,

fairness and no harm to either party. But the real picture is different. Although a thirty-year water treaty has been in effect between the two countries since 1996, India has been diverting water according to its will, depriving Bangladesh from its just share during dry season (Islam 2011).

7.5 Local Water Management: Impact of Farakka Barrage

Bangladesh is sensitive to diversion of Ganges water through Farakka barrage which adversely affect her ecology and economy. 37 per cent of the total area and 33 per cent of the total population of Bangladesh is dependent on Ganges basin (Hossain 1981). As a result of reduced flow of Ganges, Bangladesh has faced problem in the field of agriculture, industry, fisheries, navigation, salinity and ecology, etc., in the south western region (Kawser and Samad 2016). About one-third of the total area of Bangladesh is directly dependent on the Ganges basin for their livelihood. In these circumstances water diversion at Farakka is bound to have an impact as it was an attempt to introduce a new ecological system against the usual course of nature. A substantial number of studies compared the pre and post Farakka situations in Bangladesh. According to these studies, there is a huge contrast between pre and post Farakka water supply, where the situation was much better in pre-Farakka period even in dry season in the downstream, more particularly in the Bangladesh part (Mirza and Hossian 2000). It was expected that situation would improve after the treaty but a substantial amount of studies showed that the situation has become even worse in some cases.

7.5.1 Perceived Environmental Impact of Farakka Barrage on Local People

Because of the impact of freshwater withdrawals at Farakka the over-misuse of angling and ranger service assets is a far reaching issue in Bangladesh in the post 1996 period. The water levels in the dry season have become lower wherever in the nation. For this situation the groundwater is being utilized over yonder and accordingly the route profundities are diminishing because of polder development in numerous waterways. In the genuine sense pretty much every issue in the nation related with water has been

credited to the effect of Farakka (Brichieri-Colombi and Bradnock 2003). This is perceivable that the social, financial and natural issues have become a vital part to the Bangladeshi individuals which are progressively quickened because of withdrawals of Ganges waters at Farakka.

Table 7.7: Environmental Impact of Farakka Barrage

Environmental Impact	Frequency	Percentage
Flood	22	12
River bank erosion	12	7
Deforestation	25	14
River channel destroy	39	22
Biodiversity destroy	17	8
Desertification	55	31
Others	10	6
Total	180	100

Fieldwork 2017

Table 7.8 shows that twelve percent respondents said that Farakka barrage has major impact in Char Ashariadaha causing flood. Some respondents said that Farakka barrage results river bank erosion in the locality in rainy season when the flow in Padma exceeds normal state. Fourteen percent respondents argue that Farakka barrage has been bringing about deforestation due to lacking of sufficient water for plants. Twenty two percent of the local people opine that it has been declining river channel and diverting channel from their area.

Respondents view that there are some changes in composition due to change in soil structure, climatic condition in Char Ashariadaha. Instead of rice ground nut, sugarcane, betel-leaf etc. are being cultivated. There have been drastic fall in agro crops productivity. On the other hand there are some short duration crops cultivated in the sand banks just after disappearing of flood water due to availability of some moisture for short period of time. Shrinkage of the Padma's natural flow has taken highest toll upon birds, fish and other aquatic animals. Eight percent respondents explore that Farakka barrage

has been destroying biodiversity of the local area (table 7.6). The Farakka barrage has caused the destruction of breeding and raising ground of 109 fish species and other aquatic animals in the lower Ganges basin (Adel 2001). The impact has become vivid; once fish was the most common dish of this area which has been completely changed. Now fish become rich people's dish (Zaman 2014).

The water shortage has carried a lot of hopelessness and hardship to the individuals of the influenced western pieces of Bangladesh that has come about interruption of angling and route, brought undesirable salt stores into rich cultivating soil, unfavorably influenced farming and mechanical creation, changed the pressure driven character of the waterways and achieved changes in the environment of the Delta. Because of the Ganges redirection the base release of the stream Padma at the purpose of Hardinge Bridge in Bangladesh fell far underneath. The groundwater level in the profoundly influenced zone went down especially in the region of Rajshahi (Tiwary 2006).

7.5.2 Perceived Social Impact of Farakka Barrage on Local People

Farakka barrage has numerous social impacts on local people of Char Ashariadaha. Social relation with each other before Farakka period was harmonious which now is competitive due to water crisis in dry season caused by Farakka barrage. Poor-rich relationship in post Farakka period is arid as conflict over water bodies takes place in the community. Table 7.9 shows that six percent people perceived that Farakka barrage migrated people toward other regions. There were lots of people dependent upon on the natural resources provided by Padma River which changed with river flow change. Usually there are some customs and rituals around the river in many societies. Sixteen percent respondents believe that Farakka barrage has changed traditional rituals in many respects. Seven percent respondents said that Farakka barrage has played key in extinction of traditional fishing species in the community and nearby water bodies.

Table 7.8: Social Impact of Farakka Barrage

Social Impact	Frequency	Percentage
Migration	11	6
Traditional occupation change	16	9
Traditional customs and rituals change	29	16
Class conflict increase	22	12
Frustration increase	14	8
Water borne disease increase at the time of flood	17	9
Folk medicine destroy	13	8
Frequent flood	19	10
Self dependency decay	17	10
Local fishing species extinction	12	7
Desertification	4	2
Water channel destroy	6	3
Total	180	100

Fieldwork 2017

7.6 Challenges and Coping Mechanism

7.6.1 Perceived Causes of Water Mismanagement

Local people were asked to identify key factors in managing water problems in the study area. People's perception about the water problem in the locality is on ground of their understandings of the problems. Eighteen percent respondents identified lack of local people in local water management committee. National level policy negotiation and implementation is identified twenty two percent respondents while fifteen percent respondents financial transparency in governmental office as cause of water mismanagement in the study area.

Table 7.9: Cause of Water Mismanagement

Cause of Water Mismanagement	Frequency	Percentage
Unequal representation of local people in local water management	32	18
Inability of National political negotiation	39	22
Lack of Financial transparency	28	15
Lack of Resource mobilization	22	12
Lack of financial support	26	15
Lack of accountability in local Government	23	13
Don't Know	10	5
Total	180	100

Fieldwork 2017

Policy implementation and successful water management requires potential financial that actually lacks in the study area as addressed by local people. Accountability is vital issue in governance which like absent in local government that also results mismanagement in water sector.

7.6.2 Key Coping and Adaptation Strategies

Rainfall in the Rajshahi division is less than southern part of Bangladesh. But there is sufficient precipitation in rainy season that is harvested by local people in various manmade water bodies. This is an idea to explore new thinking about enabling people with more adaptive capacity using best use of available water in the view of decreasing pre-monsoon and monsoon rainfall in addition to the problem already faced with minimum rainfall. This will help people easy to stay in the same place where they are living with sentimental attachment and dignity. To improve the availability of water, it is important to scale up the use of practices that reduce demand, increase availability and increase efficient use of water. For example, more water can be made available through capturing, storing and using rainwater.

Water is collected in certain part of Char Ashariadaha in a cost-effective pond. The stored water is used for drinking, domestic use and vegetable growing. Some people collect rooftop water and preserve in pottery utensils. Some people preserve rainwater for many days where germs attack. In this circumstance, there is a adaptation mechanism where *Koi* Fish is harvested so that *Koi* Fish eats the germs and then people eat this water after boiling. Many people preserve rainwater in bigger water preserver that is used in agricultural lands. Though there is minimum rainfall and a pattern changed by climate change, it is still possible to make use of available sources. Existing sources can be conserved and enhanced for infiltration so that there is a chance to increase flow capacity with same or reduced rain flow by stopping surface runoff. Water can be stored in the pond and make used to make land wet for a longer time.

Electricity failure and load-shedding are major issues in Char Ashariadaha that hampers ground water extraction in dry season. Solar energy is gaining popularity in the locality that is used for lighting and lifting water from nearby streams for drinking and drip irrigation. The installation cost of solar power is not high but NGOs that are providing solar energy in loan practice monopoly. Their interest rate is quite high comparing to other kinds of micro credit. Since, hydro power in the locality is not sufficient to meet demand; the Government is encouraging people to use solar power in rural communities.

Drip-irrigation technology is widely used in Char Ashariadaha that delivers water directly to the plant root at the required time through a system of plastic tubes, thereby preventing losses due to evaporation or runoff. Drip-irrigation systems are more efficient, and therefore require minimum water for growing vegetables. This makes efficient use of precious water for reproducing fresh vegetables. Barind authority is playing key role in this regard. At an individual level, a change in attitude towards water use would make a huge difference. People can also save water by having short showers and capturing water from showers and may use this used water in crop land. Additionally, less water required paddy can be harvested to adapt with water scarcity in the locality.

7.7 Conclusion

Water is source of life. Its importance is badly internalized by local community of Char Ashariadaha in their daily lives. Hence, water scarcity molds the lives and livelihood of community people. This chapter has brought about insights on how local people, mainly river dependant people struggle to survive in a regime of water shortage. Water shortage has driven many traditional occupations to daily wage labors. Migration to nearby city and Dhaka is very common scenario among the agricultural labors of the community. Water shortage caused by Farakka barrage, natural events like climate change, and mismanagement have adverse impacts; crop decline, traditional fish species reduction, flora and fauna extinction, and social anarchy for controlling over water bodies.

Chapter 8

Conclusion and Recommendation

8.1 Conclusion

Local inhabitants of Char Ashariadaha of Rajshahi are facing livelihood challenges for water shortage. Traditionally they are totally depending on Padma River. Now Padma is likely going to be a curse for their livelihood, frequent flood washes way their assets and destroying the natural species. Before Farakka a lot of fishermen and boatmen were working there now mostly disappeared, shifted their work to other field. A good number of rickshaw pullers of Dhaka city come from Rajshahi to survive. A lot of female who were housewives also shifted their work and joint garment factory to survive. On the other hand natural ecosystem hampered greatly frequent flood at the time of rainy season with river bank erosion and drought at the time of dry season destroying the farm land. For Farakka Barrage the natural flow of Padma has decline many fold. So a lot of Char land comes out frequently at the same time agricultural land is going to desert land. At the consequences, frequent flood, people migration, desert land increase, biodiversity destroy, ecosystem imbalance, salinity increased creating a great hazard all over Bangladesh. Moreover, for coping with the situation a lot of project after independent was implemented that could not bring about fruitful outcomes for corruption, lack of transparency and accountability, lack of proper monitoring, lack of stakeholder participation and odd political culture.

The turn away of water from the Ganges River prior to it reaches Bangladesh is obviously the most significant of all the direct causes of adversity for the local inhabitant of Char Ashariadaha of Rajshahi division. Present study reveals that class discrimination have increased harshly over the past few decades and that now a virtual monopoly has created a small group of rich farmers over water resources, land, capital and even the government safety net programs. These monopolies offer important benefits for increasing social mobility as elites set up new businesses, poultry farms and fisheries and the marginalized people becomes their customer. Collating with local political leader and union council's chair and members, these rich farmers are capable to manage the water bodies and irrigation system. Since marginalized people currently depend on these rich

people for every aspect of their livelihoods they have very little room for raising their voices against this domination. The elite families control local agricultural materials and government subsidies. The poor are more and more dependent on the elite for employment in their commercial operations as conventional employment opportunities turn down, for increasing the total figure of marginalized people, they face dislocation and human rights violations.

Present study argues that water bodies in Char Ashariadaha comprise of complex political ecology that is not only governed by local elite but centralized political system has direct and indirect influence. Rich farmers play despotic role by controlling over natural water bodies; impeding natural water flow and making poor and marginalized farmers to depend on their will for getting irrigation water. Hence, water management system goes under political ecology, water governance runs under hydraulic despotism concept, and water use rights is protected under entitlement approach produce a multidimensional crisis that is difficult to deal from single lens. Present study propose two critical ways for these issues; a multidisciplinary comprehensive research model should be taken to account the versatility of water crisis, and a multi-stakeholder based intervention and action group for the effective implementation of the model.

Present study comes to the understandings that water quantity and water quality issues are uniquely linked. Poor water quality affects the availability of fresh water for different uses. Contamination of surface water bodies and ground-water aquifers by agricultural pollutants, industrial discharge, domestic pollution, and non-point source exacerbate water quality problems and endanger both natural ecosystem integrity and public health. Other environmental problems include: excessive soil erosion and sedimentation, water-logging and salinisation of agricultural land, groundwater depletion, watershed degradation and deforestation, reduction of biodiversity, wetland loss, saltwater intrusion, and coastal zone habitat loss.

Individuals of Char Ashariadaha experience the ill effects of absence of pure drinking water. Surface water supplies are commonly dirtied and groundwater, which till now had been the best wellspring of safe drinking water, is polluted with arsenic in numerous pieces of the locality. Substantial withdrawals of groundwater for water system have likewise brought down the water level in numerous territories beneath the powerful reach of hand tube-wells. These water supply and sanitation issues have clear ramifications for general wellbeing in the study area. Diarrheal illnesses, emerging to a great extent from drinking risky water, are a main source of death in the Char Ashariadaha. Absence of access to safe water supply in the locality is an exceptional hardship for women who need to convey water over long distance, with huge effect on their wellbeing and profitability.

The ownership of water does not vest in an individual but in the state. Authority should allot water to guarantee evenhanded dissemination, effective advancement and use, and to address destitution. Government can divert its utilization during times of dry seasons, floods, cyclone, and other characteristic and man-made catastrophes, for example, tainting of groundwater springs that undermine general wellbeing and the environmental trustworthiness. Portion rules will be the conventional component for choosing who gets water, for what purpose(s), how much, at what time, for to what extent, and under what conditions water use might be shortened. Rules for water assignment should be produced for in-stream needs during low-stream periods; for off-stream withdrawal and for groundwater energize and reflection. Distribution for non-wasteful use would infer guaranteeing least levels in water bodies utilized for that reason.

Water resources management requires involvement of the public and private sectors, communities and individuals that benefit from the delivery of water-related services. The ultimate success and effectiveness of public water resources management depends on the people's acceptance and ownership of each project. It is important to delineate the roles and responsibilities of everyone involved in water resources management. The principle that community resources should be managed by the community concerned, along with local government institutions unless a greater national interest prevails, should guide

water resource management. It is recognized that women have a particular stake in water management because they are the principal collectors and carriers of water, main caretaker of the family's health, and participants in many stages of pre and post harvest activities.

Protection and preservation of the natural environment is essential for sustainable development. Given that most environmental resources are linked to water resources, it is vital that the continued development and management of local water resources should include the protection, restoration, and preservation of the environment and its bio-diversity including wetlands, mangrove and other national forests, endangered species, and the water quality.

River bank erosions, unpredictable water flows, and embankment failures hinder with the capacity of most households to produce subsistence crops year around. Arsenic defilement in drinking water supplies maintain from groundwater extraction is bringing down the water in the community. A great deal of nearby fish species are at present wiped out. Traditional ecological knowledge that once continued these networks is additionally being lost as the ecological qualities of local farming practices transform into less reasonable.

Through community inclusion in democratization of water management institutions can support the historical employ of local knowledge and rights to common property resources. This inclusion approach have to needs to start at the village and ward levels where people feel most safe in their capability to elect a local representative with no fear of intimidation and vote-rigging. Present study address gender issues in water management. It was consequently realized that a number of issues relating to water management in the study area has to do with women. There is requiring devoting a study on how the management of water resources at the local level by women is impacting on their well being and poverty. This will assist shed light on how the bottom-up approach to resource management is impacting absolutely or if not on women in particular.

8.2 Way Forward

For supporting rechargeable shallow groundwater springs, present study argues that government ought to direct the extraction of water in the distinguished shortage zones with full open information. Explicit dry spell observing and emergency courses of action ought to be set up for every locale encountering repetitive occasional deficiencies of water with due thought to conjunctive utilization of water, surface water and ground water and elective methods for fulfilling demand. The alternate course of action ought to incorporate activity to constrain the utilization of groundwater as indicated by needs. The administration may engage the local government or any neighborhood body it regards fit, to practice its entitlement to dispense water in neighborhood times of serious dry season, and it will screen the water system and authorization of the guidelines through explicitly planned components. The administration may give water rights on private and community bodies to give secure, solid and enforceable possession rights to ground water and surface water for drawing in private venture. Empowering condition should be made for women to ensure a key role in community water management. Briefly, present study thinks that following issues may make the water management system better in local area:

- Government may encourage accessibility of protected and reasonable drinking water supplies through different methods, including water reaping and preservation.
- Energize future groundwater improvement for water system by both public and the private segments, subject to guidelines that might be endorsed by government. Improve effectiveness of asset usage through conjunctive utilization of all types of surface water and groundwater for local water supply.
- Fortify proper checking for groundwater energize, surface and groundwater use, and changes in surface and groundwater quality. Fisheries and natural life should get due accentuation in water asset arranging in Char Ashariadaha where their social effect is high.

- Natural Water bodies like khals, canals etc. should be saved for fish generation and advancement. Lasting connections of these water bodies with the river will likewise be appropriately kept up.
- Water improvement plans should not intrude on fish development and should make sufficient arrangements in control structures for permitting fish movement and reproducing.
- Create and disperse suitable advancements for conjunctive utilization of ground water and surface water. Create and elevate water extraction systems to counteract wastage and produce productivity of water and vitality use.
- Water allocations in irrigation systems must be finished with value and social equity. Simultaneously, genuine thought ought to be given to non-point contamination of water frameworks by compost and pesticides that are either filtered to the groundwater or washed off the fields to river, khals and canals.

However, informed policy making to meet policy goals and make local people aware of their significance and impact is an essential requirement of a dynamic water management policy in Bangladesh. Bangladesh's improved negotiation with India would create an atmosphere where India would abide by water treaties that could change the water crisis positively. Furthermore, if power gap between rich and poor in the study area could be mitigated then access to water and entitlement scenario could be developed. Moreover, it is essential to reach at a typical comprehension between authorities, organizers, government officials and the overall population about the changing condition and the ideal available resources of accomplishing the national water management objectives. Present study argues that as the water management becomes progressively complex with various dimensions in rural areas like Char Ashariadaha, further research should be conducted from in-depth anthropological insights and from social sciences with a view to ensure bottom-up knowledge venture instead of top-down system for local people engagement in decision making process regarding water crisis management.

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APPENDIX

APPENDIX 1: QUESTIONNAIRE

SECTION 'A': PERSONAL AND SOCIO-ECONOMIC DATA

1. **Name :**

2. **Village/ Ward Name:**

3. **Sex:** a. Male [ ] b. Female [ ]

4. **Age of the Respondent:**

5. **Age at marriage of the respondents (in years 2017)**
   a. 15-24 [ ] b. 25-34 [ ] c. 35-44 [ ]
   d. 45- above

6. **Marital Status:**
   a. Single [ ] b. Married [ ] c. Separated [ ] d. Divorced [ ] e. Widowed [ ]

7. **Income:** a. Tk. 5000 – 10000 [ ] b. Tk. 11000 - 15000 [ ] c. Tk. 16000 – 20000 [ ] d. Tk. 21000- 25000 [ ] e. Tk. 26000 – 30000 [ ] f. 31000 – above [ ]

8. **Family Members / size of the family** : a 0-2 [ ] b. 3-4[ ] c. 5-6 [ ] d. 7-8[ ] e. 9-above [ ]

9. **Number of Wife Taken**: a. One Wife [ ] b. Two wife Simultaneously [ ] c. Married After Divorce [ ] d. Married After Death [ ]

10 What is your educational attainment?
a. Class one- Class Five [ ] b. Class Six – Class Eight [ ] c. Nine – SSC Pass [ ] d. HSC Pass [ ] e. BBA/BSS/B.Com Pass [ ] f. MA/MSC/M.Com Pass [ ] g. Other (specify) [ ]

11 What is your occupation?
a. Farmer [ ] b. Business [ ] c. Service [ ] d. Fishing [ ] e .Boatmen [ ] f. Kamar [ ] G. Cobbler [ ] h. Wood maker [ ] i. Day labor [ ] j. Others (specify)……. [ ]

12. Religion : a. Muslim [ ] b. Hindu [ ] c. Buddhist [ ] d. Christian [ ] e. others [ ]

13. Are you engaged in any other income earning activity?

a. Yes [ ] b. No [ ]

b.

14 If yes, what is this?.....

15. Kindly tell me the house type that you leave in?

a. Kacha [ ] b. Semi- Paka [ ] c. Paka house [ ] d. Bamboo wall and stick roof [ ] e. Mud house with thatched roof [ ] f. Tin packed house [ ] g. Brick house [ ] h. Brick with Iron roofed [ ] i. Others……. [ ]

16. Property: a. 0-20 decimal [ ] b. 21—40 decimal [ ] c. 41- 60 decimal [ ] d. 61—80 decimal [ ] e. 81 to 100 [ ] f. 101- above [ ]

17. **What type of toilet you use ?**

a. open space [ ] b. kacha/ bamboo made toilet [ ] c. paka/ brake made toilet [ ] d. others [ ]

18. **After toilet, did you wash your hand ?**

a. yes [ ] b. no [ ]

if yes , what type ?

19. what is your local recreational factors ;

a. song assembly [ ] b. river bitch [ ] c. mojlish [ ] d. playing hadudu [ ] e. card playing [ ] f. folk dance

20. Have you any television: a, Yes [ ] b. No [ ]

21. Have you use mobile a, Yes [ ] b. No [ ]

22. Have you any refrigerator a, Yes [ ] b. No [ ]

23. **Physical Structure :** School – a, Primary b. High School, c. College, d. Madrasha

Bazar- ---, Hat----------, Mosque---------- Tample----------, Pond----------, Play ground-------, Road Kacha----------, Road Paka----------,

SECTION 'B': WATER SOURCES, USES AND MANAGEMENT

24. **What is the major source of domestic water to this community**?

a. Pipe borne water [ ] b. Tube-well [ ]

c. Hand-dug Well [ ] d. Rainwater /Reservoir [ ]

e. River/Lake/Pond [ ]

25. **Who are the main collector of water domestic water ?**

a. male[ ] b. Female [ ] c. Female Child[ ]. d, Others [ ]

26. **What is the major source of agricultural water to this community?**

Pipe borne water [ ] b. Shallow Machine [ ]

c. Tube Well [ ] d. Rainwater /Reservoir [ ]

e. Dam/River/Lake/Pond [ ]

27. **Please mention the major agricultural crops in the locality ?**

a. paddy [ ] b. dal [ ] c. vegetables [ ] d. gom [ ] e. others (specify)

28. **Are there seasonal differences in water availability to your community?**
a. yes [ ] b. no [ ] c. others [ ]
6**. if yes what types** ----------

29. **Relating any organization for operation and mentainance of water uses and management ?**

a. yes [ ] b. no [ ]

30. **if yes who are they** ? (Name maintion) a. Govt org [ ] b. Ngo [ ]

31**.if yes, please specify the name of the organization**

32. **if yes, Are they inform you about water uses or other purpose** ?

a. yes [ ] b. no[ ]

33**. Did you participated any meeting regarding water issues of your locality ?**

a. yes [ ] b. no[ ]

34. If yes , specify

35. **There are any water related committee of your locality (WMA, WMO, WMG) ?**

a. yes [ ] b. no[ ]

36. If yes , Have any idea about WMA, WMG, WMO ?

37. if yes who are the members ?

a. local elite [ ] b. local political leader [ ] c. local service holder [ ] d. taking common people.

38. if yes , who is the president of the committee ?

a. local elite [ ] b. local political leader [ ] c. local service holder [ ] d. taking common people.

39. Create any conflict to control water body ?

a. yes [ ] b. no [ ]

39. if yes, who are the leader of this conflict ?

a. Local land load [ ] b. local political leader [ ] c. outsider d. others

41. Did you participated any conflict?

a. yes [ ] b. no [ ]

42. if yes , why ? ----------

43. **which community is controlling most of the area ?**

a. Char under Boalmari [ ] b. Kamar para [ ] c. Diar manik para[ ] d. char bhabun para [ ] e. Char asharadah pani par[ ] f. Char new gram[ ] g. char kana para[ ] h. char nou shara [ ] I . Char halu manda.

44. Who are the major controller of the locality ?

a. Local elite[ ], b. Local religious person[ ], c. Local educated person[ ], d. others [ ]

45. Is local politics related to national politics ?

a. Yes [ ], b. No[ ],

46. What reason, please explain ----------

47. What type of method you use to manage water in your locality , ----------

48. **Are there Any Campaign Regarding Community Water Management Issues ?**

a. Yes b. No

49. If Yes , What type----------

50. **What the impact was created when water level increase at the time of rainy season ?**

a. Flood for increase water [ ], b. River Bank Erosion [ ] c. Unable to crop production [ ] d. Migration to Godaguri Upazila and Rajshahi Sadar [ ], e. Food shotage [ ] f. Damage houses and homestead property [ ]. g. Others [ ]

51. What the impact was created when water level decrease at the time of dry season ?

a. Create Water crisis for crop production [ ] b. Severe Navigation problem [ ], c. Local fish decrease [ ], d. Local medicinal species Decrease [ ], e. Migration to other places specially

Rajshahi Sadar and Godagori Upazila [ ], g. crop land decrease [ ], h. Occupation shift Fishermen and Boatmen to Day labour) [ ], i. Seasonal Migration[ ], j Others ----------[ ],

SECTION 'C': IMPACT OF FARAKKA BARRAGE

52 **What your opinion about farakka Barrage?----------**

53 Do you think it create any negative impact in your locality?

a. yes [ ] b. no [ ]

54 **If yes what types** a. Environmental [ ] b. Social [ ] c. Economic [ ] d. Anthropological [ ] e. others [ ]

55 **if Environmental , do you think ,What type of impact created**

a. flood [ ] b. drought [ ] c.river bank erosion [ ] d. deforestation [ ] e. River channel destroy [ ] f. Biodiversity destroy g. desertification h. others

55 **Which environmental factor is greatly affecting you most? And why ?**

a. flood [ ] b. drought [ ] c.river bank erosion [ ] d. deforestation [ ] e. River channel destroy [ ] f. Biodiversity destroy g. desertification h. others

---

56 **if Social , do you think ,What type of impact created ?**

a. Migration [ ] b. Traditional occupation change [ ] c. Traditional customs and rituals destroy [ ] d. Class conflict increase [ ] e. Frustration increase [ ] f. happiness destroy [ ] g. water bone disease increase at the time of flood

57 **Which environmental factor is greatly affecting you most? And why?**

a. flood [ ] b. drought [ ] c.river bank erosion [ ] d. deforestation [ ] e. River channel destroy [ ] f. Biodiversity destroy g. desertification h. others

58 **if economic , do you think ,What type of impact created ?**

a. poverty increased [ ] b. crop production decrease [ ] c. local unemployment problem increase [ ] d. income diversity destroy

59. **Which economic factor is greatly affecting you most? And why?**

a. poverty increased [ ] b. crop production decrease [ ] c. local unemployment problem increase [ ] d. income diversity destroy.

60 if Anthropological , do you think, What type of impact created?

a. folk medicine destroy [ ] b. frequent flood [ ] c. self dependency destroy [ ] d. local fishing species destroy [ ] e. desertification [ ] f. Water channel destroy [ ] g. traditional occupation decline [ ] h. local folk culture decline [ ]. I Migration [ ]

SECTION 'D': CHALLENGES AND COPING MECHANISM

61 **Do you think , What kind of Challenges are there to management water properly ?**

a. Multilateral contact [ ] b. awareness program initiate [ ] c. Ensure stakeholder participation [ ] d. National political negotiation [ ] e. India Bangladesh negotiation[ ] f. Financial transparency [ ] g. Resources mobilization , h. Economic Problem [ ]

62 in Your idea what is the greatest challenges you are facing ? and why ?

---

63 **What your idea to cope from it ?**

a. The current Techno centric Approach change [ ] b. The current bilateral relation with india to replace by multi-literate abiding international law. [ ] c. All levels of water management needs to reform [ ] d. Ensure Community participation [ ] e. make water reservoir [ ] f. Increase Awareness program . g. others ----------

Thanks for your cooperation

Appendix 2 Field Image

Image 1: Village River and Bridge

Image 2: Local School

Image 3: Padma River

Image 4: Boat Making

Image 5: Boats are tied on the bank

Image 6: Development Works

Image 7: Road Construction

Image 8: Newly Installed Tube-well

Image 9: Crop Field along with pond

Image 10: Dried River

Image 11: Decreased Water in Local River

Image 12: Dried River Bank

Image 13: Livestock

Image 14: Village Road

Image 15: Mustard Field

Image 16: River Crossing with Boat

Image 17: Semi Dried Canal

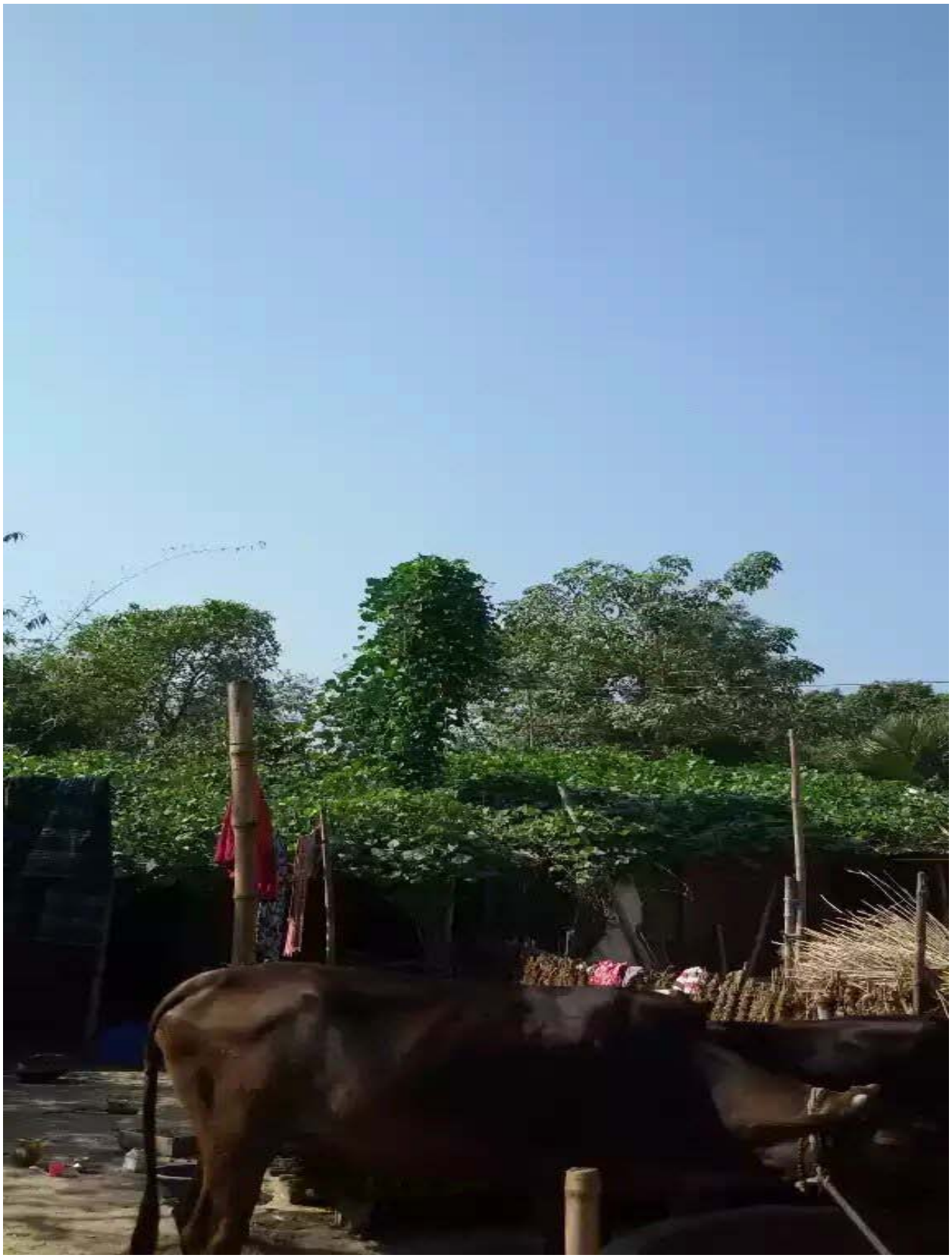

Image 18: Homestead Vegetable Cultivation