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**Women’s Technological Innovations and Adaptations for Disaster Mitigation:
A Case Study of *Charlands* in Bangladesh**

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Women's Technological Innovations and Adaptations for Disaster Mitigation: A Case Study of *Charlands* in Bangladesh

1. *Introduction*

Charlands in Bangladesh are pieces of land resulting from the accretion of silt in river channels. They are an outcome of the dynamic metamorphosis of the rivers in the country. The entire country is a delta located within the flood plains of three great rivers: the Brahmanputra-Jamuna, the Padma and the Meghna. In addition, there are more than 230 rivers which criss-cross the country. All these rivers are either contributory or distributory channels of the three main rivers.

Such a wide network of rivers plays a pivotal role in the livelihoods of the people, particularly of those who live on riverbanks and *charlands*. It also determines the extent of their exposure and vulnerability to natural hazards. Therefore, to understand the lives and livelihoods of the people of a riverine country like Bangladesh and their vulnerability to disasters, it is necessary to understand how human needs and wants intersect with nature, and transform nature into resources by modifying its different facets. 'Many natural elements are, however, not favourable to human existence and needs that often create adverse effects. Hazards occur when these potential threats to human lives and resources, in terms of loss and damage, emerge from the intersections between extreme geophysical events and a vulnerable human community' (Haque, 1997).¹

Women play a significant role in this process, but their contribution goes unnoticed. Their indigenous knowledge and practice of environmental management increases the coping capacity of communities in hazardous areas and thus contributes to their survival. Their inherent technological ability is demonstrated as they carry out a number of innovations and adaptations, which are generally embedded in their daily lives. This paper aims to describe, within its limitations, technological abilities of women living on *charlands*, who, generation after generation, have been a source of knowledge and practices that are of immense value to humankind. Development interventions by relevant institutions must take notice of women technologists if they want to increase the capacity of a community to effectively manage disasters.

2. *Methodology, Conceptual Framework and Definitions*

Methodology

A simple methodology was used in researching the subject of this paper. It included a review of secondary literature and two focus group discussions with women living on *chars* in the upper region of the Brahmanputra-Jamuna basin. A checklist was used for these discussions (annex 1). One discussion was in *Kunder Char* and the other in *Uriar Char*. Both are administratively part of the northern district of Gaibandha (see attached map).

Conceptualisation of Disasters and Women's Technological Capability

This paper endorses the understanding that a disaster should not be treated as a singular phenomenon, but instead be seen to be linked to complex intersections of geophysical, social, technological and political systems. Four basic elements are inherent in such a holistic approach to disasters:

- a) Disasters are socially and politically produced, i.e. it is vital to link disasters to prevailing socio-political relations and processes, since such processes result in the disproportionate allocation of resources. Consequently, the risk increases for poor and socially marginalised groups such as women, minorities and the elderly.
- b) Individuals (both women and men) interact with their environment, responding to it and reshaping it. Therefore, their participation is crucial for developing effective intervention strategies.
- c) Hazards and vulnerability to hazards are an integral aspect of development.
- d) Accountability and transparency in implementation are the key to ensuring sustained collaboration from people and communities.

With regard to women's technological capability, this paper endorses the view² that women use technical skills and knowledge in their daily activities. They continually innovate and adapt technologies in response to the difficulties that confront them, their families and their communities. However, these technological contributions are invisible for a variety of reasons. Many of these innovations and adaptations are in relation to activities in the domestic sphere, and are not recognised as being technical work. Often they consist of small adaptations to existing technologies rather than new inventions, which the conventional definition of technology does not consider a significant contribution. Also, Gross National Product (GNP) and Gross Domestic Product (GDP) do not accord an economic value to unpaid work, much of which is carried out by women. Unpaid work comprises of, among other things, the subsistence activities on which the lives of most rural people depend, and is oriented around family welfare activities such as farm work, processing of crops and food, weaving, sewing, collection of wood, fetching of water, cooking, fishing, tending of animals, child-care and caring for the sick. Such unpaid activities have been calculated as representing between 25 and 30 per cent of any country's current and future output (United Nations, *The World's Women: Trends and Statistics, 1970-1990*, New York, 1991).

When this understanding of women's technological capability is applied in a disaster context, it enables us to analyse women's ability to manage their environment in a hazardous situation.

Definitions of Technology, Innovations and Adaptations

In this paper, there is a shift from the conventional definitions of technology. This shift is necessary if one is to understand and analyse women's technological capability.

Technology³ does not mean only heavy and complicated machines. In a broader sense,

technology is that which helps us in the manufacture of products or enables us to perform (daily or specific) activities efficiently, following a simple process, and thereby to improve the standard of living and/or ensure sustainable livelihoods. This recognition also leads to the identification of four elements of technology: the *hardware* (machinery or equipment) of production; the *software* (experience, knowledge and skills) needed to produce something; the concepts and thinking *processes* linked to production; and the *organisation* needed both to produce a product and to enable production to take place, including social organisation and the product itself.

Innovation and adaptation refer to ‘... any change, however small, in the skills, techniques, process, equipment type or organisation of production, that enables people better to cope with or take advantage of particular circumstances.’⁴

3. *Environmental Threats and Disasters in Charlands*

Charlands are the sandbars that emerge as islands within the river channel or as attached land to the riverbanks as a result of the dynamics of erosion and accretion in the rivers of Bangladesh. They often create new opportunities to establish settlements and pursue agricultural activities. ‘Once vegetated, such lands are commonly called *chars* in Bangladesh’ (EGIS, 2000).⁵ Of the total land area of the country, 5% is *char*, which comes to about a total area of approximately 7,200 square kilometers.⁶ However, this is not a static statistic.

The environment of *charlands* is fickle and inconstant. Although they offer significant amounts of land for settlement and cultivation, living and working conditions there are very harsh. These lands are prone to acute flooding, erosion hazards, fierce storms and sand carpeting, which suddenly renders cultivable lands non-arable and may ruin standing crops. Since the study area of this paper falls within the Brahmanputra-Jamuna basin, the discussion of environmental hazards refers to that area only.

Of the three large rivers mentioned earlier, the Brahmanputra-Jamuna has the most *charland* and is ecologically most vulnerable to the disasters typical of *chars*. A large area of these *chars* gets flooded every year. In 1991, which is considered a high-average year, about 65% of the total land area was inundated in the upper reaches of the Brahmanputra-Jamuna. The 1998 floods inundated most of the area. Earlier, in 1988, 58% of the reported deaths in the *chars* were along the Brahmanputra-Jamuna. The *char* dwellers also incurred huge losses of agricultural produce and livestock.

River erosion is an even bigger threat to *char* dwellers than floods. The *chars* in the study area consist of loosely packed silt and fine sand, highly susceptible to erosion and thereby less stable than the *chars* in the upper Meghna area. The present inhabitants of *Kunder Char* have a history of being displaced by erosion between 6 and 12 times. One elderly inhabitant interviewed had experienced displacement 25 times. *Uriar Char* has been completely eroded, leaving its inhabitants dwelling on the flood embankment of the area. River erosion is one of the major factors contributing to increased landlessness in

the country.

The pre-monsoon storms (nor'westers) can create havoc for *char* people by causing extensive damage to their homesteads, standing crops, natural vegetation and trees. It should be mentioned here that dwelling places in rural Bangladesh are not only used as homes. They are also production units: homestead gardens, animal sheds, and so on. Therefore damage to homesteads leads to loss of income, too.

Normal inundation of *charlands* in many areas plays a benign role of adding fertility to the soil. But often such inundation can result in major problems of sand carpeting. A study by EGIS⁷ found that many households had been forced to give up farming as sand carpeting had completely ruined their cultivable lands.

Despite serious and frequent environmental hazards, a large number of people in the country are *char* dwellers. 'The total population of the *chars* during 1993 works out to be 630,983. The *char* population in 1993 represents a 47% increase over the population in 1984 (caused by increases in both *char* area and density of population in *chars*). The national population growth during the same period is estimated to be 26%' (EGIS, 2000). It is obvious that the ever-growing population pressure nationally and the socio-political process of marginalisation have forced the poorest of the poor to look for economic opportunities in a fickle environment. Emdad Haque (1997, p. 149) quotes Arthur and McNicoll to succinctly describe the reasons for population concentration in the risk zone:

When we look more closely at the demographic picture, we see population growth linked tightly to local environmental conditions. Two processes are at work. First, whenever new... resources appear, settlement expands to take advantage of them. Population growth, as it were, follows the contours of local economic opportunity. Second, the pressures and momentum of continued population growth sooner or later exhaust whatever "slacks" these opportunities provide; people are forced to seek and exploit whatever other local means of subsistence they can find.

The poorest of the poor and the most vulnerable seek survival in *charlands*, which are at the end of their horizon. In fact, Mukherjee writes that the first Bengal settlement was established in the alluvium tracts by inhabitants described as fishermen and unclean people.⁸ 'The vast scale of rent appropriation by the ruling classes and castes since the beginning of Bengal's history led the agrarian population into a societal and technological stagnancy' (Haque, 1997, p. 140) This process, resting on a rigid system in which a relatively small population was dependent upon appropriating surpluses from agricultural producers, led over centuries to a subsistence economy based on inequitable and underdeveloped economic relationships, contributing to a socio-political process that increased the defencelessness, insecurity and exposure of a large part of the population to hazards.

4. *Women's Coping Responses for Community Survival and Sustainability*

Every human being's (a woman's as well as a man's) living pattern and practices of resource management are profoundly influenced by the conditions that exist in her or his socio-economic, political, and natural environmental surroundings. Again, these conditions are interconnected while shaping the living pattern of an individual or a community. When it is assumed that individuals and/or communities possess inherent experience, knowledge and skills to cope with a given set of circumstances, the image of a man or men looms in the forefront. Women remain invisible and at the receiving end. As a result, they are not perceived as possessing technological ability for resource management as coping responses to harsh and hazardous environmental conditions. This paper attempts to bring to the forefront the work of women technologists at grassroots level in high-risk zones, who over generations have evolved certain practices and knowledge which doubtlessly contribute to the survival of their families and community. These technologies, possessed and practised by women and evolved through small innovations and adaptations from time immemorial, have been the key to communities' wellbeing in high-risk zones such as the *charlands* of Bangladesh.

However, this section has a limitation. The information presented here was collected from the grassroots through rapid focus group discussions over a period of only two days. Therefore, these are just a few of perhaps many examples of technological innovations and *adaptations* by women that may provide us with an insight into how the *charland* residents have been able to carry on with their day-to-day lives in the face of frequent disasters, and into the role of women as invisible technologists. This section does not attempt to portray a complete picture of the daily life of a woman in a *char* community.

The focus group discussions were held in *Kunder Char (KC)* and *Uriar Char (UC)*, in the northern district of Gaibanda, which is located in and along the Brahmanputra-Jamuna basin – the most unstable river basin in the country. KC surfaced in 1992. Thirty families live in the *char* and the male heads of almost all the families were away working on the mainland when the discussions were held. Most of them are employed as construction workers. The female heads in five of the households were widows. The EGIS study quoted Elahi and Rogge who, during their Riverbank Erosion Study⁹ in 1990, found *char* and embankment zones to have nearly three times as many female-headed and male-absentee households as the mainland. The study also found that the largest percentage of such households were located in the Brahmanputra-Jamuna basin.

UC is an attached *char*, 80% of which has been completely eroded recently. The inhabitants (approximately 80 families) are now dwelling on embankment zones and have a few plots of cultivable land extending into the river. The percentage of female-headed and male absentee households is also high. In order to explore their scientific knowledge and technological ability, we facilitated discussions around the management of agricultural and other natural resources, health and sanitation, housing, transport, marketing, and resettlement and restarting life after erosion.

Agricultural Activities and Food Security

The discussions began with the communities' current resources and their management of those resources. Usually the resources available on *charlands* are cultivable lands, natural vegetation, grazing land, various indigenous trees, open-water fish resources and domestic animals. Women on *charlands* are engaged in the entire process of crop production, unlike on the mainland where women are predominantly engaged in post-harvest processing, although the *charland* dwellers were hesitant to admit this right away as they are aware that it is socially embarrassing for women to work in cultivable fields in many places on the mainland. They use ploughs, spades, and manual weeders for cultivation of crops. They have knowledge of what varieties can be grown, in what season, and in what soil conditions. If the sand content of the soil is high, they select the range of crop varieties accordingly – usually groundnut, sweet potato, wheat, *kawan* and *cheena*.¹⁰

Women in the area also engage in homestead gardening. They use rooftops and backyard spaces to grow various vegetables and fruit trees. The major fruit trees are banana, mango, jackfruit, and only recently papaya. When asked what they do with the produce, they said they prefer to sell the crops, vegetables and fruits that have higher market value, while storing and preserving the rest for their own consumption. For example, they sell garlic and use the leaves of the plant in their own cooking as a substitute for garlic. They also dry the leaves and preserve them.

Vegetables such as sweet pumpkin and *chal kumra* (an indigenous variety of gourd sometimes referred to as 'ash gourd') and fruits such as plantain fetch a good market price. But when there is over-production they are preserved for the producers' own year-round consumption. For example, *chal kumra* is cut into rectangular pieces, blanched, dried in the sun, left to cool and afterwards stored in an airtight glass container. It is soaked in lukewarm water before being prepared into various types of delicious curry. It can also be stored in plastic containers, but the dried *chal kumra* then requires drying in the sun again from time to time. To preserve sweet pumpkin, the producers let it ripen to the point where they know it can be stored for a year. Women also dry *path 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 fish¹¹ or with whole fish if there is a surplus. To increase the nutritious value as well as taste of the dish, it also contains a vegetable locally called *kachu (colocasia)*. After the fish and *kachu* are pounded together, garlic and turmeric are mixed in for both flavour as well as preservation. More than 10 foods are preserved in various ways. However, the participants in the discussions said that their preserved foods are only adequate for six months. They still experience starvation.

In food preservation and processing, the scientific knowledge of women is clearly demonstrated in identification of the variety, and in invention of ways to preserve the food for a long time without loss of nutrition as well as taste. Their scientific ability is also obvious in the preparation of the preserved food into delicious and nutritious dishes.

Sustainability of Agriculture and Soil Fertility

It is well known that women are the seed preservers in agrarian society. The women we talked to know how to preserve seeds of more than 20 crops and vegetables and prepare seedlings of seven varieties. They also know about many other varieties that are grown on the mainland. During the discussions, we noticed openness to accepting and trying out new varieties of vegetables and crops. The women have their own network through which they constantly gather information about new varieties and their market feasibility. The information is gathered when they make social visits, mostly to their parental houses, when wholesale vendors come to their *chars* to buy their produce, and when their men come home from the mainland.

Soil fertility and maintaining the moisture content of the sandy-loam *char* soil are problems. The women compost their kitchen waste to produce organic fertiliser. They dig pits in the ground which are used to collect rainwater for irrigation when there is scarcity of water. They coat these water tanks with cow-dung to increase their water-holding capacity. Sometimes they place earthen pitchers full of water in the cultivable land; the gradual seepage of water from the pitcher into the soil maintains its moisture content and also works as a humidifier for the environment.

Natural Vegetation and Trees

Women are also very particular about preserving the natural vegetation of *chars*, which they consider to be a valuable resource and necessary for the stability of the land. They have identified some varieties of trees that grow fast on *char* soil. Quick-growing varieties such as the Rain tree, Neem tree, *Shimul* tree (from which timber and cotton are collected) and some tropical fruit trees are necessary for increasing soil stability. *Char* settlers were found reluctant to invest in slow-growing permanent trees due to their own 'temporary' residence and the vulnerability of the land to erosion.¹²

They have also identified a prolific plant, locally called *kalu*, which is used for hedging and fuel. Banana plants also grow very fast and do not require much effort to maintain. Both sweet banana and plantain are grown widely. Banana trees are very useful: they provide food, and their leaves are dried for fuel, used for fencing around the house, and provide building material. Banana trees are also used for making rafts during floods. Also valuable is catkin grass (*saccharum spontaneum*). This natural vegetation can accelerate silt deposition on *chars*, and its decomposition adds humus to the soil. Catkin grass is used to thatch houses and is also a source of cash. The stem is often used for making fences in homesteads, particularly in betel leaf enclosures. When women collect the grass, they are careful to cut it at a certain height and leave the root intact.

Livestock and Poultry Rearing and Open-water Fish Resources

Rearing and sale of livestock and poultry are an important economic activity almost entirely conducted by women. On *charlands*, livestock is also used as draught power for cultivation. Women's scientific knowledge, innovations and adaptations are

demonstrated in their care of livestock. They know what kind of fodder will keep livestock healthy and will produce more milk. The banana tree is not used for fodder because it is detrimental to the health of livestock, increasing the water content of the body and lowering milk quality. The women make their livestock stand on mounds of catkin grass during floods. They give importance to the maintenance of pasture for cattle, regularly planting grass from the mainland on *charland* to increase soil stability as well as provide pasture. They always start storing fodder for the poultry and livestock before floods. The women prefer to rear chickens because they stay around the homestead, unlike ducks which swim away and get lost.

Housing

Keeping in mind, the violent nor'wester that sweeps through the *charlands*, the women build low houses. They place an emphasis on using strong poles during construction so that their houses will not be destroyed. They also place two diagonal poles, one at the front, the other at the back, which they call *theka* (support), to protect houses from violent wind gusts. They also plant lot of trees at homestead as protection against storm winds.

For housing materials, they rely on locally available sources such as catkin grass and *dhoincha*, which is a long-stemmed water plant. When dried, the stem can be used as a building materials as well as for fuel. The leaves are used as fodder. The women usually prefer non-durable materials for housing since they need to move frequently because of river erosion.

Health and Sanitation

On *charlands*, institutional health and sanitation facilities are poor, and the primary health care of families is heavily dependent on the traditional knowledge and practices (home remedies) of women. They know of many plants and seeds that can be used for fever, healing of wounds and burns, delivery difficulty, and so on. Paste made from neem leaves (of the original neem tree, which the women call *jaat neem*) is applied on wounds and burns.

We asked the women how they ensure drinkable water for their families as river water is considered impure for drinking and cooking. The traditional practice is to dig holes in moist, sandy places near the river. After three to four hours, water, filtered through the soil, has seeped in and the sand particles have settled to the bottom. The women then scoop out the water with a ladle made from coconut shell and store it in a clean pan. Now of course some households have access to tube-well water.

Open-water Fish Resources

The abundant open-water fish resources represent a huge livelihood potential for *charland* dwellers. But women's access to those resources is very much restricted as

fishing is considered to be a male occupation or the job of a low caste. Although almost all the women in the focus group discussions knew how to catch fish, they were reluctant to speak about it. Besides, they said, not having access to fishing equipment, they only used hand techniques to catch fish or a piece of thin cloth as a substitute for a fishing net.

Transport and Marketing

Access to transport and marketing facilities is very limited for women. Their spatial mobility is highly restricted, and as a result, despite their potential and ability to take care of families in a hazard zone in the absence of able male members, they are still vulnerable to disasters. They have been taught to look upon their husbands or male guardians as *prabhu* (master). They are not permitted to leave their homestead even when it is on the verge of being destroyed through erosion. They are ready to wait till the last minute and keep sending messages to their male guardians. Frequently, this last-minute move causes them to incur more loss through erosion than if they had moved earlier.

Although widows or women without a male guardian are forced to do their own marketing, they are ashamed to admit it because it is not a socially approved activity for women. The women have information about *hat* days (traditional market days) but they usually wait for wholesale traders to come to their door.

Resettlement / Restarting Life After Erosion

Resettlement is also an area where women feel less confident and the process remains very much dependent on their male guardians. Even though women make very significant contributions to the survival of families and communities, skewed gender relations leave them with very little or no power to negotiate land for resettlement, or opportunities for starting an economic activity, once they have been uprooted/displaced by river erosion. Their contributions remain invisible and they have very little decision-making power. As a result, women without male guardians sometimes find themselves destitute.

The thrust of the discussion in this section was to determine women's role as technologists and their contributions to the survival of their families as well as communities in a hazardous and volatile situation. Women's knowledge and skills in food production and processing play a crucial role in household livelihoods and food security, and thereby disaster management. The technological world of women is different from that of men and is also different from what we understand as technology and scientific knowledge. The natural disasters which are a part of the lives of *charland* women affect patterns of production, and the modification and use of technology. The innovations and adaptations that women make are based on their perceptions of the priorities in all aspects of their lives, and particularly on their understanding of the risks involved.

5. *Concluding Remarks*

This paper does not seek to romanticise the technological and scientific ability of women at the grassroots or to suggest that these women are self-sufficient and in a position to survive on their own in a hazard zone. Rather, it is addressed to development policy makers and practitioners who are trying to find ways to manage disaster issues as part of mainstream development interventions, and its message is that planning has to be based on an understanding of women's technological ability.

Sustainable management of disasters through mitigation measures requires increasing the livelihood options of disaster-affected communities such as those living on *charlands* in Bangladesh, so that they gain more control over their lives and environment. In this connection, it is important to invest efforts and resources in the further development of the skills and knowledge base of those communities. While doing so, it is important to remember the gender dimension of technology development. Technology is 'gendered', i.e. the problems and priorities around disaster issues are often perceived differently by women and men. The types of technology developed by and useful for men and women are often different. There are often substantial differences in the skills, knowledge and social formations of women and men. There are often differences between women and men in access to and control over the resources required for food and livelihood security as well as for overall social empowerment. Recognition of these important differences will need to underpin development policy measures regarding technology development options for disaster-affected communities.

Many technology development interventions in marginal communities around the world are based on the discourse that technology development '... draws on the community's experience and feeds it, recognises their potential and releases it, respects their environment and nurtures it and builds on their past, to sustain the future.'¹³ Unless there is enough understanding of the women's world of technological ability, they are likely to get sidelined in this process of community-based technology development. This case study illustrates that women do innovate and adapt techniques, skills, organisation, management and behaviour to minimise the effects of hazard-ridden circumstances, and that they are not confined to a single technical area or sphere of knowledge. 'As women's skills in daily life range across a number of activities, so does their capacity to innovate' (Appleton, 1995). This fact further indicates that women are capable of taking on and adapting new ideas and new technology, and moving successfully into non-traditional roles.

It is important to extend the recognition of women's technical capability to disaster mitigation and environmental management. On the one hand, this would help women to feel more confident and enable them to value their contributions. On the other hand, policy makers and development practitioners would be able to take women's contribution to technology development into account in their planning and implementation with regard to disaster mitigation and management. In addition, if development plans and programmes recognise women as having enough technical capability in the type of work they are already doing in a disaster-prone area, efforts will be made to further develop their scientific capability in other non-conventional spheres that are kept reserved for

men only.

For women's empowerment in actual sense, will require women to realise their own potentials and must feel confident to gain access into areas such as market opportunities, increase in and ease of mobility, power of negotiation, property rights, formal network of information and so on. Recognising women's technological ability will facilitate their moving into gaining access to those areas. Development in this direction will certainly strengthen their's and the community's coping capacity with regard to disasters.

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Bibliography

Appleton, Helen (ed.), *Do It Herself: Women and Technical Innovation*, ITDG Publications, London, 1995.

Brammer, Hugh, *Agricultural Disaster Management in Bangladesh*, University Press Limited, Dhaka, Bangladesh, 1999.

Datta, Anjan (ed.), *Planning and Management of Water Resources: Lessons from Two Decades of Early Implementation Projects*, Bangladesh, University Press Limited, Dhaka, Bangladesh, 1999.

Datta, Anjan, and Banik, Joyanta Kumar, *Natural Disasters, Vulnerability and Livelihood: an Investigation into Bangladesh Scenario*, Study Report of ITDG-Bangladesh, 1999.

Environmental and GIS Support Project (EGIS), *Riverine Chars in Bangladesh: Environmental Dynamics and Management Issues*, University Press Limited, Dhaka, Bangladesh, 2000.

Foster, Maggie, *Supporting the Invisible Technologists: The Intermediate Technology Development Group*, Gender and Development: An Oxfam Journal, Vol. 7, No. 2, July 1999.

Haque, C. Emdad, *Hazards in a Fickle Environment: Bangladesh*, Kluwer Academic Publishers, the Netherlands, 1997.

ITDG-Bangladesh Programme Document (PD), *Long Term Disaster Mitigation and Preparedness Programme*, 2000/2001.

ITDG Seminar Report, *Technology, Poverty and the Future of the Developing World*, Imperial College, London, September 2001.

Mamun, Z. Muhammad & Amin, A.T.M. Nurul, *Densification: A Strategic Plans to Mitigate Riverbank Erosion Disasters in Bangladesh*, University Press Limited, Dhaka, Bangladesh, 1999.

Annex 1

Check List for Focus Group Discussions

1. What are the disasters they face: (e.g., floods, erosion, storm, sand carpeting etc.)
2. **Describe** floods / erosion / storm and sand carpeting i.e., how often it is normal floods, severe floods or catastrophic floods.
3. Duration of the floods and the **damages** each of these disaster causes.
4. How do you adjust your year-long activities to protect them from the damage of disasters (through adaptations and innovations)? Ask this question with regard to Agricultural crops, land, natural vegetation, grazing land, trees and open water fish resources and also disaster wise.

Agricultural Crops / land / natural vegetation / grazing land / trees / open water fish resources / animals

- Crop Identification and why these certain varieties?
 - Any **innovations** or **adaptations** with regard to:
 - Land preparation,
 - Maintenance,
 - Fertility,
 - Use of tools,
 - Crop protection,
 - Increase in productivity
 - Identification of indigenous variety
 - Diverse use of any of these resources (for health, cure, income)
 - Pattern of use: Sustainable use of non-renewable resources.
5. **Hygiene and Sanitation**
- In harsh natural conditions what are the sanitation and hygiene problems the community face? What role women are playing on their own to manage the situation e.g., water.
6. **Housing**
- What are the housing needs?
 - What role women play to meet those needs and its maintenance to make it compatible with the natural conditions?

How the materials are procured

How the materials identified and selected for wall, roof, doors.

Any innovations and adaptation with regard to the technology or the techniques of housing.

7. Resettlement / Restarting Life after Erosion

- Negotiation for land: how is it done, what role a women play?
- Re-starting Occupation: What role women play
- Any measures that women take during resettlement against further / future threats of erosion.

8. Transport

- What are the problems in general and in particular for women?
- What measures women have taken to find ways around the problems?

9. Marketing

- What are the marketing needs for women?
- What measures women have taken to find ways around the problems?

- ¹ C. Emdad Haque, *Hazard in a Fickle Environment: Bangladesh*. Dordrecht, the Netherlands: Kluwer Academic Publishers, 1997, p. 12.
- ² This view is taken from the 1992 ITDG study titled *Do It Herself (DIH)*, which looked at women's technical capability in carrying out their activities. The study was designed in essence to investigate the contributions of women to technical innovations at grassroots level. The case studies from Asia, Africa and Latin America in the study confirmed that women use their knowledge and skills to develop, modify and adapt the techniques and technical processes in which they are involved.
- ³ The definition of technology in this paper has been developed partly from ITDG's research for *Do It Herself* and the sessions of the subsequent pilot training courses on Gender and Technology in Bangladesh.
- ⁴ Helen Appleton (ed.), *Do It Herself: Women and Technical Innovation*. Place of publication: ITDG Publications, 1995, pp. 5-6.
- ⁵ Environmental and GIS Support Project for Water Sector Planning (EGIS), *Riverine Chars in Bangladesh: Environmental Dynamics and Management Issues*. Place of publication: the UPL, 2000, p. 1.
- ⁶ . Z. Muhammad Mamun & A.T.M. Nurul Amin, *Densification: A Strategic Plans to Mitigate Riverbank Erosion Disasters in Bangladesh*, University Press Limited, Dhaka, Bangladesh, 1999.
- ⁷ Environment and GIS Support Project.
- ⁸ R. Mukerjee, *The Changing Face of Bengal: A Study in Riverine Economy*. Calcutta: University of Calcutta, 1938.
- ⁹K.M. Elahi and J.R. Rogge (eds.), *Riverbank Erosion, Floods and Population Displacement in Bangladesh*, Riverbank Erosion Impact Study. Dhaka: Jahangir Nagar University, Savar, 1990.
- ¹⁰ . *Kawan* and *Cheena* are indigenous cereal varieties.
- ¹¹ The heads of fresh small fish are usually thrown away before the fish are cooked.
- ¹²This was also a finding of the EGIS study.
- ¹³. ITDG, *Technology, Poverty and the Future of the Developing World*, seminar report. London: Imperial College, September 2001, p. 27.