

Chapter 6

Developing the Infrastructure

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A core intervention of CDSF has been water management infrastructure to reduce the damage to different crops from salinity, flooding and water logging and improve the environment for crop growth. Effective management of water resources is necessary to enable char dwellers to adapt to climate change, for protection against tidal and storm surges, and to improve drainage. This is done through water management interventions (construction of embankments, drainage sluices, and drainage channels) and by construction of climate resilient internal infrastructure such as cyclone shelters, roads, bridges/culverts, and deep tube wells for water supply. This improves communication, giving people access to outside markets and protection from extreme weather events, and ensures hygienic sanitation and a sustainable solution to the lack of a potable water supply.

Protection from climate change

In char areas sedimentation and riverbank erosion of channels is a considerable problem. There were no water management structures in these chars before CDSF intervention. To address this problem and for protection from climate change, water management infrastructure is constructed by the Bangladesh Water Development Board (BWDB). The following water management activities were undertaken by BWDB:

- **Construction of peripheral embankments (Sea dyke and Interior dyke):** to stop flooding by saline water during high tides.
- **Construction of dwarf embankments:** to build a hydrological barrier between two polders such as Char Nangulia and Noler Char, as there is difference of elevation.

- **Construction of drainage sluices:** to stop inflow of saline water during high tides and for controlled drainage of the catchment area.
- **Construction of closures:** to close the channels (*khals*) after construction of sluices.
- **Initial excavation of drainage canals:** to improve drainage congestion of agricultural land.



Fig. 6.1. Drainage sluice, Char Nangulia.



Fig. 6.2. Construction of Caring khal closure, Char Nangulia.

During the feasibility study of CDSP-IV, the long-term effect of climate change was considered. However, in the case of some structures such as sluice gates and embankments, a 20 year lifetime was targeted as otherwise the structures would not be cost-effective. This is because the coastal chars are very dynamic and constantly moving. In CDSP-IV, provision is also made for maintenance of water management infrastructure. These works are usually contracted out to contractors and Labour Contracting Societies (LCSs) for smaller items with a quality control function for agency staff. In CDSP-IV, 91 LCS groups with a total of 2,137 members (28% women's participation) were formed to carry out minor construction work including earthworks, road pavements and construction of rural markets. The assessment of LCS (CDSP-IV TR17, 2018) showed that, up to September 2017, there had been 56 LCS contracts with the Local Government Engineering Department (LGED), valued at a total of Tk. 52.4 million. These involved a total of 1,247 men and 381 women, generating a total of 86,991 days of employment. More work has been undertaken since then. The Technical Assistance (TA) team monitors the quality control exercised by the agencies and makes recommendations to the donors on the payment of reimbursement claims. The lion's share of the costs of civil works is covered by Financial Assistance from IFAD, the Netherlands Government, and the Government of Bangladesh.

Four water management development options have been considered in CDSP-IV, from a zero option to a fully-fledged protected area. Due to the highly dynamic character of the morphological processes (continuous accretion and erosion), the preferred option for Caring Char and Urir Char was to avoid any embankments and to concentrate where possible on re-excavation of existing

channels and improvement of links between them. This is expected to reduce the area under tidal flooding by about 50%. The impact on drainage congestion and water logging would be even greater.



Fig. 6.3. Lift gate operating deck at C/S of Sluice DS-1, Char Nangulia.

Climate-resilient infrastructure, water supply and sanitation

Climate-resilient internal infrastructure is constructed by Local Government Engineering Department (LGED), including (rural) roads, bridges and culverts, cyclone shelters and *killas* (refuges), *ghats* (jetties) and markets. Climate-resilient internal infrastructure also includes a water supply and sanitation programme by the Department of Public Health Engineering (DPHE) to provide test tube wells, deep tube-wells and single pit latrines. Where possible, works were undertaken by LCSs which channel income directly to some of the poorest men/women of the society.



Fig. 6.4. Female LCS constructing Thanarhat Market, Noler Char.

Rural roads

Rural roads³ connect villages, farms, markets etc. with feeder roads and embankments. These roads improve communication both inside the area and with the surrounding areas. Construction of rural roads has enormous impact on the economy by giving people access to outside markets, both to sell their own products and to buy necessary goods. To minimize roads crossing existing channels the new road alignments are planned parallel to the existing channels. Thus, the number of bridges and culverts are kept to a minimum. CDSP-IV has constructed 4 bridges (10 m-36 m span) and 81 box culverts to facilitate the smooth running of vehicles and easy flow of water to avoid water logging. For cross drainage provision, pipe culverts have been constructed where necessary. During CDSP-IV, a total of 152 km of surfaced rural roads (BC and HBB) and 134 km of earthen roads have been constructed in the project areas among which 25 km of both types of roads were lost to river erosion.

People of the five new chars suffered from very poor and muddy road communications until the inception of CDSP-IV. CDSP-IV has built roads and

³ The rural roads are R2 type of LGED Standard, the specifications are: crest width: 3.7 m; side slope: 2 : 1; crest level: 4.5 m (Public Works Department).

bridges that made road transportation comfortable and less time consuming. All kinds of transport can use these roads thus encouraging business and associated sectors to flourish. Char dwellers also reported that due to construction of the bridges, there is no longer a water logging problem and they do not need to use boats and trawlers to cross canals.

Markets

In CDSP-IV, seven markets have been developed, all connected by good roads. However, one market building was lost to erosion in Caring Char. The design is based on LGED's manual for Growth Centre Planning. The markets consist of land raising, construction of multiple sheds (i.e. for vegetable and fish/meat), an open sales platform, internal roads and drains, and a toilet block. A tube well and a women's toilet are also established, with each market having a special raised parking area for trucks.

Better communication and infrastructure have increased access to markets. This ensures that farmers and fishermen can easily sell their products and spend less on transportation. This has also improved access to agricultural inputs, such as HYV and fertilizer, and reduced travel time.

Cyclone shelters

Living on unprotected mudflats only just above mean sea level, char dwellers are extremely vulnerable to tidal flooding, cyclones and other storms. CDSP-IV is working to reduce this vulnerability by building cyclone shelters to give a high degree of security and safety for the people and for livestock by constructing *killas* (raised earth platforms) against tidal bores and cyclones. At the top of each cyclone shelter, there is a stand for hoisting 'disaster' signal flags which can be seen from far distant places to provide the char people with an early warning signal. During the non-emergency period, the shelters are used as primary schools, places of social gathering and as Madrassas (religious education institutions). The shelters are also used by the Union Disaster Management Committees (UDMC) to hold training on disaster preparedness.

CDSP-IV has constructed in total 39 cyclone shelters, among which one shelter in Caring Char was lost as the land where it was built has been eroded and two more in Noler Char and Caring Char are likely to be lost in the same way. Riverbank erosion is a huge constraint in CDSP areas. The total number to be constructed has been determined by planning one cyclone shelter for every 500 households. Shelter sites are selected in densely populated areas preferably near important market places and *Samaj* (community). Approach roads are being built to each shelter to provide easy access during bad weather.



Fig. 6.5. Thanarhat Bazar Multipurpose Cyclone Shelter cum Primary School, Noler Char.

The 2016 Annual Outcome Surveys (AOS) recorded that only 2% of the sample CDSP-IV households reported being displaced due to flood, cyclone, or tornado, and only 3% reported loss of crops due to flood and drought in the previous 12 months. This is considerably less than the 42% reporting displacement and 47% crop loss in the 2011 baseline survey period. BRAC (one of the CDSP-IV partner NGOs) mid-term assessment, carried out in 2016, recorded that 87% of sample CDSP-IV households reported that they had a cyclone shelter near their house, compared to only 9% in the 2012 baseline survey.

Other infrastructure

CDSP-IV has constructed two Union Parishad offices in Char Nangulia for Chandi Union and another in Boyer Char for Hosui Union. Also in Chandi Union office accommodation was built for female staff of government agencies and NGOs. The project also constructed 12 *killas* (refuges for animals) of which 4 were lost to erosion.

Some of the key areas impacted by improved water management are described in the section below.

Reduced flooding and improved drainage

The PRA study found that, with protection from embankments and sluice gates, major flooding is no longer a concern in the CDSP areas. However local people report that drainage is gradually becoming more of a problem as: (i) siltation of

drainage canals is reducing their water carrying capacity; (ii) there is siltation downstream of some sluice gates; (iii) there is continued development with construction of minor roads without enough cross-drainage culverts; building of new houses, expansion of markets, construction of ponds with raised banks, and enclosure of land with raised boundaries all create numerous small pockets which get flooded and water-logged during the monsoon season. Better maintenance could reduce the problem of siltation, and Water Management Organizations (WMO) are encouraged to take the initiative to organize such work. WMOs continue to function but their role is often (but not always) limited to sluice gate operation and stopping (or removing) cross dams in canals built by fishers. The responsibility for maintenance is split between WMOs, Union Parishads, BWDB and LGED. Efforts are made to encourage optimal communication and cooperation between these institutions.

Salinity in Land and in Drinking Water

The level of salinity has been significantly improved in CDSP areas, with people reporting to the PRA study that there has been a reduction of 90–95% compared to the pre-project situation. This reduction has been due to embankments built by BWDB, and in many parts of the CDSP areas salinity is no longer seen as a problem at all. However, there are differences between chars depending on their location, with more inland chars showing a greater tendency towards decreased soil salinity. In some locations, drinking water from tube wells is still saline, and lack of fresh groundwater is considered to be the main bottleneck in cultivating high-yielding boro paddy. Extraction of water from the deeper (300 m) aquifer for irrigation is being discouraged, since it is used extensively for drinking water, for which it is the only available suitable and safe source.

Soil Fertility

The PRA survey showed that the soil fertility was as good as other more upland parts of Noakhali district, but the production may be less, due to lack of skills and investment funds, and lack of irrigation facilities in the boro (dry) season. However, with the improvement in drainage and flood protection stemming from work carried out in CDSP IV (which has also reduced soil salinity), farmers are able to take up new crops and farm enterprises and increase production of existing crops. Cropping intensity has increased and farmers are using HYV and hybrid varieties. In the majority of the chars, farmers cultivate two crops and in some areas even three crops a year.

Water supply and sanitation

In order to ensure sustainable livelihoods and quality of life, access to safe drinking water and sanitation is of crucial importance to CDSP. Water-related diseases are the most common cause of illness and death among the poor of developing countries, and this is true in Bangladesh. Diarrhoeal and other water borne intestinal diseases were widespread in char areas. This was due to the lack of safe drinking water in the project areas. People were completely dependent on surface water sources such as nearby ponds, rivers, and ditches. In addition, most of the ponds and ditches fall dry in the dry season. Every year, an epidemic of diarrhoea used to break out and several people used to die from the disease. Aside from suffering, such diseases lead to loss of working days and income, increased expenses, and sometimes result in loss of family assets used for health service expenses. There was a handful of deep tube wells, provided by some NGOs and private initiatives, but the number was insufficient for the vast population living in the char area. People used to travel a great distance to a deep tube well to collect water. Sometimes there were lines of men and women with pitchers at each tube well. Women and girls used to spend a lot of their time collecting water. The baseline survey of CDSP-IV shows that safe drinking water coverage in the area was 46% and sanitary latrine coverage was 6.5%. In addition, there were no health services in the project area.

Nargis Begum, aged 32 years, from Noler Char is a caretaker of a deep tube well provided by CDSP IV. She says, “I feel proud as a caretaker family of a deep tube well sunk near my homestead and I had an opportunity to ensure access to pure drinking water for my neighbours for the last 6-7 years. I can recollect the past days when everybody had to drink dirty and saline canal water or collect water from a well which was normally 2-5 km away and took 1-2 hours walk, with the water collected mainly by women. Now-a-days every household has a sanitary latrine from CDSP IV which has had a huge positive impact on women, as before they had to wait until sunset to respond to nature’s call. That was an intolerable situation. Because of all these interventions, water borne diseases are now reduced greatly. These days we seldom use Oral Rehydration Solution (ORS). These significant changes happened only because of CDSP”.

Water Supply Service

In CDSP areas, tube wells are now used by almost all households. Currently 98 % of the households in CDSP-IV project areas have access to safe water available within, on average, a 55 m distance. The water is from deep tube wells installed by the project. At the same time, the distance between a household and its water source has also become shorter with the increased availability of tube wells.



Fig. 6.6. Woman collecting drinking water.

One deep tube well is provided for 15 to 20 households within 55 m of household premises and one has been installed for each cyclone shelter. So far, 1,475 DTWs have been installed and among them currently 1,372 tube wells are functioning. 103 DTWs have been lost to erosion. DPHE has worked closely with PNGOs, who have been responsible for forming Tubewell User Groups (TUGs). PNGOs also selected and trained two women from each group as caretakers – who were given tool kits for simple maintenance tasks. In total, 1,532 TUGs were formed with 27,654 female members. They received latrines, and raised awareness of the importance of good hygiene practices. DPHE is rightly proud of achieving “100% total sanitation” in CDSP IV. Due to sinking and installation of DTWs in the project chars, the majority of the population now has access to pure drinking water. In addition, six test tube wells are sunk to get advance information on the aquifers of the project area.



Fig. 6.7. Women are collecting drinking water at the inception stage of the project, Noler Char.

Sanitation Service

CDSP followed the ‘one household one latrine’ ideology to ensure the minimum sanitation service level. Thus, every household received a hygienic latrine with an appropriate faecal sludge management system. Households are responsible for proper maintenance of the latrines for continual use and improved hygienic practice. Through coordination with DPHE, PNGOs ensured the installation of 25,639 ring-slab latrine sets in project areas, of which 710 latrines were lost to river erosion. Regarding the construction of latrines, as of September 2017, 11 LCS contracts worth Tk. 4.38 million had generated 1,091 days of work for men and 642 for women.



Fig. 6.8. Single pit latrine, where the super-structure is built by the stakeholder and the sub-structure by DPHE, Noler Char.

It has been observed that diarrhoeal diseases have reduced to a minimal level. This result is based on the NGO statistics of saline packet demand and distribution which saw no demand of saline packets (Jan-June 2017), while it was over 200,000 on average during the early days of the project.

Outputs of WATSAN activities

Through its water and sanitation activities, CDSP-IV managed to ensure basic water and sanitation (WATSAN) services to the beneficiaries of the project areas. Access to preventive health services significantly reduces the vulnerability of poor households to illness-induced income erosion and expenditure crises. Some of the key outputs of this sector can be seen in Table 6.1.

Table 6.1. Outputs of WATSAN activities.

| Major intervention | Output/Indicators |
|-------------------------------------|---|
| Availability of safe drinking water | 98% of households (HHs) have access to safe water available within an average 55 m distance from DTWs installed by the project. |
| Access to basic sanitation service | 74% of HHs have access to an improved sanitary facility. |

| Major intervention | Output/Indicators |
|--|---|
| Use of soap or ashes in the latrine | 79% of HHs have soap and water at a hand washing point inside the latrine. |
| Hand washing with soap at critical moments | 75% of HHs have soap and water at a hand washing point commonly used by family members. |
| Changes due to safe water and sanitation | Significant reduction of water borne diseases like diarrhoea, hepatitis, scabies etc. |