

Environmental and Social Impact of Flood Control, Drainage and Irrigation projects: Is it a Development Disaster for Bangladesh???

Manik Kumar Saha

Young Professional, BRAC

Email: manik.0415009@gmail.com

Introduction: Background of Flood Control, Drainage and Irrigation Projects

Bangladesh is agricultural country with huge number of rivers. Agriculture plays a key role in Bangladesh by contributing 24 percent to its exports, 32 percent to its GDP and employing more than 60 percent of its labor force (Islam, 2009).

Due to the geographical position, Bangladesh has a long history of experiencing annual floods, and occasionally, catastrophic floods. In many respects, these floods are beneficial; however, in some cases, the detrimental effects are believed to outweigh the benefits. Some floods have had devastating impacts on both infrastructure and human lives. It has been estimated that because of the damages to Aman crop due to 1998 flood, the harvest has been reduced by about 2 million tons (Saleh, *etal.* 1998: 254). Therefore several flood control schemes in the form of embankments and related water control measures, collectively known as "Flood Control, Drainage and Irrigation" (FCD/I) projects, have been developed under the Bangladesh Flood Action Plan (FAP)(Ansary, *etal.* 1997).

As a part of stimulating water sector development, in 1964, a master plan was prepared envisaging 58 flood protection and drainage projects covering about 5.8 million-hectares (ha) of land. Three types of polders were envisaged: polders with gravity drainage, tidal sluice drainage and pump drainage. In 1993, the total area of wetland was 3.14 million ha of which 1.55 million ha were cultivated and 1.38 million ha drained through surface drains (Chowdhury, nd). Over the years, Bangladesh Water Development Board (BWDB) has constructed more than 400 FCD/FCDI projects covering about 3.7 million ha, which is about 60% of the total flood vulnerable area and about 40% of the net cultivable area of the country (Chowdhury, *etal.*1996).

Number of water projects, such as, Brahmaputra right bank embankment project, Pabna project, Dakatia and Halda project, Meghna-Dhonagoda Embankment (figure 1), Naayanganj-Narsingdi Irrigation project (figure 2), Barisal project, Ganges-Kobadak Kushtia project, Chenchuri and the Barnal, Salinpur-Bashukhali projects in the Khulna area, Surma-Baulai Haor and the Knowai River projects in Northeast region, River training, Chandpur riverbed stabilization project, Chilmari project, Kurigram project came into being.

All these FCDI projects worked very well in short term but eventually it turns into development disaster causing serious adverse effect on adjacent environment and society.



Figure 1: Meghna-Dhonagoda Embankment project



Figure 2: Narayanganj Narsingdi irrigation project

Reasons Behind FCDI Projects

All the FCDI projects never come into the picture without any reasons. As Bangladesh is a flood prone country, every year it loses its significant amount of yield due to flood. Before and after independence the population was growing so faster. To ensure the food securities of growing population there was no other way other than increasing the agriculture productivity as well as minimize the yield loose due to flood. That's why during 1970s the state policy was to emphasize the construction of FCDI projects with following objectives.

1. Flood protection with polders in order to enhance agricultural productivity
2. Drain wetlands for making them available for crop production
3. Provide irrigation by pumping either groundwater or surface water

To achieve these objectives, around 482 small, medium and large water and embankment projects were implemented under the master plan between 1959 and 1993, around 400 of these projects were implemented after 1971. More than 8,200 kilometers (kms) of embankments were constructed under these projects. In addition, more than 4,700 kms of irrigation canals, 3400 kms of drainage channels, more than 9000 hydraulic structures (such as sluice gates and regulators), 4300 bridges and culverts, 96 pump houses and two barrages were built.

Positive Impact of FCDI Projects

Positive aspects of these FCDI projects ranging from primary benefit like agriculture productivity increase to secondary benefit like fish culture. Some of the positive impacts are as follows.

1. The most obvious advantage of an embankment, in fact it's very purpose, is to control floods. This can help save lives (in the event of catastrophic floods) as well as livelihoods and properties.
2. Another distinct benefit is that the embankment can be a source for controlling irrigation and drainage, provided that it is operated and maintained efficiently. This can increase agricultural production as it enables farmers to plant high yield variety (HYV) crops and thereby significantly increase food yields. Due to all-year accessibility of production, expansion of cropping areas and the extension of the cropping period and improved drainage, the cropping intensity increased to 175.97% of Bangladesh (Ministry of Agriculture, 2012). The degree of improvement has varied widely, for instance, in the Zilkar Haor Project, located in Sylhet, north-east Bangladesh, yields inside the project area have reportedly been double those in the control area; whereas in the case of the Kurigram South Project, situated in Kurigram and Lalmonirhat, north-west Bangladesh, "agricultural performance was mediocre". But in the example of the Konapara Embankment Project, located in Mymensingh, north-east Bangladesh, the planners, namely Bangladesh Water Development Board (BWDB), failed to anticipate that farmers were rapidly getting access to irrigation quite independently of the project and thus the significant improvement in agricultural production ultimately has been largely attributable to factors other than the project itself (Ansary, *etal.* 1997).
3. FCDI projects unlock an open opportunity for capture fish culture.
4. It reduced hazards from extreme floods and tidal surges.
5. The beneficial effects were found to be increased flood- free secured land for agriculture, livestock, settlement, industry and infrastructure.

Adverse Impact of FCDI Projects

The ultimate value of embankments, a reduction in the risk of flooding to households and property, including crop damage, is very difficult to measure against the long-term negative impacts. A number of studies have examined the environmental impact of the water management projects. These beneficial effects, however, were often much lower in magnitude than the estimated benefits shown to justify the projects. Moreover, the benefit in project area in short term is not seen keeping long term effect in the area as well as in the area outside the project under consideration. So, FCDI projects are proved to be beneficial in short term but in long term their detrimental environmental and social problem began to exceed its benefits converting the projects as a development disaster. The main negative impact of FCDI projects are as follows.

1. It encourages the poor and marginal farmers to sell their land (because of high market price), after which they become laborers and eventually poorer in future.
2. These have led to loss of habitat and prevented the movement and migration of fish from rivers and water bodies to flood plains and vice versa. This has contributed to a rapid decline in open water fisheries.
3. Embankments can be rather expensive to build (Miller, 1993).
4. The mission considers that the FCDI projects are not sustainable as they imply a continuous drain on government resources for their operation and maintenance. Their replicability is also doubtful.
5. Research for deep water rice varieties is probably a more effective means to boost Aman production than FCDI. But it must be noted that in order to take advantage of the potential to grow HYV crops in this controlled environment, one must be able to afford the necessary input costs. Moreover, HYV monoculture is reducing agricultural diversity and agro system resilience. One of the basic features of Bangladesh farmer is the utilization of one year yield to meet the needs of seeds for the next year which is not possible in using HYV.
6. Embankments can have mixed effects on employment. Construction of the embankment and the labor activities associated with it are a source of employment for the local communities (Flood Action Plan, 1992) but this generally ends with the completion of the project. As previously mentioned, increased crop production can lead to higher employment in that sector. On the other hand, it can reasonably be expected that there will be a decline in employment for fishermen inside the embankment because of the shrinkage in

- fish population; and also in boatmen because travelling by boat is no longer the only mode of travel, the embankment itself is now a road.
7. Reduction of nutrients derived from flood-prone sediments, hence reduced availability of soil nutrients and thus increased dependence on chemical fertilizer inputs of which overuse is very much harmful for our environment.
 8. Loss of natural flood-induced pest control and increased dependence on pesticides.
 9. There is a greater possibility of crop loss under with greater flood and failure of embankment. This has occurred to the Meghna-Dhonagoda embankment twice - in both the disastrous floods in 1987 and 1988 (Ansary, *etal.* 1997).
 10. Agrochemical runoff from fields into water bodies causes water pollution in both surface and groundwater, and can lead to eutrophication due to low oxygen content in stagnant water. Because the existing environment and ecological balance is altered, losses in wildlife diversity can be expected.
 11. Increased depth of flooding, higher flood velocities and erosion of char and other unprotected active flood plains.
 12. Livestock grazing areas are reducing due to the stagnant water inside the embankment.
 13. Increase in the incidence of diseases, such as cholera and malaria, as a result reduced flushing of polluted water sources.
 14. Most flood control and drainage projects prior to 1988 were justified in terms of increased crop cereal production but undermine the need for water by industry, fisheries, inland navigation and environment.
 15. Siltation, or the gradual deposition of soil, becomes another major problem on river beds as this is no longer washed away by floods. Furthermore, when the fields aren't drained due to poor designed/or maintenance of the embankment (a common problem in Bangladesh) water logging results, which can be devastating by increasing soil salinity, rotting crops and altering the whole social structure of that particular area.
 16. Some of these FCDI projects have given rise to social unrest and public reaction. In extreme cases even death has resulted. A tragic case of failure of an FCD/I project is documented in Beel Dakatia. This area (Beel Dakatia, figure 3) is located in polder 25 near Khulna, a deltaic plain in southern Bangladesh. The project's aim was to protect the area from daily tidal saline waters and from seasonal floods. Although it did initially help to raise agricultural production but

the pitfall of this project was poor operation and maintenance resulting in siltation problems, severe drainage congestion, water logging and salinization. Moreover, it brought a profound changes in the socioeconomic situation with complete broke down of agriculture structure, forestry, fisheries, livestock and social infrastructure, including educational and health facilities (Rahman, *etal.* 1994).



Figure 3: Drainage congestion in Beel Dkakatia

To name a few, Chalan Beel, one of the richest wetland areas of Bangladesh, is now almost ruined by water projects. Due to construction of ill conceived embankments & regulators, drainage has been impeded and water logging has become a serious problem in Atrai-Hurasagar drainage basin. Vobodoho is an area of Jessore, which is submerged into floodwater due to the FCDI projects since last two years. Approximately one hundred thousand people lives in this water clogged area. The people of this area are suffering a lot as habitat has been changed, their livelihood opportunities is gradually decreasing. So it is very clear that, due to the long term environmental and social impact these FCDI projects became a curse for the so called beneficiaries.

Point of Reconciliation

As with most human interventions in nature, there are both beneficial as well as detrimental effects associated with embankments. Often the benefits are reaped almost immediately while the negative effects take time to eventually become apparent. This applies to the effects of embankments as well as to any other 'controlled' environment. The following steps can be taken to improve the present in future condition in FCDI projects area.

1. To eradicate drainage congestion in any further FCDI projects, the project design should be qualified enough to minimize its harmful impact on environment.
2. For the protection of human lives, houses and livestock, alternative solutions such as shelters and pile foundation houses should be investigated.
3. To create the livelihood opportunities promotion of culture fisheries is necessary.

4. Integrated management of land and water is necessary to extract the positive outcome from FCDI projects without hampering the environment.

There is no doubt that all FCDI projects with its reduction in seasonal flooding and hydro logically controlled environment, has resulted in a major ecological change. This change appears to have enabled the primary objective of increasing HYV rice production to be achieved. However, this change has also been the primary cause for further environmental, social and economic changes within the Project area. Secondary changes are affecting natural resources, soil, water regime, farming systems, fisheries. The environmental sustainability of these FCDI project remains questionable. The effects of intensive rice cultivation are becoming more apparent. The people of the FCDI project's area are now committed to living within the realms of a new artificial environment. The benefits of this environment are now also being readily reflected in the diversity of negative effects resulting from the ecological change.

It is easy to find that the political parties always interested in structural solutions to the flood problems that involve huge costs. Expensive projects have always been preferred, probably because expensive projects ensure a good fortune to the local-foreign parties involved. However, the Flood Action Plan was virtually abandoned in the face of criticism from home and abroad. But it was later replaced by the Water Resources Planning Organization (WARPO), which was basically the same program under a new name.

Conclusion

Despite all that has been done to make a country of free flowing abundant water into one that is water logged, it seems that the water sector becomes an increasingly more lucrative field for profit making investment of corporate bodies and beneficiaries. To them projects are not meant to solve the problems which lead to disaster but to permanent system of monitoring and studying the phenomenon that give well-connected parties a permanent way of making wealth. Flood just like Poverty give them immense opportunity to ensure fatty lives at home and abroad. As a result of these greedy desires, short term thinking and political influence, the ultimate value of FCDI projects, a reduction in the risk of flooding to households and property, including crop damage, is very difficult to measure against these long-term negative impacts. Instead of reducing the suffering of general people, these FCDI projects turned into development disaster making the people life more aching than ever.

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