

## FEASIBILITY OF THE FLOOD CONTROL MEGAPROJECT IN BANGLADESH

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### ABSTRACT

Catastrophic floods such as the one which occurred in 1987 and 1988 pose a serious threat to the economy and the lives of the people of Bangladesh. It has become imperative to take preventive measures. The World Bank has proposed to build massive flood control embankments along the major rivers in Bangladesh. Although the efforts of the World Bank are appreciated, the wisdom of such a scheme as a possible solution to the flooding problem is debatable on the basis of adverse consequences that would follow the implementation of this megaproject. This paper analyzes the feasibility of the megaproject and the adverse geologic, hydrologic, ecologic, agricultural and social impacts that will result should the project materialize.

### INTRODUCTION

In recent years the frequency of abnormal floods has increased substantially, causing serious damage to crops and property. As a result, it has become crucial that some preventive measures are taken (Chowdhury 1988; Alexander 1989b; Khalequzzaman 1989). The floods of 1974, 1984, 1987 and 1988 were all above normal (Montgomery 1985; Brammer 1989; Huq 1989; Ali and others 1989; Rashid and Pramanik 1990). The most devastating were the 70-year flood of 1987 and the 100-year flood of June-September of 1988 (Chowdhury 1988;). The flood of 1988 is considered the worst in the modern history of Bangladesh (Chowdhury 1989). It devastated the economy and according to some estimates submerged 75% of the country. The severity of the flood stunned the entire world (Brammer 1990; Khalequzzaman 1991). Bangladesh urged for international assistance to solve the flood problem and the World Bank came forward to coordinate the flood control initiative (Joyce 1990). A massive flood control plan has been outlined by a team of French engineers and has received approval from the World Bank. The scheme calls for the construction of hundreds of kilometers of tall embankments along the great rivers of the Bangladesh delta, including the Ganges and Brahmaputra, and enormous drains to prevent water accumulation on the land behind the levees from local rainfall and tributary rivers. A huge area of the countryside will be divided into embanked "compartments" in which controlled flooding will be managed by intakes from rivers and outlets through the drains (McDonald 1991). This concept of building embankments along the rivers in an effort to mitigate flood hazards is also supported and exercised by a number of national and international

organizations such as the Bangladesh Water Development Board, the Bangladesh National Water Master Plan, the Bangladesh Center for Advanced Studies, and a Dutch delegation to the Intergovernmental Panel on Climate Change-Coastal Zone Management (IPCC-CZM) sub group (Rashid and Paul 1987; Joyce 1990; Huq and Ali 1990). While the intentions are good behind such a proposal deserves appreciation, serious consideration needs to be given to the long term economic and environmental consequences, along with all of the geologic hazards that would follow should the megaproject materialize.

This paper emphasizes the necessity of analyzing flooding as a geologic process which interacts with the land in an attempt to achieve a natural equilibrium. Natural processes can not be prevented by confronting them. However, a comprehensive knowledge of these processes can help us to better plan land use and to mitigate their effects by helping us find ways to adjust to the processes while safeguarding the environment. Structural solutions to flood problems will upset the natural equilibrium, causing tremendous ecological, economic, technical, and environmental problems (Shalash 1982; Broadus and others 1986; Rashid and Paul 1987; Smith and Abdel-Kader 1988; Khalequzzaman 1989).

#### **PROBLEMS ASSOCIATED WITH THE FLOOD CONTROL MEGAPROJECT**

##### **a) Shortcomings of engineering solutions to flood problems:**

The major shortcoming of a structural solution such as the building of embankments along rivers is that the problem section of a river is treated in isolation, without consideration for the hydrologic and geologic characteristics of the entire basin. Most engineering solutions to flood problems are of a "troubleshooter" type. Flooding is a fluvial (geological) process. Any attempt to prevent or mitigate it necessitates a prior comprehensive understanding of the geologic, hydrologic, climatic and soil characteristics of the entire basin. It is important to realize that natural processes cannot be prevented by confronting them. The best we can do is to try to understand them and to act in harmony with them (McPhee 1989). Solutions to the problem of mitigating natural disasters lie in treating the early symptoms of disequilibrium caused by interactions between mankind and nature and restoring a balance in the processes.

##### **b) Feasibility of the megaproject:**

The feasibility of a flood control megaproject of this magnitude has not been proven anywhere in the world. The effectiveness of such a megaproject will remain vastly outmatched by the natural processes acting on the flood plain and delta plain. Any solution employing the use of artificial structures to prevent the natural flooding in Bangladesh will upset the hydrologic equilibrium in the whole region, causing many havoc-creating geologic, economic, ecologic and environmental consequences (Alexander 1989a; Joyce 1990). The most drastic problems that would follow the implementation of such a megaproject include flash floods, flooding by the tributaries of the two great rivers, flooding due to surface run-off behind the embankments, sediment

starvation on the flood plain, river bed aggradation through siltation, destruction of navigation and loss of land fertility.

#### **c) The Mississippi Project - an example of failure:**

The geological setting of the Mississippi and the Ganges-Brahmaputra deltas is very similar in that both deltas are undergoing submergence due to subsidence and local relative sea level rise. The structure of the embankments under the proposed megaproject in Bangladesh is similar to those built along the lower Mississippi River in the USA. The proposed megaproject in Bangladesh, however, is an order of magnitude larger than the Mississippi project. A long stretch of tall embankments along both banks of the Mississippi River and a discharge control structure have been constructed in order to keep the river in its present course and to prevent flooding due to river overflow. The height of these embankments exceeds fifty feet. Being confined by the embankments the riverbed of the Mississippi has been aggrading quickly. Deprived of their sediment supply, the floodplains of the rivers are undergoing submergence in the face of rising sea level. Presently the base of the river is above the surrounding communities, including the city of New Orleans. Should the embankments fail entire communities on the surrounding floodplain will be wiped out. Despite enormous expenditures for annual maintenance and very close monitoring of the project by the Army Corps of Engineers, the embankment project has proven to be a complete failure (McPhee 1989). It is just a question of time as to when the embankments and the control structure are going to collapse, causing devastation on a scale that the mankind has never experienced. The embankments were nearly wiped out during the floods of 1973 and 1984.

#### **d) Hydrodynamics of rivers:**

All rivers have a natural tendency to attempt to reach their ultimate base level, the ocean, via the shortest possible distance and over the steepest gradient. Shifts in course by the Yellow, the Mekong, the Po, the Volga, the Tigris, the Euphrates, the Indus and the Brahmaputra are just a few examples of the occurrence of this riverine dynamic process (McPhee 1989). Sooner or later the Mississippi, for example, will change its course in an attempt to attain a natural equilibrium. Such an inevitable natural shift by the Mississippi will cut off many communities, including New Orleans and Baton Rouge, from the rest of the USA.

#### **e) Geologic problems:**

The Ganges-Brahmaputra delta, most of which forms the country of Bangladesh, has been growing both vertically and prograding seaward since its creation millions of years ago (Fairbridge 1985). The primary mechanism for any delta growth is deposition of river-borne sediments. The embankments will prevent sediment accumulation on the delta plain, causing riverbed aggradation and subsequent submergence of the areas behind the embankments by even a sea level rise at present rates. The building of embankments will also create a chronic necessity to maintain them for generations--not a easy task for Bangladesh. The proposed compartments are almost

sure to complicate matters on flood management on the floodplains and delta plains, for it will be necessary to pump rain water in and out of these compartments constantly. Such a permanent dependency on a mechanical operation will certainly cause a lot of agricultural, economic and technical hardships for Bangladesh. Any disruption in the pumping operation will cause a nightmare for agricultural practices, interfering with the planting and harvesting of crops within the project area.

**f) Shifting of river course due to riverbed aggradation:**

The riverbeds of the embanked rivers will aggrade quickly, causing a decrease in gradient of the lower parts of the rivers. Should the gradient of the downstream region of the Ganges be reduced due to riverbed aggradation, it is very likely to shift its main course to the to the Hoogley in an attempt to find a steeper and shorter course to the ocean. Upstream damming of the Ganges has already created favorable conditions for such a shift in course. The Brahmaputra also may change its course again following the implementation of the project. The land which is now Bangladesh was created by sediment accumulation from the rivers that drain it. The country will be wiped out by the rising sea should the major rivers shift their courses away from Bangladesh.

**g) Socio-psychological consequences:**

Aside from the adverse agricultural, economic, hydrologic and geologic consequences already discussed, tremendous social and emotional hardships will be caused by the relocation of thousands of occupants from their lands. The embankments will occupy a huge land area otherwise usable for agriculture and housing.

**h) Ecological and environmental problems:**

The ecology of the area will be affected by the project as well. Thousands of pumping machines will generate noise level that will keep most of the wildlife out of the project area. Once the operation is in full swing the people will be forced to live in a hellish, noisy environment for the rest of their lives.

**CONCLUSION**

Implementation of the flood control megaproject proposed by the World Bank will not solve the flooding problem, but rather will create a series of geologic, hydrologic, economic, environmental, agricultural, ecologic and social problems in Bangladesh. Bangladesh has been formed by sediment from the rivers that drain it. The country will eventually be wiped out by the rising sea should the major rivers shift their courses.

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