Sandwip-Urir Char-Noakhali cross dam for long-term food security

SHAHIDUR RAHMAN KHAN

The cross dam is neither going to block nor obstruct any upland discharge/channel flow of the region. Muhuri River, Little Feni River, Bamni River and other local channels will have their own free passages for discharging into Sandwip or Hatiya channels. Present water logging of Noakhali district will go on increasing due to southward extension of coast as a result of natural accretion (even without the cross dam) unless mitigatory measures are taken.

BANGLADESH with a population of 150 million and having only 91,500 sq km of land under cultivation is in a critical state so far as food security is concerned. Environmentally it is also in a crucial situation with less than 15 percent forest cover (preferable 25 percent). Available agricultural lands are fast depleting as: (i) about 100 sq km of agricultural land is eroded by rivers each year; and (ii) about another 1300 sq km is going out from agricultural to non-agricultural uses each year. Population increase of about 2 percent per year and simultaneous reduction of cultivable land are making the situation more and more precarious day by day. Increase of cultivable lands by reclamation from Meghna Estuary is one of the viable alternatives for enhancing individual and national food security as well as improving natural environment.

The natural process of accretion is giving rise to new chars along major portion of the 710km Bangladesh coast. The rate of natural accretion in the Noakhali region is about 90 ha per year since recent past and the same rate can be expected to continue in the coming years. Lands reclaimed (upto 1985) by Meghna -1, Meghna -2 and Muhuri cross dams were 300 sq. km, 600 sq. km and 500 sq. km respectively. Meghna cross dams have integrated Ramgati Island with Noakhali mainland. The landmass of Noakhali District has already exceeded 3600 sq km whereas the landmasses of neighbouring districts of Feni and Lakshmipur are 928 sq km and 1456 sq km respectively.

Land Reclamation Project (LRP) observed that the Lower Meghna River branch was already shifting to its present course into the Shahbazpur Channel when the Meghna cross dams were being constructed. Relevant studies, upland discharges and tidal flow distributions between different channels as well as on-going southward extension of Noakhali coast support the long term trend of shifting of Lower Meghna from eastern to western side. The trend signifies that eastern Meghna channels will die naturally in the long run, even without any external intervention.

Almost 2.4 billion tons of sediment passes to the Bay of Bengal each year through the Meghna Estuary. Holding of the passing sediments will give rise to about 200 sq km of land each year. Natural processes of accretion are slow and the outcomes are often fragile. It is neither technically impossible nor economically prohibitive to arrest a considerable portion of passing sediments for reclamation/ development of new lands. With external interventions, it is possible to sustain the gains and develop vast new landmasses at an accelerated rate.

LRP's study (1987) on the Sandwip-Urir Char-Noakhali Cross Dam found that the cross dam will give rise to about 18,000 ha new land in near future and another 18,000 ha within 30 years, directly benefiting more than 180,000 people. Evaluation of impacts by mathematical model confirmed that the dam would have only local effects on the water levels and tidal currents. At some distance from the dam, the changes in tidal volumes appeared to be limited to a few percent only. The study did not anticipate any negative effects on navigation at any place.

Morphological evaluation of the study indicated no or negligible impact on the erosion of Hatiya, Bhola, other off-shore islands and coasts of Noakhali mainland; as these processes were and would continue to be governed by the overall morphological processes in the Lower Meghna Estuary (the Cross Dam will have insignificant impact on the total morphological processes of the region). The Cross Dam was not going to affect the Chittagong Port in any way; as flow and sediment regime, tidal propagation etc. of the Karnaphuli River mainly depend on up-river discharges and tide levels of the confluence. Similarly, the study did not find any adverse impact on natural environment like forests or fisheries of the region.

'BWDB Task Force Report (2003)' as well as Mater Plan (1998) and Development Plan (1998) of Meghna Estuary Study (MES) recommended construction of the Sandwip-Urir Char-Noakhali Cross Dam as a priority project. The Task Force estimated reclamation of about 18,000 ha of lands (above + 2.2 mPwD) in 15 years and another 30,000 ha within next 15 years. Implementation of the Cross Dam is commensurate with all the related national policies and plans.

The channels between Sandwip and Noakhali are gradually being silted up and shrinking in width as a continuous natural process. The present ground levels (above mean sea level) of Urir Char Island are between 4 and 5 m whereas those of Noakhali coast varies between 3 and 4 m. Present topography of the region and channel bathymetry are shown in Figure 1 and Figure 2 respectively. MES's (1998) expectation of natural building up of a connection between Sandwip and Noakhali mainland, without external intervention, is coming out as a reality. The following table shows the gradual reduction in width of the channels:-

Study/ observation	Width
(A) Sandwip – Urir Char Channel	
LRP Study (1985)	8 km
BWDB Task Force Study (2003)	About 4 km
Present situation (2008)	About 3.23 km
(B) Urir Char – Noakhali Channel	
LRP Study (1985)	5.3 km
BWDB Task Force Study (2003)	About 5 km
Present situation (2008)	About 2.11 km

The major tasks of the Sandwip-Urir Char-Noakhali Cross Dam Project have now virtually come down to closing of channels between Sandwip-Urir Char and Urir Char-Noakhali only. Figure 3 schematically shows the locations of closure dams and expected areas of accretion. The proposed closure dam sites are located at meeting places of tides coming from opposite sides. Considerable portions of the channel of the sites dry up (and water depth become very low at other places) during winter low tides. Estimated cost of the Cross Dam (2 closure dams and other ancillary minor works) comes to around Taka 700 million only. The Cross Dam is going to give rise to 360 sq. km or more lands within 30 years and integrate Sandwip, Urir Char etc. with Noakhali mainland by a continuous land mass.

The Cross Dam is neither going to block nor obstruct any upland discharge/channel flow of the region. Muhuri River, Little Feni River, Bamni River and other local channels will have their own free passages for discharging into Sandwip or Hatiya channels. Present water logging of Noakhali district will go on increasing due to southward extension of coast as a result of natural accretion (even without the Cross Dam) unless mitigatory measures are taken.

The Fisheries Department has declared the following zones as hilsha sanctuaries:- (i) 100 km of the Lower Meghna Estuary from Shatnol (Chandpur) to Char Alexander (Lakshmipur), (ii) 90 km of the Shahbazpur River from Madanpur/Char Ilisha (Bhola) to Char Pear (Bhola) and (iii) 100 km of the Tetulia River from Bheduria (Bhola) to Char Rustom (Patuakhali). The proposed cross dam will not affect the hilsha sanctuaries or any migratory birds in any way.

Some of the pertinent facts of the Sandwip-Urir Char-Noakhali Cross Dam are:

·Available BWDB expertise and experiences are sufficient to implement the project. Estimated cost of Taka 70 crore is manageable even with own resources of the government.

·Closure dam sites are located at meeting places of tides coming from opposite directions. Considerable portion of the channel drys up (and water depth becomes very low at remaining portion) during winter low tides at these places.

·The Cross Dam would give rise to about 360 sq. km of land benefiting 1,80,000 people directly and the whole nation indirectly. Newly gained lands could be used for agriculture, homestead, forestry etc. This will enable production of food grains as well as create job opportunity helping in development of individual and national food security. New afforestations will increase availability of forest products, create new jobs and improve natural environment.

·The continuous land strip with its peripheral mangrove belt will provide protection to lives and properties against cyclones and tidal surges.

·Sandwip and Urir Char would be integrated with Noakhali mainland and direct road communication would be possible. This will also enable construction of over-land electricity, telecommunication and gas transmission systems at a fraction of presently required under-sea construction costs.

·No major consequential negative impact is anticipated. The Cross Dam is neither going to block nor obstruct any upland discharge/drainage channel.

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The above is a compilation from studies of different sources, collected over a period of time. As such, some of the figures might be indicative. Expressed views are writer's personal opinions.

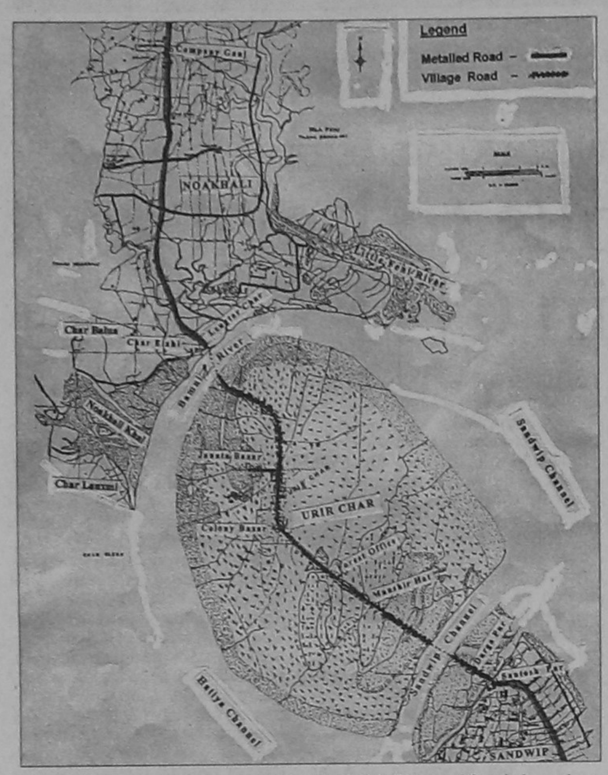

Figure 1: Present topography of Noakhali, Urir Char and Sandwip region with roads and channels (Source: Mr. M A Kalam)

Figure 2: Recent bathymetry of Noakhali, Urir Char and Sandwip region

Figure 3: Schematic diagram of the proposed closure dams and expected accretion areas

Mycorrhiza: Bio-fertilizer for the future

ABDULLAH AL MAHMUD

To reduce the arsenic contamination in crop plants a number of experiments conducted under USDA financed project indicated that using mycorrhizal fungi could reduce the arsenic uptake by the crops.

AS different factors like lower-fertility, arsenic contamination, pollution of air and water coupled with draught and attack of pathogens put a dent on harvest Professor **Dr Md. Amin Uddni Mridha** of Chittagong University comes up with bio-fertilizers and methodology of Mycorrhizal fungi application to overcome the problem and ensure food security with a good yield.

An agricultural scientist of Plant Pathology and Microbiology, especially Mycorrhizal Technology Dr Mridha recently talked to this writer. A pioneer of mycorrhizal research in Bangladesh, he has identified more than 40 different types of endomycorrhiza and 25 different types of ectomycorrhizal fungi used for producing bio-fertilizers that could successfully help crops survive odds and bring forth increased yield.

Dr Mridha also spoke of methodology he recently developed with Arbuscular Mycorrhizal Fungi to reduce the arsenic contamination in crops in collaboration with scientists from USA under a project financed by USDA. Study on biodiversity of wood decay fungi helped him record a number of plant diseases, mainly in medicinal plants, and evolve method for their sustainable management with biopesticides.

Mycorrhizas are highly evolved non-pathogenic symbiotic association between roots of most vascular plants and certain specialized soil fungi (Basidiomycetes, Ascomycetes and Zygomycetes) that colonize the cortical tissues of roots during periods of active plant growth both in natural environment and in cultivation, he said.

Dr Mridha came up with the following findings and suggestions regarding the application of bio-fertilizer producing mycorrhizal fungi.

Plant growth in low-fertile or acid soil: The beneficial effects of Vesicular-Arbuscular Mycorrhizas (VAM) used in bio-fertilizers to plant growth, especially in soils of low fertility, are well documented, said the professor.

In the tropics, many crops are grown in infertile acid soils, where low levels of available phosphorus frequently limit their establishment. In such soils, an efficient mycorrhizal association can increase phosphorus uptake and crop yield.

In addition to enhanced P (phosphorus) uptake, VAM fungi often enhance acquisition of relatively immobile micronutrient cations, particularly Zn (zink) and Cu (copper). Vesicular-arbuscular mycorrhizas are also important for N (nitrogen) uptake to stimulate the growth and nutrition of plants and are of great ecological importance with regards to N-nutrition of plants, especially non nitrogen-fixing species.

"In mycorrhiza laboratory of Chittagong University we have studied the influence of mycorrhizal inoculation in growth improvement of a large number of agricultural crops, horticultural crops, ornamental plants, forest plants, tea, rubber and other plantation species. In most of the cases we have recorded higher growth," said Dr Mridha.

"During these study we have studied the biodiversity of a large number of Arbuscular Mycorrhizas (AM) fungi belonging to six different identified genera. Out of the 126 species recorded all over the world we have recorded more than 40 different species from our soils in our laboratory for the first time working last 15 years. The fungi recorded in our laboratory have not been reported earlier from Bangladesh," he maintained.

Transfer of carbon and nutrients: Vesicular-Arbuscular Mycorrhizas play an important role in the direct transfer of carbon from one plant to another. Nutrient transfer can occur between plants of the same species or between different species and, even in some cases, from trees to herbaceous plants. The plant roots are interconnected by mycorrhizal hyphae through which the nutrients move from one plant to another. Vesicular-Arbuscular Mycorrhizas can mediate interplant transfer of P and N. When there are legumes and non-legumes growing in N deficient soil, this flow of N will likely be from legume to non-legume and may be of considerable significance to the N-economy of the non-legume. The interplant nutrient transfer technology may be useful for Bangladesh agriculture. The implementation of Rhizobium technology available in our country needs mycorrhizal fungi for P nutrition, which is needed as energy of Rhizobium bacteria for better fixation of N from the atmosphere.

Tolerance against attack of root pathogens: Several studies have demonstrated, the potential of using VAM for establishment and growth of different micropopagated species after transplanting. Many reports have shown that VAM can decrease the severity of diseases caused by root pathogenic fungi, bacteria and nematodes. The VAM appear to decrease plant susceptibility to disease, or increase tolerance against the attack of root pathogens.

"In our laboratory we have recorded plants previously inoculated with fungal symbionts as exhibiting an increased resistance to fungal root diseases like wilts and rots," Dr Mridha said.

Reports have also indicated that VAM increase plant tolerance to salinity, thereby increasing yield in saline soils. The VAM can help plants to become established in nutrient deficient soils or degraded (eroded) habitats and can assist plant establishment in coal waste, eroded desert and disturbed soils, he said.

Land-rehabilitation and fertility: Land rehabilitation induces the mediation of soil aggregation -- a process known to be carried out by VAM fungi. Vesicular-arbuscular mycorrhizal fungi can improve plant-water relations in many situations. Through maintaining the uptake of slowly diffusing nutrients under water stress situations the VAM fungi can help plants cope with drought stress.

Mycorrhizal fungi play a significant role in the regulation of soil biological activity because of their abundance throughout the uppermost soil layer. It is interacting with other beneficial soil microbes to improve the soil fertility where soil biological activities are reduced because of burning and shifting cultivation. In last fifteen years of mycorrhizal studies it has been established that mycorrhizal inoculation enhance plant growth in degraded soil, saline soils, water stress condition, flooded soils etc.

Methodology to reduce the arsenic contamination in crops: More than 30 million people are already facing the problem of arsenic contamination in our country. The ground water contaminated with Arsenic poses significant risk to animal and human health through soil-crop transfer, through food crops like vegetables and cereals where arsenic entere the food chain. Arsenic poisoning causes skin pigmentation, development of warts, ulcers, cancer etc. To reduce the arsenic contamination in crop plants a number of experiments conducted under USDA financed project indicated that using mycorrhizal fungi could reduce the arsenic uptake by the crops.

We have also developed technology by which soil arsenic can be reduced by hyper accumulated plant like Pteris vitata.

Use of VAM fungi in agricultural management: Propagation of inocula for large-scale inoculation is a major problem in popularizing VAM fungi for use in agricultural management because of fungi are obligated symbionts and cannot be multiplied artificially. Although the fungi cannot be cultured in the laboratory, large-scale production techniques under field condition for VAM fungi have been developed in mycorrhiza laboratory in Chittagong University and the inoculum is available for distribution among the farmers.

Dr Mridha said, "The inoculum production technology developed in our laboratory is very useful and unique because we have developed this technology with our own mycotrophic plants available in our country only. The inoculum is ready for distribution among the farmers."

Use of mycorrhiza needed to improve agricultural productivity: The reduction of water and air pollution from the leaching loss of chemicals and reduction of soil erosion because of mycorrhizal association can improve the soil health and environmental conditions. It is now recognized that VAM can be harnessed in order to improve productivity in agriculture, fruit culture, and forestry by reducing the input of fertilizers and/or by enhancing plant survival, thus offsetting ecological and environmental concerns, observed Dr Mridha.

For this reason, mycorrhizal research and its practical use as a low input technology for managing soil fertility and plant nutrition in the country is drawing increasing attention, he maintained.

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Clock running out on irreversible climate change

JIM HANSEN

Young people seem pretty puny in comparison to industry moguls, and animals don't talk or vote. The battle may start with local and regional skirmishes, one coal plant at a time. But it could build rapidly -- we're running out of time.

FIFTY years ago, Yankee Stadium had about 70,000 seats. It seldom sold out, and almost any kid could afford the cheapest seats. Capacity was reduced to about 57,000 when the stadium was remodeled in the 1970s. Most games sell out now, and prices have gone up.

The new stadium, opening next year, will reduce seating to about 51,800. This intentional contraction is aimed at guaranteeing sellouts, increasing demand, allowing the owners, in short order, to triple prices or more.

The owners have learned that scarcity will fatten their wallets. The plan may discriminate against the lower middle class, but as long as the owner is footing the bill without public subsidies, there may be little grounds for complaint.

Now fossil-fuel moguls are intent on hoodwinking the entire planet with an analogous scheme.

The basic trick is oil producers overstating fossil-fuel reserves. Government "energy information" departments parrot industry. Partly because of disinformation, the major efforts needed to develop alternative energies have not been made.

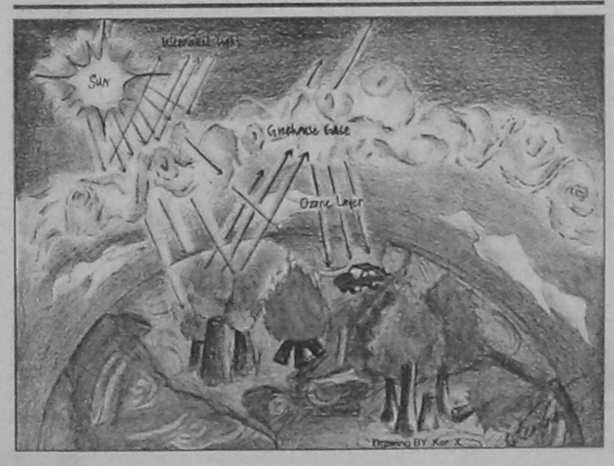
The reality of limited supply forces prices higher. Eventually, sales volume will begin to decline, but fossil-fuel moguls will make more money than ever. They'll continue to assert that there's plenty more oil, gas or coal to be found, aiming to keep the suckers on the hook.

Indeed, they may find somewhat more in the deep ocean, under national parks, in polar regions, offshore, and in other environmentally sensitive areas. They don't need much to keep the suckers paying higher and higher prices.

Oil "reserves" suddenly doubled when Opec decided that production quotas would be proportional to official reserves. These higher reserves are, at least in part, phantom. Coal "reserves" are based on estimates made many decades ago.

Closer study shows that extractable coal reserves are vastly overstated, consistent with present production difficulties and rising prices. The presumed 200 year supply of coal in the United States is a myth, but it serves industry moguls well.

Conventional fossil-fuel supplies are limited, even if we tear up the Earth to extract every last drop of oil and shard of coal. Tearing up the Earth to get at those last drops -- Exxon/Mobil proudly advertises that they're drilling the depths of the ocean and searching the most extreme pristine environments -- is as insane as the smoker who trudges 4 miles through a raging storm to buy a pack of Camel cigarettes to feed his nicotine addiction.



Our conclusion is that, if humanity wishes to preserve a planet similar to the one on which civilisation developed and to which life on Earth is adapted, CO2 must be reduced from its present 385 ppm (parts per million) to, at most, 350 ppm.

We find that peak CO2 can be kept to about 425 ppm, with large estimates for oil and gas reserves, if coal use is phased out by 2030 (except where CO2 is captured and sequestered) and unconventional fossil fuels are not tapped substantially.

Peak CO2 can be kept close to 400 ppm, if actual reserves are closer to those estimated by "peakists," who believe that the globe is already at peak global oil production, having extracted about half of readily extractable oil resources.

This lower 400 ppm peak can be ensured, assuming phase-out of coal emissions by 2030, if a practical limit on reserves is achieved by means of actions that prevent fossil-fuel extraction from public lands, offshore regions under government control, environmentally pristine regions and extreme environments.

The concerned public can influence this matter, but time is short, the industry voice is strong and climate effects have not yet become so obvious to the public as to overwhelm the disinformation from industry moguls.

A near-term moratorium on coal-fired power plants and constraints on oil extraction in extreme environments are essential, because once CO2 is emitted to the air much of it will remain there for centuries.

Improved agricultural and forestry practices, mostly reforestation, could draw down atmospheric CO2 about 50 ppm by the end of the century. But a greater drawdown by such more-or-less natural methods seems impractical, making a long-term overshoot of the 350 ppm target level, with potentially disastrous consequences, a near certainty if the world stays on its business-as-usual course.

If we choose a different path, which permits the possibility of achieving 350 ppm CO2 or lower this century, we can minimise the chance of passing tipping points that spiral out of control, such as disintegration of ice sheets, rapid sea level rise and extermination of countless species.

At the same time, we could solve problems that seem intractable, such as acidification of the ocean with consequent loss of coral reefs.

In any event, we must move beyond fossil fuels soon, because a large fraction of CO2 emissions will linger in the atmosphere for many centuries.

The world must move to zero fossil-fuel emissions. This is a fact, a certainty. So why not do it sooner, in time to avert climate crises? At the same time, we halt other pollution that comes from fossil fuels, including mercury pollution, conventional air pollution, problems stemming from mountain-top removal and more.

Breaking an addiction is not easy. But we may be like the smoker who trudged four miles through rain to get a pack of Camels -- when he got back to his motel he threw the pack away and never smoked again.

Fossil-fuel addiction is more difficult -- one person's epiphany cannot solve the problem. This problem requires global cooperation. We must be on a new path within the next several years, or reducing CO2 levels this century becomes implausible.

Developed countries, the source of most excess CO2 in the air today, must lead in developing clean energy and halting emissions. Yet it is hardly a sacrifice: "Green" jobs will be an economic stimulus and a boon to worker well-being.

A major fight is brewing -- it might be called war. On the one side, we find the short-term financial interests of the fossil-fuel industry. On the other side: young people and other beings who will inherit the planet. The fight seems uneven. The fossil-fuel industry is launching a disinformation campaign, and they have powerful influence in capitals around the world.

Young people seem pretty puny in comparison to industry moguls, and animals don't talk or vote. The battle may start with local and regional skirmishes, one coal plant at a time. But it could build rapidly -- we're running out of time.

Meanwhile, the moguls' dirtiest trick is spewing "green" messages to the public -- propaganda, intended to leave the impression they're moving in the right direction.

Meanwhile they hire scientific has-beens to dispute evidence and confuse the public.

When will we know that the long-term public interest has overcome the greed? When investors, companies and governments begin to invest en masse in renewable energies, when all aim for zero-carbon emissions.

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