

Offshore Nijhum island: Overcoming climate change impact

The mangrove ecosystem of Nijhum Island is a sustainable resource that provides huge number of people with food, tannins, fuel wood, timber, medicines and other ethno-botanical values. Mangrove offers protection of property and life from storms and coastal erosion. Adaptive management can be effective to overcome the problems raised from climate change.

DR. MD. MIZANUR RAHMAN

NIJHUM is an offshore island in the Bay of Bengal, located in the extreme south of Hatia island separated by Hatia channel. It is a scenic treasure trove having 20 kms long sandy and grassy beach. Accredited on the estuarine Meghna river and the Bay of Bengal, Nijhum is a virgin island constituted of intertidal mudflats and sandflats. The island is dissected by small creeks or canals and its centre part is under cultivation and human habitation. It is a cluster of several small accreditation mainly Char Osman, Char Kamla, Char Muri and Ballar Char.

It came under human settlement during 1969 and the Forest Department began afforestation in 1972 with mangrove species. Now it has a large deep green forest with native and early successional tree species. This island was declared as a National Park in 2001 and now is one of the attractive tourist spots for its rich faunal and floral diversity. This island could be the next prime tourist spot after St. Martin's island.

The most important type of tree planted in the island is Keora, also known as Kerfa, which has fast growing roots holding the sandy soil. Kakra, Gewa, Hargoza, Khalisha and Bain are the co-dominant species of this forest. There are several patches of Hogla (a robust herb) throughout the area. The main attraction in this successional mangrove forest is the herd of about 5000 spotted deer. The natural beauty has been enhanced by monkeys, wild boar, wild buffaloes, fishing cat, snakes, turtles, tortoises, Bengal monitor, black lizard, yellow monitor, oriental small-clawed otter, clawless otter and a huge number of migrated winter birds.

Tidal mudflats are very important habitats for water birds. Oysters of various nature and snails can be easily seen in this island. The water bodies are the ideal habitat for Hilsa fish, Zebra fish and Hamilton fish (Baila fish in local language). There is a large breeding colony of black-crowned night-heron, pond heron, grey heron, purple heron, cattle egret, little egret, lesser whistling-duck, bar-headed goose, cotton pygmy-goose, common shelduck, ruddy shelduck, tufted duck, water cock, and a wide variety of shorebirds, ring-billed gull, herring gull, noisy gull, sea terns, hawks, swallows, falcons, small cranes, local nightingales and king storks.

The environmental parameters with the direct influences on this island in terms of global climate change are sea-level rise, natural calamities like cyclones, rise in temperature and salinity. The species composition, natural regeneration, species richness, vertical and horizontal structure of this successional mangrove forest will undergo major changes under the predicted climate impacts. The World Wildlife Fund (WWF) has warned that within 60 years the mangrove forests will be inundated by the rising sea. The sea is rising more swiftly than the anticipation and may rise 11.2 inches by 2070. This would result in shrinkage of this island by 96% within half a century (WWF 2010).

A study has revealed that sea levels in the Bay of Bengal have risen much faster over the past decade. Recent satellite images show the New Moore Island or South Talpotti (the uninhabited territory south of the Hariabhanga river) has vanished due to sea rise. It is predicted that in the coming decade other islands in the Bay will follow South Talpotti beneath the waves (BBC, 24 March, 2010).

Sea level rise will cause a major threat to this successional mangrove ecosystem through sediment erosion, inundation stress and increased salinity landward.

The predicted one-metre rise in sea level will destroy the whole ecosystem of this island. As sea level rises, the existing concentration of salinity and the distribution of freshwater in mangrove areas will be changed. The mangrove ecosystem will respond by changing in productivity, canopy closure, tree coverage and species diversity, or by migrating. Sea level rise will bring drastic changes in the livelihoods and socio-economic conditions of the inhabitants of these areas.

It is likely that their valuable arable land will be lost. Even a limited rise in sea level will seriously affect the people through loss of land; accelerated erosion along the coasts and in river mouths; increased salinity, changes in the physical characteristics of tidal rivers and increased vulnerability to flooding. Communities living in this island will be climatic refugees increasing pressure on the mainland.

The frequency of occurring cyclones increased by 26% over past 120 years in the Bay of Bengal, which may be increased further with the intensifying of El Nino in the upcoming days. Aila caused a mass devastation on this island with two-three metres high surges sweeping over the whole area. A tidal surge of 15-20 feet inundated Nijhum Island during Sidr. These cyclones uproot, topple stems, break off trunks and defoliate the canopy. Sediments carried by storm surges are deposited on the forest floor as the surge recedes, cause plants mortality by interfering with root and soil gas exchange, leading to eventual death of the plants.

Storm surges weaken the potentiality of natural regeneration by reducing the viability of seeds, seedling germination and seedling recruitment. Invasive plant species like lantana has the ability to rapidly colonize disturbed areas, and causes slower-growing of native plant species. The cyclone damages or alters structural diversity and spatial pattern of forests. The density of mortality (>5 cm diameter at breast height) ranges from 14-100% (depending on the intensity) and averages 47.7%. The reductions in total basal area range from 9-100%. Mortality increases by 9% during post-cyclone 7-18 months. Inter-specific differences in susceptibility to wind damage appear to be a primary factor contributing to spatial patterns in mortality (Sherman 2001).

With the increase of salinity the tree mortality rate will be accelerated as the production of new leaves, leaf longevity and the leaf area, net photosynthesis rate, stomata conductance and transpiration rate of leaves -- all will be reduced. The deer, often in groups will come to the nearby locality by swimming rivers and canals to quench their thirst with sweet water. Many of the deer will die of drowning or caught by crocodiles and the people, or even bitten by dogs.

The breeding habitat of fishes like Hilsha and other crustacean will be destroyed with the intrusion of salinity. They lay their eggs and stay up to juvenile stage in the freshwater. The leaves, stems, and roots of mangrove vegetations provide a vital shelter for predators and nourishment for young fish, shrimps, and crabs. Without this environment, only a handful would survive. Mangrove trees, a crucial component, provide shelter and nutrients to their ecosystems. They provide habitats to young fish, shrimps, crabs and mollusks. Hundreds of migratory bird species nest in mangrove forests.

Animals inhabit mangrove forests. The mangrove trees provide not only support to countless food webs; they are also indirectly responsible for the survival of the most primary planktonic and epiphytic algal food chains, which in turn provide carbon for the mangrove tree. Salinity is one of the most important factors of mangrove forest growth and distribution. 20-35% salt concentration is congenial for mangrove ecosystems. A salt concentration of 40-80% diminishes the number of species and their size and only a few species can exist and grow in 90% concentration (Hong 1993).

The mangrove ecosystem of Nijhum Island is a sustainable resource that provides huge number of people with food, tannins, fuel wood, timber, medicines and other ethno-botanical values. Mangrove offers protection of property and life from storms and coastal erosion. Sea level rise induced by global warming could alter substantially the status of mangrove forests, with serious consequences for coastal protection and resource management of this island.

Adaptive management can be effective to overcome the problems raised from climate change. Adaptation is often a traumatic process triggered by disaster rather than a gradual process of adjustment (Karas and Kelly 1993). However, the pragmatism of the people of Bangladesh in adapting to difficulties in the past with limited resources should prove of great value in the identification of appropriate adaptive responses. The nexus of pragmatism, education and community participation can provide an excellent base for efforts. The following measures could be taken to mitigate these problems:

- understanding the intrinsic links between climate change and impact;

- strong commitment of sustainable development at all levels of society; pushing forward research on climate change and preventive measures;
- controlling coastal ecosystems;
- framing a climate programme directed towards improving understanding of the global warming problem, monitoring of climate change and climate impacts, and the identification of appropriate responses;
- reducing greenhouse gas emissions by using hydropower and renewable sources to fulfil the demand of energy;
- designing and establishing sea-level / climate modelling network;
- restoring the nation's forests and protecting the biodiversity which will not only reduce greenhouse gas emissions but could provide an enhanced sink;
- formulating a well-established strategy which will cope present-day climate-related disasters and the result of those disasters with the future impact of climate change;
- afforestation and reforestation by salt tolerant species;
- emphasising on the regional and wider international co-operation in scientific research;
- assessing accurate and more comprehensive data on the sources of greenhouse gases;
- establishing databases and information systems;
- developing alternative livelihoods for the people who are dependent on mangrove forest;
- examining different strategies to determine the extent to which their performance may be affected by climate change and sea level rise. Where possible, they must be "climate-proofed";
- coastal vulnerability and risk assessment;
- emphasising on the protection, restoration and sustainable use of biological resources;
- integrated coastal and marine management;
- protecting existing mangroves against encroachment and cutting;
- facilitating natural regeneration and natural succession of native tree species;
- encouraging communication and co-ordination within and between relevant departments and institutions;
- raising funds for the conservation programme
- and developing coastal infrastructure;
- modifying the current organizational structures to facilitate reactions to climate change and sea level rise;
- establishing mechanisms to promote carbon uptake; and
- increasing social awareness and arm everyone with knowledge.

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Water is life

Government should hasten implementation of undertaken viable projects in the water sector. And for immediate satiation of acute demand may take some short-term mitigation projects. But long-term solution is a must for meeting the demands over the coming decades.



MADAN SHAHU

IMPORTANCE of water is supreme. For there wouldn't have been life on earth had there been no water there. Water is life. We, for that matter all creatures, have right to life, so we, they all have right to water. Why not, water is there in the environment and we are born in it; we stretch our hand or just move around and find it. This was the situation even, say, a thousand years ago. Then and upto a few centuries thereafter, people also dug their own ponds and wells further enhancing water in the environment. Potable water was accessible by any one where it was naturally available except the deserts where it is naturally scarce.

But things have changed over the decades, rather fast changed over the last half of the past-century, and it has saturated to unbearable now. Much of the nature has been taken over by human settlements and whatever natural sources of water still exist are left polluted. You have to buy water, and potable water at much higher a cost. Water also is an economic goods now.

In fact water has, become an economic goods following the industrial revolution when it started to flow to urban houses through pipe in exchange for a service charge. The convenience initiated spreaded through urban centres across the world over the century and decades that followed. The period witnessed two great wars that led to indiscriminate destruction necessitating speedy rebuilding and development. This development included provision of utility services against charges. Thereafter urbanisation getting special impetus with rise in population more than before, supply of water became more important. The urbanites didn't mind paying more charges for meeting the cost of its supply. But that didn't ensure its supply to all who have right to it. In course of time sort of crisis started to take root.

Recently, at a dialogue centering on water crisis held in the city, the speakers opined that implementation of envisaged projects for reducing water scarcity and increasing supply of potable water.

Styled as 'North South Dialogue' it was jointly organised by End Water Poverty Campaign (supported by Water Aid Bangladesh), Fresh Water Action Network South Asia-Bangladesh and Water Supply and Sanitation Collaborative Council-Bangladesh Chapter. Participated by donor country/agency representatives and local key sector actors the dialogue was arranged to deliberate on and find ways to bridge the so-called north-south gap.

Bridging this gap means implementation of projects with the donors' fund that goes back unutilized. Implementation of such projects would in turn mean availability of water to the poor at a subsidy who just cannot meet its economic cost.

The situation with water has evolved from a state of its abundance to its restricted availability, not over the past millennium, rather in a past couple of centuries. Potable water is so costly now even in a supposedly water affluent country like Bangladesh that it sells at Tk 10 a litre (pet bottle). How many in this poor country can dare afford it? The poor obviously cannot. But they are an absolute majority and they are virtually living on more or less polluted water.

This is a dangerous situation. Every day the number of victims of water borne

diseases is swelling.

The poor have been habituated to procure there required water from the environment they live in. It was not so unsafe and hard till the seventies of the past century. Thereafter with population boom taking on supporting spaces, such sources started to shrink and get polluted under pressure. Ground water level also dropped for over exploitation. And the crisis began, and more that in cities, Dhaka in particular.

There of course have been efforts to mitigate. Government departments took up programmes, some NGOs specifically started working in water and sanitation sector. And there have been inflow of funds from donors. But the results have always been fractional and never of a permanent nature. There, of course, have been reasons for this. The speakers at the dialogue referred to above deliberated on some of these.

One of such reasons has been pointed out as institutional weakness. True, we are a poor country, but most of such projects did not suffer lack of funding. Rather it has been lack of efficiency that led to lot of wastage and delay in the implementation process of project appreciating its cost and often ultimately its abandonment. But that not because of fund shortage, as even after wastage lot of fund money had to be returned to donors being not utilized within the time or extended time frame.

Not only fund utilisation but project flexibility has also become important for any solution vis-a-vis demographic situation. Rural-urban migration continues unabated while population growth remains not so controlled. In such a situation even an implemented project has every chance of becoming ineffective or inadequate within a few years not to speak of any taking too much time in implementation. So institutional reform and capacity building is a must for success of any mitigation effort.

They think and perhaps rightly so, that government in Bangladesh, still considered a poor country, has a low income so its expectation cannot be very high. Well, Bangladesh need not expect too high but it can go for what is appropriate, what is necessary. And Bangladesh is also not an aid dependent country. It can take up programmes on its own, and it should. Donors help initiate projects and it appreciates their concern.

By now water crisis has taken a serious turn with surface water being polluted and its availability shrunk, and ground water level dropping as aquifers run dry.

So government should hasten implementation of undertaken viable projects in the sector. And for immediate satiation of acute demand may take some short-term mitigation projects. But long-term solution is a must for meeting the demands over the coming decades. There must be all out effective approach to simultaneously preserve surface water bodies and recharge ground water aquifers. This is a huge task of enormous size. But it has to be undertaken to ensure access of all to the essential who has right to it, albeit as an economic goods at the lowest affordable cost. Just not let any one suffer for want of it.

Water is part of environment. We are pledge-bound to preserve nature for our own survival. We must try to conserve water in nature more for our life. For water is life.

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Sustainable use of biodiversity: Bracing the change

It goes without saying that, for conserving biodiversity, for making biodiversity sustainable, and for using biodiversity we need the sound and normal distribution of three layers of vegetation in our tropical rain forest ecosystem.

DR. M.A. BASHAR

To make biodiversity sustainable is one thing; and to practice sustainable use of biodiversity is another. Making biodiversity sustainable is the process; and sustainable use of biodiversity is the technique. To us important is that, we shall have to understand the process of making biodiversity sustainable, and the technique to be adopted for its use at the same time, for the soundness of environment.

To go for sustainable use of biodiversity, conservation of biodiversity is essential either in the in-situ or ex-situ conditions. So, use of scientific technique is a prerequisite for biodiversity conservation. Sustainability of species assemblage and their interactions with abiotic factors in any certain area of the bio-

sphere is the technique required for sustainable use of biodiversity then it is necessary to exercise the functional structure of the interactions in a certain area of the biosphere.

To make biodiversity sustainable means the sustainability of species assemblage. We can take an example of forest ecosystem to explain. Sustainability of the forest is based on the steps like: i) vegetation richness, ii) richness of the animal distribution and abundance, iii) richness of functionality of the interactions between abiotic (climatic factors) and biotic factors, iv) richness of interactions between biotic and biotic factors (between plants and animals; between animals and animals).

Integration of all the factorial functions produce assemblage of species richness and then it migrates towards conserva-

tion of biodiversity. As biodiversity is dealt with the living organisms, if species assemblage is conserved, conservation of the assemblage ensures multiplication of all organisms in a sound way. When species are conserved, they become resources. Now the question comes how the resources are sustainably used?

Sustainable use of biodiversity is measured under the headings -- 'Direct-use value', 'Indirect-use value' and 'Non-use value'. Direct-use value includes food, medicine, biological control, industrial materials, recreational harvesting and ecotourism. Indirect-use value is dealt with biodiversity and ecosystem functions for maintenance of soundness of environment as a whole. Non-use value provides options value, bequest value, existence value and intrinsic value. All use-values of biodiversity are possible to make sustainable when conservation of biodiversity is made sustainable.

Living sequences of the bio-resources are always dependent on Changing of abiotic factors (climatic conditions). If any such change occurs, continuity in multiplication of the biotic resources immediately stands stagnant. That stagnancy causes stoppage of use of

biodiversity in any one of the above said value assessment fields.

How the stagnancy in the use of biodiversity comes? It comes when any one of the above four points (i, ii, iii, iv) get disturbed in an ecosystem or in an area of the biosphere like forest ecosystem. As we talk about the situation of forest ecosystem, let us take an example of the less disturbed forest in Bangladesh and see what is happening there regarding the question of sustainability of biodiversity.

To my study knowledge, I have found Satchari forest area in Sylhet district as the less disturbed forest because richness of vegetation still sustains there. Plants are distributed more or less equally in three typical layers. This forest has got distribution of small plants at the soil surface layer (1st layer of vegetation); at the man-height layer plants are available by the distribution of hedges, vines and climbers (2nd layer of vegetation); big trees are there which are providing canopy layer for the forest (3rd layer of vegetation). These vegetation layers are providing suitable habitats, nutritional supplies, successive trophic levels and the suitability of occurring interactions among them.

If any layer of vegetation remains disproportional among them, then homes of the respective animals are destroyed and home for them does not remain available. Consequently, multiplication in animals of different trophic levels does not remain functional. Use of biodiversity becomes shattered. Question does not come whether sustainable use is possible or not.

It goes without saying that, for conserving biodiversity, for making biodiversity sustainable, and for using biodiversity we need the sound and normal distribution of three layers of vegetation in our tropical rain forest ecosystem. Any climatic change or otherwise abiotic change causes serious impacts on the phenology of the plants in all the three layers of vegetation. It is to be noted that animals of different niches and different habitats are respective to the layers of vegetation. And that is why, they are distributed and habituated with the three layers of vegetation.

Moreover, the successive trophic levels are highly sensitive in their life stages to the phenological changes of the plants in different layers. If phenology of the plants is disturbed and time-lag happened,

obviously life cycle of the related animals is hampered and declined. Change of climate makes the change in genetic-flow sequence and then conservation of biodiversity and use of biodiversity stand blocked.

To live sustainably, the human population must do so within the biosphere's regenerative capacity, drawing on its natural capital without depleting the capital stock. Evidence suggests that since the 1980s, human exploitation of the Earth's biological productivity may well have exceeded this capacity, such that the ecological footprint of the global population in 1999 was 1.2 times that of the entire Earth.

Issues of sustainability thus extend far beyond the frequent media focus on trade in particular commodities of high economic value, such as wood from mahoganies, horn from rhinoceros, body parts from tigers and ivory from elephants. Put simply, most present use of biodiversity is just not sustainable (management approaches have often focused on maximizing short-term yield and economic gain rather than long-term sustainability).

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