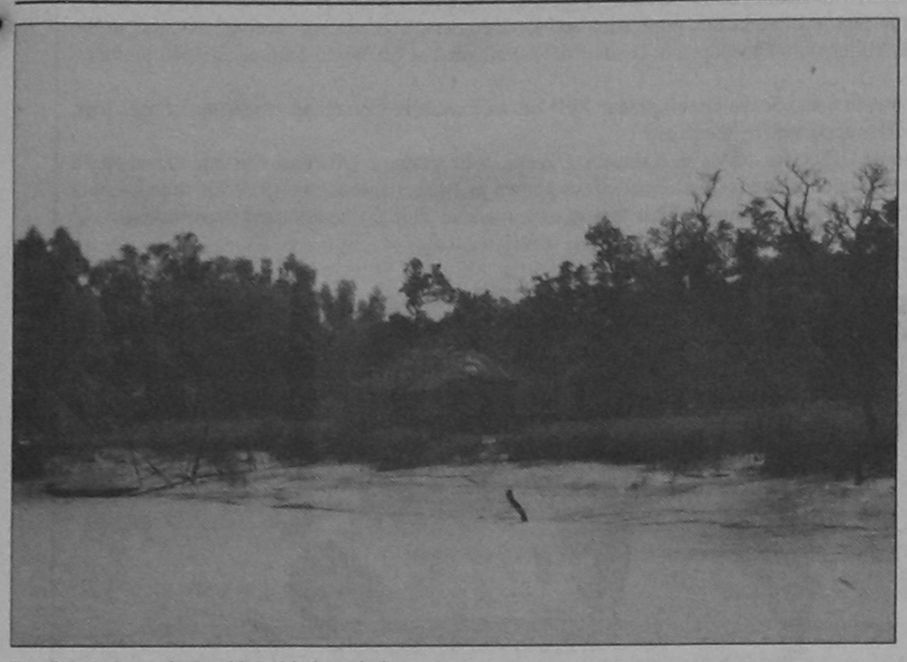
Climate change impact on biodiversity of the Sundarbans

We need survey and monitoring of the coastal areas particularly the Sundarbans to ascertain by the GIS (Geographical Information System) the probable sites of inundation due to sea level rise.Elevated areas may be developed above the expected sea water level to provide food and shelter and other environmental requirements to animals living in the sea level rise prone areas.



The Sundarbans during high-tide inundation.

DR. MD. SOHRAB UDDIN SARKER

CLIMATE change resulting in sea level rise would cause severe environmental impact on the living resources including people and biodiversity in the affected areas. There are so many coast line associated islets and islands in the Bay of Bengal in the southern part of Bangladesh, e.g. Shandip of Chittagong, Shahpari and St. Martin of Teknaf, Kutubdia, Moheshkhali and Sonadia of Cox's Bazar and islets like Nijhumdip, Char Kukrimukri, Char Dale, Char Fashon, etc of Patuakhali, Barguna and Bhola districts. Lakhs of poor and homeless people live in these areas. Sea level rising 0.5-1m there will be catastrophic for these affected areas and people. They might need immediate shifting to nearby high lands.

Sundarbans, the biggest mangrove forest in the world consisting 6200km² of forest and riverine areas lies there. It has been listed as World Heritage Site and is the most important ecosystem and protective natural barrier against the calamities like tidal surge, cyclone etc. This gift of nature would simply be submerged by the rising sea.

Impact assessment

Biodiversity: There are 375 species of birds, 55 species of mammals and 83 species of reptiles and amphibians in the Sundarbans. Besides, more than 150 species of fish, 50 species of shrimp and other invertebrates also live there. It is the largest habitat of the most endangered Royal Bengal tiger, salt water crocodile, the leatherback sea turtle, python, king cobra and spotted deer. Besides, wild boar, rhesus monkey, dolphins, snake bird/darter, stork and ibis, sea eagle, vulture, finfeet, skua, forest eagle owl, swamp partridge, bustard quail, trogon, pigmy woodpecker, brown wing kingfisher, racket tailed drongo, ground thrush, forest wagtail, streaked spider hunter, nuthatch, scarlet minivet, ring lizard, sea snakes, green frog and other threatened species live in the Sundarbans.

Flora: There are shon grasslands at a number of places like Hiron Point, Kochkhal, Jamtoli of Katka, Rash Mela of Alorkol in Dublar and Kalar chars. Besides, mangrove vegetation of the Sundarbans would be seriously affected by sea level rise. The pnematophores (roots of mangrove plants) regularly go under water twice daily during high tide for 1-3 hours. In the inter-tidal period trees in mangrove and coastal mud flat areas use to respire by specially growing roots called pneumatophores. Each tree has thousands of such pnumatophores growing up about 10 cm to 1m high in the air and spreading 2-5m around the base. These air roots are smaller in golpata, hantal, goran, etc. and longer in sundri, gewa, amur, keora, etc. If the sea level rises from 0.5 to 1m the pneumatophores will remain under water permanently and trees will die due to problem of respiration and sand deposition.

Fauna --

Mammal: All herbivore animals will face shortage of food. Deer, hare, porcupine, arboreal monkey, rat and mice, etc. are purely herbivorous, seedivorous and fruigivorous. They have no other alternative but to die due to lack of selective food items e.g. grasses, leaves, seed, fruit, roots, etc. They do not move to highland areas either.

Deer will be the worst sufferer due to food shortage and habitat loss. During high tide deer usually move to high lands in the forests. Otherwise, remain standing in the water until the tidal water is receded. There will be no dry land left in the forest after sea level rise.

Wild boars can tolerate water more than deer and they swim but without food their fate will be the same as deer. Monkey is semi arboreal and may continue to survive longer than deer and boar. But when trees will start dying due to inundation their fate will also be the same due to lack of food and shelter.

Carnivores like tigers, fishing cats, cevets, otters, etc. will face the similar problem: loss of habitat due to inundation and shortage of food due to lack of herbivores in the forest.

Tigers are the world's most endangered species and survive only in a few places including the Sundarbans of Bangladesh in very small number. Tiger is a good swimmer and may move from one place to another but the prevailing condition will not be favourable. Tigers of the Sundarbans usually move to higher places during high tide, but whither that when sea level rises?

Birds: Resident and migratory terrestrial birds of the Sundarbans and coastal areas will create excess pressure and ecological problems on the existing fauna and flora where they will fly. Aquatic birds like herons, gulls, terns, owls, nightgers, wagtails, pratincles snipes, sandpipers, finfoot, culew, whimbrels, spoonbils, wild ducks will also loss their habitats along the coastal belt. Hole nesting birds like woodpeckers, kingfishers, swallows have better chance to survive for more time. They use to feed on the insects from wood and fish from water and flying insects from air, respectively, and all will breed in the tree holes. But changed climate will also affect their food chain.

Land birds like pheasants, red jungle fowl, quail, swamp partridge,tunki, rails, larks, field pipits, pittas, ground thrushes, babblers leave the forest because of lack of feeding, resting and breeding provision due to inundation of grass land, forest clearing etc.

Reptiles: Particularly the salt water crocodiles and five species of marine turtles, e.g. olive ridely, green hawksbill and loggerhead are endangered species.

Crocodiles become more dominant because of expansion of habitat in the forests for preying on fishes and animals as food. But in absence of these food species how will crocodile survive?

Leatherback is the largest sea turtle of the world and are critically endangered. The leatherback turtles including other sea turtles lay eggs on the sandy beeches along the coastal zone mainly St. Martin's Island, Sonadia, Kutubdia, Moheshkhali, Cox's Bazar, Inani, Shapari dip of Teknaf and the Sundarbans every year from September-October to March-April. Thousands of sea turtles come to shallow water areas of the Bay where the males mate with females and the females lay eggs on the beaches nearby. They will certainly lose their breeding ground due to inundation by sea level rise. There will be no exiting beech for egg laying along the coast.

Large number of red crabs and other marine crabs and terrestrial insects will disappear from the coastal areas and the Sundarbans due to loss of habitat and food.

Recommendation

We need survey and monitoring of the coastal areas particularly the Sundarbans to ascertain by the GIS (Geographical Information System) the probable sites of inundation due to sea level rise.

Elevated areas may be developed above the expected sea water level to provide food and shelter and other environmental requirements to animals living in the sea level rise prone areas particularly in the Sundarbans.

A national committee/task force should be formed immediately with relevant national specialists, experts, researchers, who will prepare plan and programme of works on priority basis.

Government, NGOs, international organisations should come forward to provide support to conduct the ecosystem assessment survey to prepare plan and programmes for the subsequent situation.

World Heritage Site and other international conservation organisations could come forward with supports for conservation of tigers, their prey species, habitats, other animals, as well as the environment on a permanent basis.

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Keora forest of Sundarbans destroyed and a tiger died by cyclone Sidr, considered as a climate change effect, in November 2007.

Can Copenhagen deliver 'hope' for Bangladesh?

A draft 'climate change agreement' leaked to the media in Copenhagen gives "more power to rich countries and sidelines the United Nations' role in all future climate change agreements," The *Guardian* reported. This must not be the case. The conference is already fraught with many misgivings and differences. It may not conclude as envisaged at the beginning.

PARVEZ BABUL

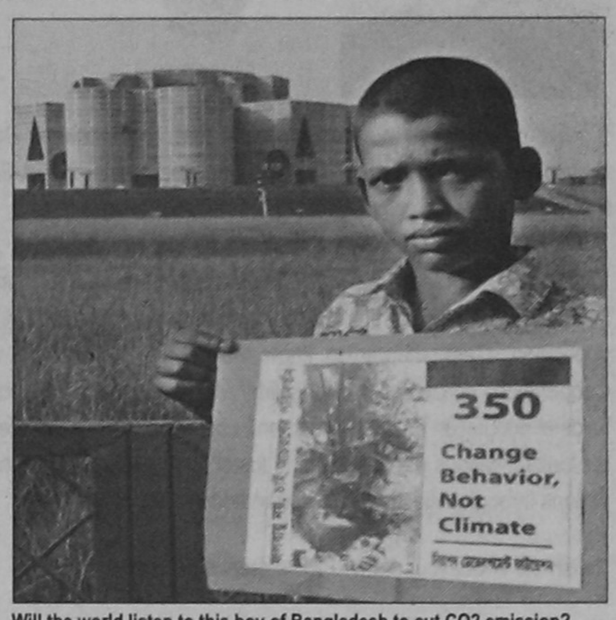
THE Prime Minister of Denmark Mr. Lars Løkke Rasmussen said on Decemeber 07, at the beginning of the climate change conference (COP 15), " Copenhagen will be 'a city of hope' for the next two weeks (December 07-18) because of climate change conference". Dr. R.K. Pachauri, IPCC Chairman, urged the world to stand by Bangladesh. He has been able to show the world that Bangladesh is going to be a most-suffered victim of climate change. The British Prime Minister Gordon Brown wrote in the Guardian: "Copenhagen must be a turning point. Our children won't forgive us if we fail. We need to build a low carbon economy across the world, with a deal that helps developing nations and ensures trust".

Germanwatch conclude its Global Climate Risk Index 2010 ahead of the Copenhagen climate change conference. highlighting, "In countries like Bangladesh, extreme events have become a constant danger. Just last May, millions were displaced when Cyclone Aila hit the low-lying country. Globally since 1990, more than 600,000 people have died as a direct result of extreme weather events, the sort that are expected to become increasingly common as the planet warms. Lack of substantial progress on the way to low-carbon economies is a key factor why many poor countries face a bleak future in face of more severe climate change". It calls for an increase in financial support from wealthier countries. So, the fact of Bangladesh as a most sufferer and vulnerable country due to climate change has, hopefully, been realised worldwide.

In his annual speech, US Vice President Nobel laureate Al Gore told delegates to the most recent climate negotiating session: "We must now 'toughen our goal' to 350ppm". Carbon dioxide threatens total Human health in many ways. The hard fact is: though Bangladesh is not guilty any way of creating any problem of climate change, but this country and its people have to suffer the most in the world. So, such illogical sufferings must stop at any cost with the help of the developed countries, who are mostly responsible for the cause of these sufferings.

Media's role

Media can play a crucial role in communicating climate information to the public. The media in the developing world was at the forefront of reporting and bringing the issue of global climate change and its impact on the local economy into sharp focus. Nobel laureate Dr. Amartya Sen wrote: "Independent media are essential to social development and economic growth".



Will the world listen to this boy of Bangladesh to cut CO2 emission?

President of the World Bank James D. Wolfensohn wrote an encouraging foreword in the book 'Write to tell: the role of mass media in economic development': "Over 1.2 billion people (including Bangladesh) live on less than a dollar a day. And many of those poor people not only suffer from physical and human deprivation but also lack voice in decisions that affect their lives. A key ingredient of an effective development strategy is knowledge transmission and enhanced transparency. To reduce poverty, we must liberate access to information and improve the quality of information. People with more information are empowered to make better choices".

Nobel prize winner journalist Gabriel Garcia Marquez in his write-up titled: *Journalism is the best profession of the world wrote* "All that time, journalism fell into three broad categories: news, feature and editorials. All journalists, must, by definition, be research oriented; and building awareness that ethical standards cannot be a product of happenstance; like the drone of a bee, they must be the constant companion of every journalist".

Internews Network President David Hoffman wrote: "Open media translate into transparency and government accountability, less corruption, participatory democracy, civil society and, yes, greater income". Obviously we must look into the global media to recognise our stakeholders and partners of development. And to work through partnership with proper integration. Above all, media is an inseparable medium to get and disseminate information, update ourselves and save our valuable lives. Bridging the gap and creating network of journalists of the world could be very helpful for sharing information on climate change and other issues.

There is also a need to build bridges between scientists and journalists. Scientists are often unwilling to simplify their research findings for a lay audience, so journalists may sharpen their skills to simplify jargon-heavy scientific content and make the matter easier to understand. We also need to build bridges between North, East, West and South (NEWS) environmental and science journalists so that we can exchange ideas and information on global climate change.

A draft 'climate change agreement' leaked to the media in Copenhagen gives "more power to rich countries and sidelines the United Nations' role in all future climate change agreements," The *Guardian* reported. This must not be the case. The conference is already fraught with many misgivings and differences. It may not conclude as envisaged at the beginning. Yet the participating parties must be hoping against hope for a conclusion that matters most to the vulnerable.

Under the United Nations Framework Convention on Climate Change 'The Copenhagen Agreement: A Shared Vision for Long-Term Cooperative Action' mentions: "...The Parties underline that climate change is one of the greatest challenges of our time and commit to a vigorous response through immediate ambitious national action and strengthened international cooperation with a view to limiting global average temperature rise to a maximum of 2 degrees above pre-industrial levels. The Parties are convinced of the need to address climate change bearing in mind that social and economic development and poverty eradication are the first and overriding priorities in developing countries...". Let it be so. We in Bangladesh look forward to the logical requirement we deserve.

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Climate change and sea-level rise in the Pacific islands

Despite some uncertainties in sea-level behavior, findings from these islands are significant in that they demonstrate that the rate of sea level rise in parts of the tropical Pacific basin is higher than the general global projections made by IPCC. It is an important regional example demonstrating the importance and societal ramifications of sea-level rise.

DR. MD. RASHED CHOWDHURY

THE west pacific islands [such as the Territory of Guam, Republic of Palau, Commonwealth of the Northern Mariana Islands, Republic of the Marshall Islands, Federated States of Micronesia, and American Samoa (Fig. 1), and other neighbouring islands are among the world's most vulnerable communities to climate variability and change, especially sea level rise, as many parts of these islands are regularly affected by erosion and inundation. The small size, lower elevations and extensive coastal areas of the islands, their remoteness and limited financial resources, and in some cases, poor economic and social decisions contribute to great ecosystem and human vulnerability to disasters.

The climate literature provides abundant evidence that the tropical climate variability is heavily influenced by the phase of El Niño-Southern Oscillation (ENSO) climate cycle. Based on the pervasive tropical Pacific zonal wind anomalies accompanying ENSO fluctuations, recent studies at the Pacific ENSO Applications Climate Center (PEAC) have described the degree of sensitivity of sea-level anomalies in the tropical Pacific island communities to the phase of the ENSO cycle, with below normal sea level during El Niño events and above normal sea level during La Niña events.

During the 2006-08 El Niño and La Niña events, many Pacific Islands continuously experienced high sea-level for a period of 18 months. From July to December 2006, weak-to-moderate El Niño conditions influenced the ocean and atmosphere; then, after a brief transition through ENSO-neutral conditions, weak-to-moderate La Niña conditions developed and persisted from February 2007 through May 2008. In order to determine the relative intensity of each of the El Niño and La Niña events, the authors employ the Southern Oscillation Index (SOI) and the Oceanic Niño Index (ONI). According to these two indices, the 2006-07 El Niño is considered to have been a weak to moderate event and the 2007-08 La Niña event is considered to have been moderately strong. Likewise, the 1997-98 and 1986-87 El Niño events are classified as strong and moderate, and 1998-99 and 1988-89 La Niña events are classified as moderately strong. When the rise in sea level during the two other moderately strong La Niña events (1998-99 and 1988-89) is compared to the rise of sea-level in the 2007-08 event, the latter was found to be considerably higher. As a result, most of the tide stations in these islands recorded elevated sea levels from July 2006 to June 2008, which from a historical perspective is quite significant, since no other El Niño event on record has resulted in an observed sea level rise in these islands.

One immediate answer to this question appears to be in the tide gauge records, showing a rising trend in sea-levels at all stations, to varying degrees, over the past 15 to 20 years. This evidence supports the many anecdotal assertions that global extreme high-water levels have increased within recent decades. According to the Intergovernmental Panel for Climate Change (IPCC), global average sea-level rose at an average rate of 1.8 [1.3 to 2.3] mm per year over the period from 1961 to 2003. The rate was even faster from 1993 to 2003, with an average of about 3.1 [2.4 to 3.8] mm per year. Other scientific publications projected sea level rise in this century. This 3.1 mm per year rising trend is in approximate agreement with the rise observed in some of these locations, particularly within the Federated States of Micronesia. In fact, the rate of rise at Federated States of Micronesia is higher than that projected by IPCC over the globe in general. The tide gauge measurements elsewhere around the globe do indeed show qualitatively similar trends over the last 2 to 3 decades.

The sea-level rise in these small islands for 1997 to 2007 maintains a close correspondence with the faster rate of predicted average global sea-level rise. However, it is unclear whether the rise is a reflection of recent decadal variability or an actual increase in the rate of the longer-term trend. While more research is necessary to test hypothesis of the latter cause, our immediate observations do confirm that the sea-levels have recorded a rise at most of these North Pacific stations over the last approximately 20 years.

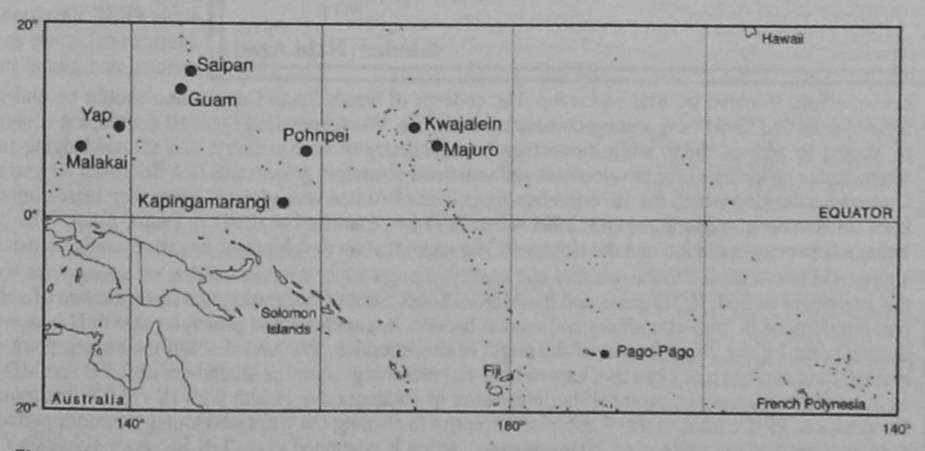

Figure 1: Locations of tropical Pacific tide-gauges. Those islands discussed here are labeled with round black spots.

Despite some uncertainties in sea-level behavior, findings from these islands are significant in that they demonstrate that the rate of sea level rise in parts of the tropical Pacific basin is higher than the general global projections made by IPCC. It is an important regional example demonstrating the importance and societal ramifications of sea-level rise. Moreover, it supports the observations of sea-level rise worldwide, generating greater confidence that the rate of observed sea-level rise has increased from the 19th to the start of the 21st century.

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