

# Healing of the Sundarbans following Sidr

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THIS article examines the possible environmental problems that the forest might face after Sidr devastation and looks at management approaches to address them.

The Sundarbans mangrove is the salt-tolerant forest ecosystem like the other coastal mangroves of Southeast Asia, and is the last large wilderness area of significant natural beauty in Bangladesh with a number of critically endangered animal species, such as the world renowned Royal Bengal Tiger, marine turtles, estuarine crocodiles, dolphins, and several rare bird species. With the recognition of the Sundarbans as a world Heritage Site, conserving and promoting biodiversity of this unique forest is an imperative. However, severe cyclonic disaster of November 15 over the eastern part of Sundarbans has disrupted the species-rich productive part of the forest that represented varieties of economic, social and environmental values.

Environmentally, Sundarban mangrove ecosystem is a vital shelterbelt for protection against tidal waves, storms and cyclones. The dominance of tree species that composite in this wet-land ecosystem not only serves a strong wind break but also its ecologically adapted root systems act as an anchor against frequent river bank erosion. While the ecological successions following the degree of salinity had greatly influenced the distribution of species and stand-height from 10m to more than 15m in the eastern part of the Sundarbans, following cyclone Sidr, the stand-height has drastically reduced in severely damaged areas. Environmental aspect of cyclone Sidr however suggests much delaying of the recovery process for the original composition and its structure. But question is that, do mangroves survive in the environmental disaster? Or, does it require re-establishment?

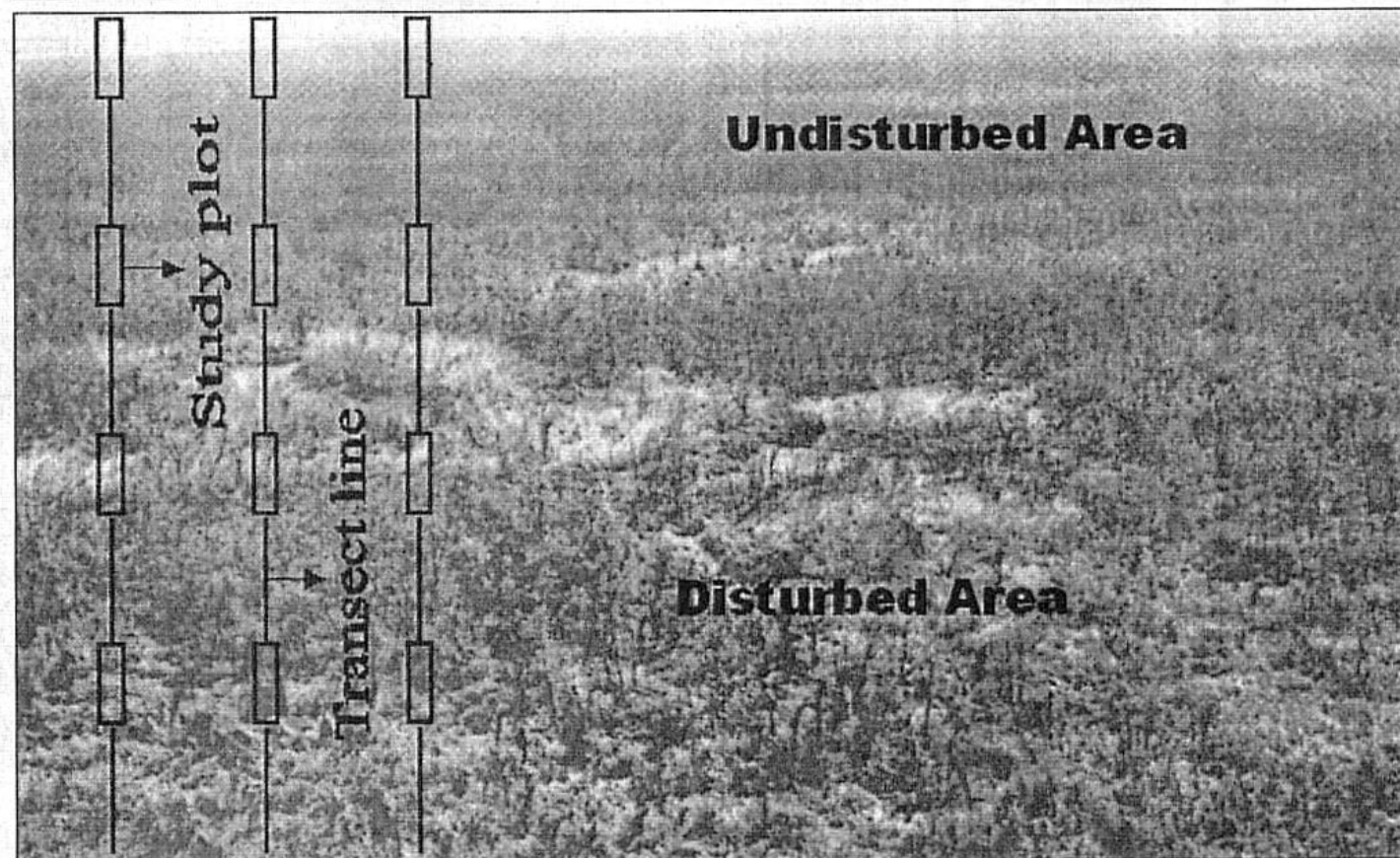
Mangroves survive well in the environmental disaster as the forests rely on some natural disturbance to maintain its biodiversity. But if the ecological factors

become extremely adverse then the regenerations are much delayed. Re-establishment of mangrove species under the normal situations also showed unsuccessful and was not environmental friendly. Studies on Timber Stand Improvement (TSI) in the Sundarbans which included 'enrichment planting', 'assisted natural regeneration (ANR)' and 'golpata plantation' showed less than 50 percent of the physical target of TSI achieved and the condition of plantations and survival of seedlings not satisfactory. The high cost of TSI and its justification in the mangrove forest has therefore become a debatable issue. Only rare and endangered tree species such as, Passur, Dhandul, Amur can be re-established through a pilot study where natural regeneration is impossible. But what happened in the case of ANR? In the name of ANR, forest stands were thinned, non-timber ground cover and climbers having biodiversity value have so far been damaged or removed without clear understanding of ecological consequences.

Based on the above facts, the man made attempt in healing the cyclone affected areas of Sundarbans is of no consequence, and no success history is also available. The only way is to encourage natural regenerations by keeping the forest undisturbed, threat free. This conforms to the aerial photographs flowing cyclone Sidr in which patches of comparatively dense forests have been tremendously decelerated by the wind velocity through tree boles and crowns keeping the inner side of forest almost intact. This learning is important as historically illegal felling of timber and over-harvesting of plants and aquatic resources and their effects on biodiversity have been the subject of many newspaper articles. The recent cyclone Sidr attack over the forest and its vicinity could have been much less if human induced damage of the forest would have been under control.

Reports are available on how the core problem "Sundarbans biodiversity resources in deple-

The recent widespread devastation by the cyclone Sidr of the eastern part of Sundarbans and its likely occurrence in future strongly suggest existing management system should be more oriented towards ecological and conservation approach. The Forestry Master Plan prepared for the period 1993-2012 emphasized the critical need for effective policy, legislation and improvement mechanisms for conservation, protected area management, wildlife management and biodiversity.



Cyclone Sidr hit areas showing disturbed and undisturbed forest stands for systematic sampling in which line transects and plots are positioned at a definite interval to capture the maximum diversity and environmental conditions.

tion" is caused by different factors. Out of the nine factors that were identified as the main causes behind the depletion, the major one was the insufficient capacity to manage the resources in a sustainable way. For example, fish stock assessment in the Sundarbans done by Aquatic Resource Division of Forest Department showed severe stock depletion due to catching of juveniles and use of destructive nets. The Chakaria Sundarbans of southeastern part of

Bangladesh vanished some decades ago due to over harvesting and illegal. But once it was full of biodiversity-rich flora and fauna. Forest formation after natural disturbance possesses inherent resistance against the natural calamities as compared to man made creation of new habitat and thus natural diversity makes the ecosystem stable.

There are some possible effects of cyclone Sidr on plant species diversity. Recoveries of plant spe-

cies diversity in cyclone-hit wetlands are highly variable due to intensity of disturbance. In heavily damaged compartments, the species of low abundance may even become extremely rare or become extinct, and the number of individuals of dominant species may be drastically reduced, affecting structure of the forest. However, spatial and temporal heterogeneity following Sidr may increase total species diversity particularly at intermediate fre-

quencies of disturbance. A year after tropical cyclone Larry crossed the far north Queensland coast, the World Heritage areas were found recovering better than the adjacent forest landscapes, because the Heritage areas, were quite well protected.

Cyclone Sidr might also extend the top-dying of Sundari trees. Studies on top-dying Sundari have detected some indications which relate to the ecological conditions of the affected area. Top-dying was

predominant in areas with high sedimentation rate where the number of pneumatophores (breathing roots) were significantly less. This suggests the low redox potential, which is a measure of soil aeration, in the top-dying areas. Canopy openness was also found responsible for enhancing the severity of top-dying. As such, in the Sidr affected forest floor where heavy sedimentation have been accumulated and the original soil physical structure and canopy closure is severely disrupted, the changing microclimates there could enhance the severity of top dying.

**Management approaches**  
Conducting cyclone Sidr damage assessments: Meanwhile, a very rough idea on the damage to flora and fauna is available as per report published in many newspapers. In the past there was no intensive study on the cyclone hit areas of Sundarbans. FD should now mobilise their field staff to assess damage done by Sidr to the residual stands by systematic sampling with appropriate statistical precision. Systematic sampling may be stratified also to capture maximum variation in the environmental conditions. By classifying various types of Sidr injury to trees, the results can be summarised as percentage intact, lost (smashed or dead) and damaged (trees that survived after injury) for trees of more than 1.5m height. Measurements must be done at three different size classes: saplings, poles and timber. Regeneration status of different plant species should also be registered along with habitat types. This data base of Sidr injury might influence the FD's existing inventory in stock analysis and understanding biodiversity status (abundance and rarity) of the residual stands as additional contribution.

**Holistic approach of resource management:** It may be mentioned here that the existing management plan of the forest is not based on the ecosystem and biodiversity approach, rather the plan guides commercial production of timber and other forest products. As a result, past management inventory targeted the spe-

cies of low abundance for felling and thus gradually they become rare and extinct from the ecosystem. The recent devastation of Sidr strongly suggests revising the management plan with due consideration of ecological and biodiversity parameters so that all species of plants are equally cared.

**Support integrated resource management:** The management of Sundarbans should be more intensive, integrated and continuous, and can not be always donor based. Long-term integrated management plan for all aquatic and terrestrial resources must be developed for a period of 20 years or so with the aim of securing funds from the revenue budget. FD's existing capacity should be broadened in terms of trained manpower to manage the resources in a sustainable way. Provision of hardship allowance is of vital importance to build up morality of the field staffs. People living in the impact zone are to be identified properly and engaged in different income generating activities through funding from PKSF to reduce their dependency on Sundarban resources.

**Policy reform:** Improvements to natural resource management policies affecting forest conservation should be given the highest priority. The recent widespread devastation by the cyclone Sidr of the eastern part of Sundarbans and its likely occurrence in future strongly suggest existing management system should be more oriented towards ecological and conservation approach. The Forestry Master Plan prepared for the period 1993-2012 emphasized the critical need for effective policy, legislation and improvement mechanisms for conservation, protected area management, wildlife management and biodiversity. Policies should also give priority to establish field based and well integrated research units with support system and build up human resource capacity to conduct research. Nowadays, emphasis is being placed to integrate biodiversity and ecological aspects into forest management planning, policy and research issues.

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## Bangladesh in global warming scenario

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TODAY one of the most hotly deliberated topics on Earth is the issue of global warming or climate change. Increased populations, extreme demand for energy and limited resources have put the global environment under threat. As a result we are getting increasingly aware about the stake of environment we reside in. Nowadays the terms greenhouse effect, industrial pollution, air pollution, sustainable development, and biodiversity etc. have become frequently used words.

The greenhouse effect is a natural occurrence initiated by carbon dioxide and other gases in the atmosphere. Scientists all over the world have known for more than a century that greenhouse gases like carbon dioxide, methane, water vapour and chlorofluorocarbons help prevent heat from escaping the earth's atmosphere. In the temperate region green houses are built to cultivate crops when the outer land remains covered by snow. Sun light of a shorter wavelength enters the glass roof of the green house and strikes the soil and radiates back with a longer wavelength. The change in wave length of sunlight transports the release of heat energy. This stored heat energy raises the green house temperature, making its environment suitable for crop growth though the outside temperature still remains around freezing point. Similarly, greenhouse gases also keep the earth warm enough to support life. So, the concern is not with the fact that we have a greenhouse effect, but whether human activities are leading to an enhancement of the greenhouse effect or causing the global warming.

Automobiles and other transport exhausts are thought to be the principal source of atmospheric carbon dioxide. Coal or petroleum based power plants and different industries release a huge amount of carbon dioxide into the atmosphere. In addition, animal breathing, plant and microbial respiration, agricultural and other solid waste disposal also produce a large amount of carbon dioxide. This carbon dioxide is dissolved into ocean water, incorporated in marine organism and utilised by green plant and so on.

On the other hand, deforestation may have terrible global effects as well. Forests are natural consumers of carbon dioxide -- one of the greenhouse gases whose buildup in the atmosphere contributes to global warming. Annihilation of forest not only removes these carbon sinks, but forest burning and decomposition pump into the atmosphere even

A very rough appraisal indicates that with one meter sea level rise, area of high salinity intrusion will increase from existing 13 percent to 31 percent of Bangladesh land area. This will reduce the crop yield significantly in the affected areas. Salinity intrusion may affect the power station's water use in the Siddhirganj and Narayanganj areas.

more carbon dioxide, along with other greenhouse gases. Increase of carbon dioxide in the lower levels of the atmosphere warm sit-up and global warming obviously takes place. The global climate models predict that a doubling of carbon dioxide concentration will increase the mean daily temperature by about two (to five degree centigrade). There are likely to be more natural calamities like devastating hurricanes, tornados, cyclones, storms and drought. Altered weather will greatly harm the world's largest food source or agricultural pattern.

Indirect indicators of warming such as, borehole temperatures, snow cover, and glacier recession data are in significant agreement with the more direct indicators of recent warmth. Evidence such as changes in glacier length is useful since it provides qualitative support for existing meteorological data. However, there is a great deal of disagreement among scientists about whether global warming is actually occurring and it is certainly an important political issue which has shaped legislation and generated regulations.

According to Special Report on Emission Scenarios (SRES) published by Intergovernmental Panel on Climate Change (IPCC), due to thermal expansion and loss of mass from glaciers and ice caps, global mean sea level is projected

to rise by 0.09 to 0.88 meters between 1990 and 3100. Over several centuries, it may be possible to observe the effect of these orbital parameters, however for the prediction of climate change in the 21st century, these changes will be far less important than radiative forcing from greenhouse gases. Further research is required to improve the ability to detect, attribute and understand climate change, to reduce uncertainties and to project future climate changes. In particular, there is a need for additional systematic and sustained observations, modeling and process studies.

In the 1970s, various sectors of the scientific community became concerned about the possible reduction in the ozone layer surrounding the earth in the upper atmosphere. After a decade like in 1980s, scientists, governments, and the public in all over the world became concerned about the possibility that the world may be getting warmer. However, there is much need to refine our understanding of key natural forcing mechanisms of the climate, including solar irradiance changes, in order to reduce uncertainty in our projections of future weather pattern change.

As it relates to recent estimate by Intergovernmental Panel on Climate Change (IPCC), due to global warming the sea level may

levitate by about 20 centimeter by 2030 and it could be as much as one meter by the end of the next century depending upon the future control of greenhouse gases.

Based on the geographical structure like low elevation of the land areas, the low inclining of the rivers, and proximity to the sea, Bangladesh is one of the most susceptible country to the effects of sea level rise and climate change. In coastal area, the significant effects of sea level changes on flooding, drainage, agriculture, tides, waves and vital wetlands cannot be overlooked. One (1) meter sea level rise will inundate about 5,608 million acres of existing coastal land which is about 15 percent of the total area of Bangladesh. The area comprising of 65 percent of greater Khulna, 99 percent of Barisal, 100 percent of Patuakhali, 44 percent of Noakhali and 12 percent of Faridpur will be inundated and as a result 13.74 percent of net cropped area and about 401,600 hectares of mangrove forest along with its wild life will be vanished.

A very rough appraisal indicates that with one meter sea level rise, area of high salinity intrusion will increase from existing 13 percent to 31 percent of Bangladesh land area. In fact, entire south and south western part of Gages, Padma-Lower and Megna river system will be affected by high salinity penetration. This will reduce the crop

yield significantly in the affected areas. Salinity intrusion may affect the power station's water use in the Siddhirganj and Narayanganj areas.

It is patent that the green house effect is a great threat for the world. The industrialised countries are mostly responsible for this undesirable effect. The use of chlorofluorocarbons in air conditioners, refrigerators, and as propellants has resulted in the release of large amounts into the atmosphere. Because chlorofluorocarbons are implicated in both global warming and ozone depletion, considerable international attention is focused on controlling their manufacture and release.

Cutting across these uses is a crucial need associated with strengthening international co-operation in order to better utilise scientific, computational and observational resources. This should also promote free exchange of data among scientists. A special need is for increasing the observational and research capacities in many regions, particularly in developing countries. Finally, as is the goal of this assessment, there is a continuing imperative to communicate research advances in terms that are relevant to decision making.

Global warming may be reduced by three inter linked levels such as personal, technological and legal. The levels should work by energy conservation, shifting to renewable energy sources, reforestation and educating people to make them aware about global warming. At the personal level, recycling, increasing efficiency and reducing demands for every item are parts of conservation strategy. Use of renewable energy sources like solar and wind energy should be enhanced. Improvement of energy efficiency of all machinery, buildings and factories will reduce the rate of carbon dioxide emission. Replacement of fossil fuels by solar energy, biofuels (ethanol) hydropower, hydrogen fuel, wind etc. will reduce the carbon dioxide emissions.

It is an obvious indication in modern science that we will be living with global warming for the rest of our lives. Thus, it is indispensable to think ahead and take all essential steps in time to minimise the greenhouse emissions all over the world otherwise soon it will be too late. Finally, control of the green house gas is the crying need for maintaining an environmental equilibrium and saving the world for the future generations.

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## Primates disappearing from tropical forests Eco-system in peril

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PRIMATES are considered closest living relatives of mankind. These living relatives -- apes, monkeys, lemurs and other primates -- are becoming rarer from the tropical forest. "Reasons for the decline are no mystery: they all relate directly or indirectly to human actions" says a Worldwatch Institute report. A survey, worked out by 60 experts from 21 countries, cautions that failure to respond to the mounting threats has now been worsened by climate change. On the whole, 114 of the world's 394 primate species are categorised as threatened with disappearance on the International Union for Conservation of Nature (IUCN) red list. Illegal wildlife trade and commercial plant-meat poaching have been largely blamed for their disappearance.

**Russell A. Mittermeier**  
The primate-mongers brutally kill primates for food and to vend the meat. They encage them for live business; and farmers, loggers and land promoters destroy their habitat. One species, Miss Waldron's red colobus of Ivory Coast and Ghana, already is feared extinct, while the golden-headed langur of Vietnam and China's Hainan gibbon number only in the dozens. The Horton Plains slender loris of Sri Lanka has been sighted just four times since 1937.

"You could fit all the surviving members of these 25 species in a single football stadium; that's how few of them remain on Earth today," said Conservation International President Russell A. Mittermeier, who also chairs the IUCN/Species Survival Commission (SSC) Primate Specialist Group. "The situation is worst in Asia, where tropical forest destruction and the hunting and trading of monkeys put many species at terrible risk. Even newly discovered species are severely threatened from loss of habitat and could soon disappear." "By protecting the world's remaining tropical forests," Mittermeier says, "we can save primates and other endangered species while helping prevent climate change."

**Enlisted countries and regions**

The 21st Congress of the International Primatological Society in Entebbe, Uganda has published an alarming report that enlists the world's 25 most endangered primates. Eight of the primates on the latest list, including the Sumatran orangutan of Indonesia and the Cross River gorilla of Cameroon and Nigeria, are "four-time losers" that



also appeared on the previous three lists. Six other species are on the list for the first time, including a recently discovered Indonesian tarsier that has yet to be formally named. Madagascar and Vietnam each have four primates on the new list, while Indonesia has three, followed by Sri Lanka, Tanzania, Ivory Coast, Ghana and Colombia with two each, and one each from China, Cameroon, Equatorial Guinea, Kenya, Nigeria, Myanmar, Bangladesh, India, Peru, Venezuela and Ecuador. Some primates on the list are found in more than one country.

By region, the list includes 11 species from Asia, seven from Africa, four from Madagascar, and three from South America, showing that non-human primates are threatened wherever they live. All 25 primates on the 2006-2008 list are found in the world's biodiversity hotspots--34 high priority regions identified by Conservation International that cover just 2.3 percent of the Earth's land surface but harbour well over 50 percent of all terrestrial plant and animal diversity. Eight of the hotspots are considered the highest priorities for the survival of the most endangered primates: Indo-Burma, Madagascar and the Indian Ocean Islands, Sundaland, Eastern Afrotropical, Coastal Forests of Eastern Africa, Guinean Forests of West Africa, the Atlantic Forest of Brazil, and Western Ghats-Sri Lanka.

**Basic issues**

A journal states, the clearing of tropical forests for agriculture, logging, and the collection of fuel wood continue to be key factors in marauding the primates. Tropical deforestation also emits 20 percent

of total greenhouse gases that cause climate change, which is more than the carbon discharge of all the world's cars, trucks, trains and airplanes combined. In addition, climate change is altering the habitats of many species, leaving those with small ranges even more vulnerable to extinction. Hunting for subsistence and commercial purposes is another major threat to primates, especially in Africa and Asia. Live capture for the pet trade also poses a serious threat, particularly to Asian species.

The list focuses on the severity of the overall threat rather than mere numbers. Some on the list, such as the Sumatran orangutan, still number in the low thousands but are disappearing at a faster rate than other primates. Others were discovered only in recent years, and their low numbers and limited range make them particularly vulnerable to habitat destruction and other threats.

**Conclusion**

These genus are our closest living family members. Non-human primates are indispensable to keep up our eco-system's energy. Through scattering seeds and other interactions with their environments, primates facilitate to sustain a wide range of plant and animal life that rebuild the Earth's forests. Conservation of non-human primates is a critical issue facing primatologists today. By protecting the world's remaining tropical forests, we should save primates and other endangered species for our easy breathe. We have to check strictly the factors that lead to primate related business or its annihilation.

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