

Is biodiversity conservation mere tree plantation?

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BIODIVERSITY Conservation Projects are designed to change something, to protect biodiversity. One of the major differences between biodiversity conservation projects and other projects, however, is that some people think it is often difficult to define -- in clear, operational terms -- precisely what it is that biodiversity conservation projects are trying to achieve. In a business setting, the project goal is usually financial profit and it is usually pretty easy to evaluate how much money a company is making or losing. But for biodiversity conservation projects, what practical and meaningful measures of project impact are available to us? In many fields, the cause-and-effect relationships between specific interventions and resulting impacts are easy to see. They are not so apparent in conservation. This makes it difficult to measure the impact of a project on the biodiversity in a given area.

Some of the government agencies and environmental NGOs discuss their on-going biodiversity conservation projects splendidly describing the numbers of saplings or species they have planted or the land area they have brought under plantation. Well this may be an effort to restore the degraded habitat -- an entity of the ecosystem but what about addressing the issues or factors that have led to the degradation of the habitats? Will tree plantation alone help restore other components and elements of biodiversity and ecological processes?

Another big issue in biodiversity conservation projects is the involvement of the community members in the project activities and to raise their awareness level. Innumerable meetings are organized with the community members, huge billboards hoisted and modest amounts of project fund utilized for this purpose, but are there any evaluations done to measure the impact of such meetings at the end of the day?

Further, sporadic visits are made to the project sites, for example, to do a bird census and if during one such visit the numbers of birds observed are higher than previous count blatant statements are made like the project is doing good in biodiversity conservation as the numbers of birds are more than previously recorded. Birds are good indicators of the state of the ecosystem if the bird populations are monitored regularly but are such statements verified against project activities, other environmental or physical factors and project outcomes?

The major problem is the misperception about the way biodiversity conservation projects should be treated. The general notion about all development or donor-funded projects is that they should produce results. This is a valid consideration for conservation projects too. But conservation projects have their limitations since they are based on the biodiversity parameters or indicators and changes in the biodiversity indicators cannot usually give

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results in the short span of the project life, say three to five years. However the target should be to give appropriate attention to reduce the threats or factors that are detrimental to the biodiversity; the ecosystem, ecological niches and ecosystem functions that support the biodiversity.

It is the threat level that needs to be targeted, monitored and assessed periodically for conservation projects. Isn't it very much relevant to ask what the efficacy of plantation for habitat restoration is when the factors/threats that destroy the forests within the project area persist in similar magnitude?

Several examples can be cited where plantations have been successfully raised but other threat factors were not addressed adequately resulting in physical changes in the land use characteristics, habitat degradation (either due to mono-culture or exotic species or lack of undergrowth or species diversity), and loss of biodiversity in that particular area. Take for example the mangroves of Sonadia Island. Forest Department (FD) claims it to be theirs while the district administration thinks otherwise as it is listed as khas land and the Department of Environment (DOE) treats it as an Ecologically Critical Area (ECA).

The district administration from time to time leased large chunks of mangrove forested areas in the name of revenue collection to local politically-backed and influential people for conversion to shrimp farms and salt pans. FD, members of the civil society and environmental NGOs objected to such leasing as this involved clearing of vast areas of mangroves and land grabbing by claiming more than what was actually allotted to the lessee in the lease agreement. With the declaration of ECA in 1999 DOE

was supposed to legally manage it as a protected area. But establishment of shrimp farms and salt pans within an ECA continued unabated until last year when this caretaker government (CTG) took over the country's helm.

Political backing to some local influential people and support by the government machinery had led to the destruction of thousands of acres of precious mangrove forests to a state of no return. After 1/11, in February last year with financial support from Coastal & Wetland Biodiversity Management Project (CWBMP), DOE and assistance from the Cox's Bazar district administration, FD and law enforcement

agencies some of the illegal shrimp farms and salt pans were evicted and 350 hectares of forest land recovered from the land-grabbers. Mangrove plantations were done by FD (190 h) and CWBMP-contracted NGO, Bangladesh Centre for Village Development (BCVD), (160 h) in those recovered land.

The land grabbers are so influential that they are now planning to regain control. A proof of this in last April 2008 further eviction was not possible. Now if we look into this case the major threat factor was widespread deforestation and illegal land grabbing that was continuing unabated right under

the nose of the district administration, FD and the DOE. This threat was never effectively addressed by the past governments that resulted in the steady loss of habitat, biodiversity and ecological functions. Mangrove ecosystem is one of the highest biomass producers and acts as nursery for aquatic biodiversity including fisheries, reservoir for carbon sequestration, and first line of defence against tidal surges.

The reduction of the threats to biodiversity is directly related to the political will, commitment and government's intention to conserve biodiversity. It is pertinent to mention that biodiversity is for human welfare and conservation is one of the means to garner that benefit through wise use. The conservation projects may help the government identify the threats, suggest means for addressing those threats, but it is the political will and the government's commitment to take appropriate actions to reduce the threats to create conducive environment for the biodiversity to flourish.

Apathy in timely decisions and actions from the government side escalates the threats creating a situation of no return. No matter how much land area we plant biodiversity will not be benefited unless the threats are targeted, reduced and regulated.

The area of threat reduction is the one that plays a significant role in the success of conservation projects. It is also the area that involves players from multiple sectors where coordination is arduous to achieve. If the intentions of the government are clear and there is a political will to back up the biodiversity conservation

intentions of the government the inter-sectoral coordination glitch among the various government agencies can be resolved. Take for example, the road constructed in St. Martin's Island bisecting the lagoon restricting water flow (clearly visible in the Google map) and exterminating the biodiversity that survived on the rocky wetland.

The road was constructed by LGED knowing well that the island is an ECA and that the MOEF is the responsible ministry for ECAs. Had any information been exchanged among the agencies concerned prior to the construction of the road better options would have been available without altering the physical landscape of the lagoon. This was an act of sheer departmental egotism backed by bureaucrats and political pundits since many of them own landed properties in proximity and a luxurious hospital was built along the road for the rich.

Among other factors that are imperative to be addressed in biodiversity conservation projects is the socio-biological factor but due to pressures from the political leaders and government bureaucrats to show that something is being done for the people the social factors become the primary objectives while the biodiversity conservation issues diffuse in the thin air. The mere fact that wellbeing of biodiversity is directly related to human welfare is often forgotten or ignored and just tree plantations remain.

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Tropospheric ozone and air pollution

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OZONE is one of the highly reactive gases, which is photochemically active. It is composed of three atoms of oxygen (O₃) and its role depends on its location in the atmosphere. This gas plays a different role in the lowest two layers of the atmosphere, known as the stratosphere and troposphere. In the stratosphere, above the tropopause about 90 percent of the ozone protects life on earth from the sun's dangerous ultraviolet radiation. In contrast, the layer surrounding the earth's surface is the troposphere where the presence of ozone is harmful for the environment as well as for human health.

In a polluted urban atmosphere ozone acts as a more powerful photochemical oxidant than other oxidants such as Nitrogen dioxide (NO₂), Hydrogen peroxide (H₂O₂), and Peroxy Nitrogen (PAN). Moreover, ozone in the troposphere is designated as a greenhouse gas due to its absorption in the infrared, visible, and ultraviolet spectral region. Enhancement of ozone in the middle and upper troposphere could have significant climatic consequences. In addition, enhanced ozone levels in the boundary layer of polluted regions have adverse effects on human health and crop yields. The photochemical nature of tropospheric ozone in relation to photochemical air pollution is discussed in this write-up. Photochemically produced ozone may affect crop yield, plant growth, and the respiratory system and lung function of humans. Furthermore, it may also damage the building materials.

Formation of tropospheric ozone

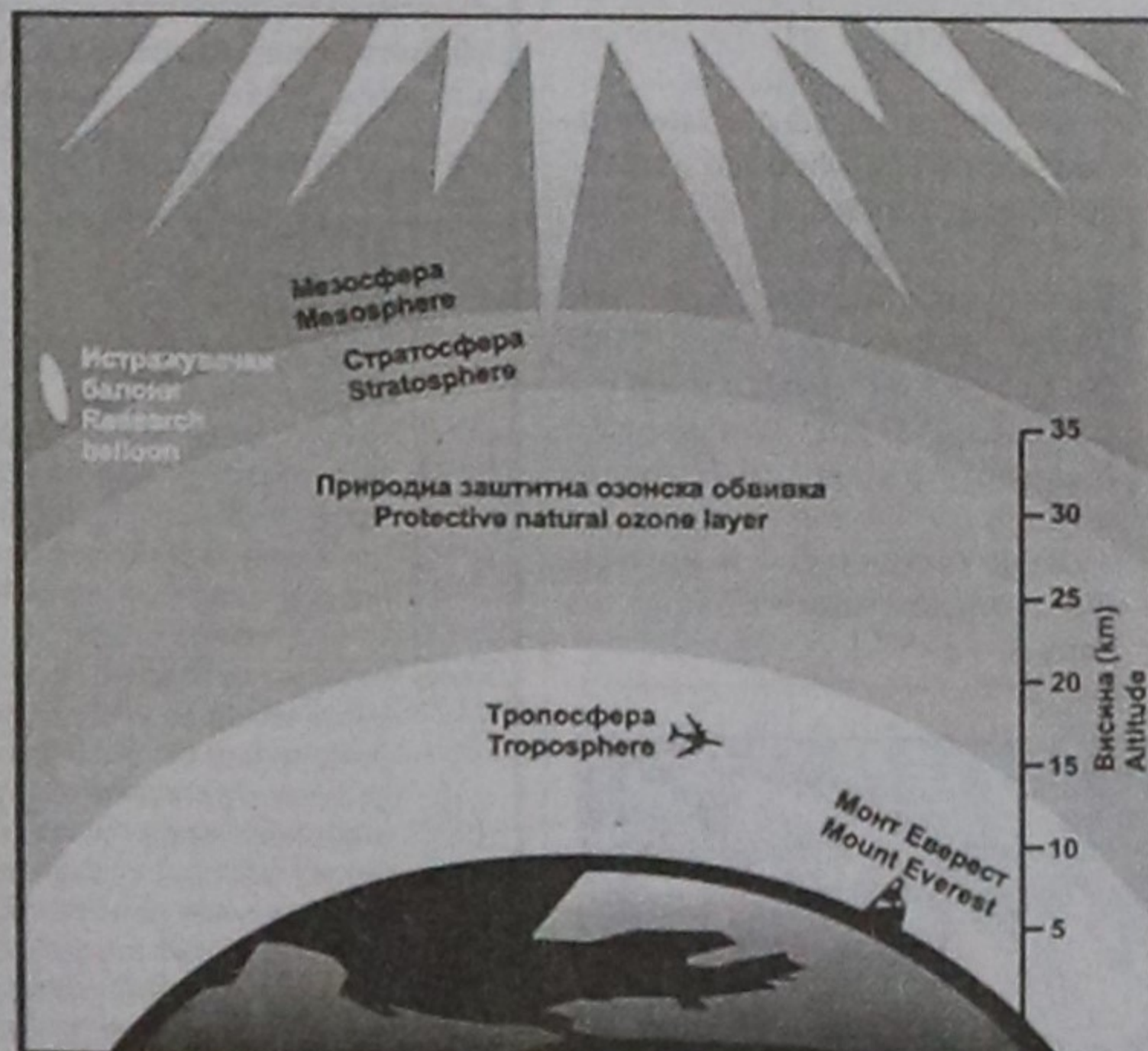
Tropospheric ozone is not directly emitted into the troposphere; rather its presence depends on stratospheric intrusion and complex photochemical reactions. It is considered as a secondary or transformation pollutant rather than a primary pollutant. Primary pollutants that are involved in the formation of secondary pollutants are often referred to as precursors. The formation of tropospheric ozone depends on some precursors such as oxides of nitrogen (NO_x), Volatile Organic Compounds (VOCs), and carbon monoxide (CO). Aromatic and olefin hydrocarbons contribute significantly to ozone formation. These precursors act in the presence of sunlight to produce ozone. Since, these reactions are stimulated by sunlight and temperature, the peak ozone levels typically occur in the warmer times of the year during daytime.

Due to the increase of anthropogenic emissions in the atmosphere, the growth of carbon and nitrogen compounds are rising dramatically. As a result, the enhanced level of tropospheric ozone has become an issue of concern in terms of photochemical air pollution. Tropospheric ozone was first measured over 100 years ago. Reports mentioned that the average daily maximum of tropospheric ozone in North America was approximately 0.019 ppm, and in Europe 0.017-0.23 ppm. But now this amount exceeds 0.2-0.3 ppm in some cities the world in peak pollution periods.

Impacts

Impacts of ozone on humans and

Intrusion from stratospheric ozone and photochemical production are the two main sources of ozone in the troposphere. The photochemical formation of ozone depends on some precursors such as VOCs, NO_x, and CO. Due to world expansion in agriculture, transportation and industry, huge amounts of these precursors are emitted into the troposphere. The concentrations of ozone have risen from pre-industrial times to the present because of increased emissions from anthropogenic sources.



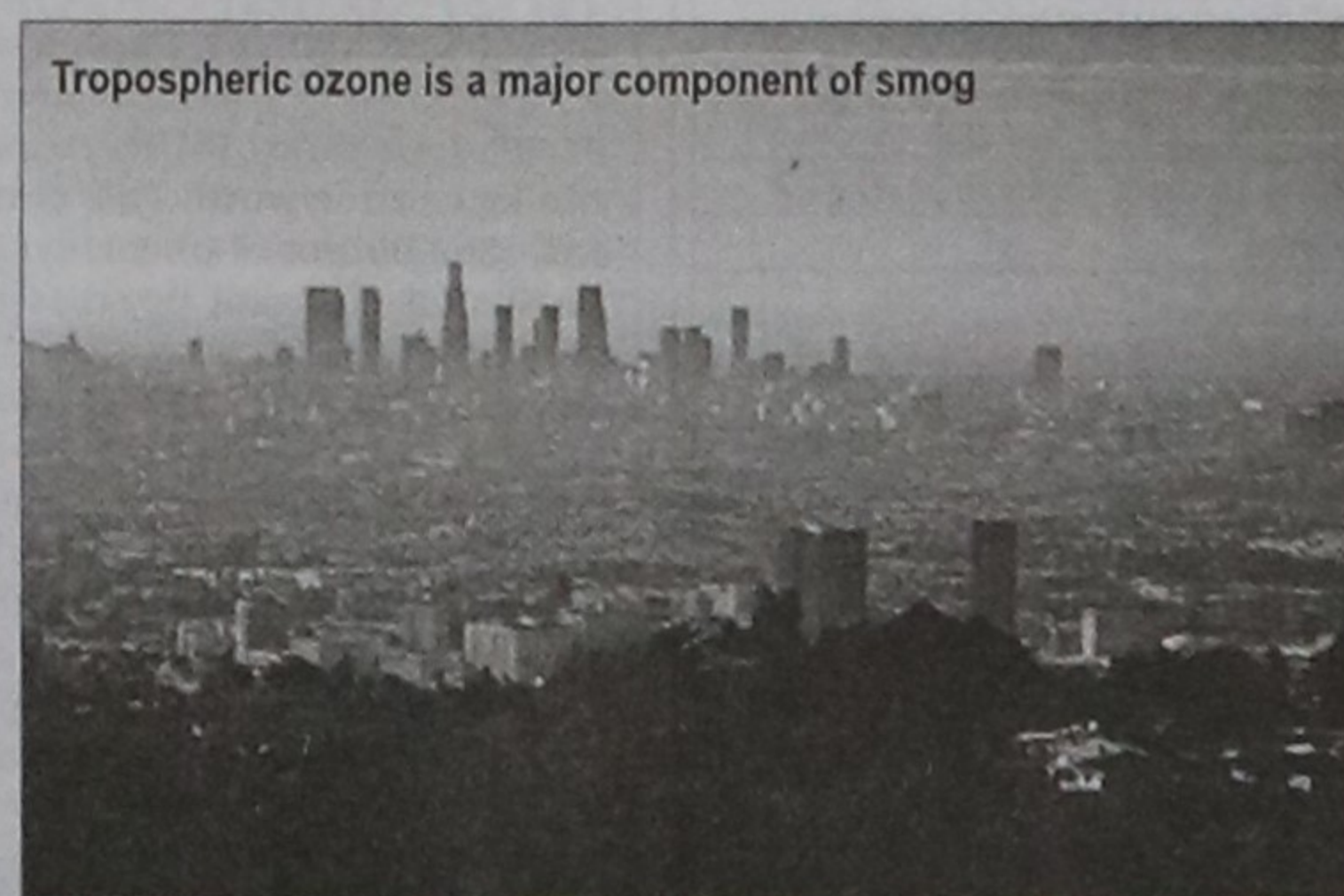
the environment vary with the emission patterns, meteorological transport and chemical and physical processes. The effects associated with levels of ozone have been monitored in many areas of the world.

Effects on human health

It is hardly surprising that oxidant like ozone can be damaging to health. Ozone exposure experiments on human health began in

the mid 1960s. That exposure data provide a foundation for the interpretation of epidemiological studies and indicate what concentrations are likely to impact on the normal population. It is the potentially serious effects on human health that have caused many countries to adopt air quality standards.

Numerous studies indicate that there is an adverse effect on health associated with short-term, pro-



longed or sub chronic, and chronic exposure to ozone. There has also been growing concern about long-term exposure to elevated ozone levels -- may be cause of irreversible chronic lung injury.

Photochemical oxidant can damage respiratory tissues through inhalation. Ozone has been linked to tissue decay, promotion of scar tissue formation, and cell damage by oxidation. Ozone can impair an athlete's performance, create attack that is more frequent for individuals with asthma, cause eye irritation, chest pain, coughing, nausea, headache and chest congestion and discomfort. It can worsen heart disease, bronchitis, and emphysema.

On Vegetation

Research and analysis indicate that the impacts of ozone on vegetation have also been observed in several regions in the world. Ozone may damage forests and crops. This slows down photosynthesis and plant growth. Ozone can lead to plant tissue injury and reduction in growth and productivity because of its phytotoxic nature. If a sufficient amount reaches sensitive cellular sites within the leaf, ozone exerts a phytotoxic effects.

However, ozone injury will not occur if the rate of ozone uptake is slow enough, to allow plants to respond to ozone by defensive reactions, such as avoidance by stomatal closure, detoxification of

Summer Solstice 2008

DIPEN BHATTACHARYA

JUNE 21st is the Summer Solstice for the northern hemisphere. On this day, the sun rises at its northernmost position, attains the highest position in the sky, and sets at the northernmost position. This day also carries a special meaning for Bangladesh because of an imaginary geographic line that runs through the middle of the country. The Tropic of Cancer runs through Comilla, south of Dhaka, and through Faridpur and Kushtia before it enters West Bengal. On this day, if you happen to find yourself on the Tropic of Cancer, the sun would shine directly overhead and cast no shadow of any erect object. The time would be about 12:30 p.m.

This day would also be the longest day of the year, with the sun rising on the Dhaka horizon at 5:12 a.m. and setting at about 6:49 p.m., giving us total daylight time of about 12 hours and 38 minutes. From this day on, the sun would rise later and set earlier, thus shortening the days until the Winter Solstice on December 22. One should bear in mind that in the southern hemisphere, these days are reversed, so, if you happen to be in Buenos Aires on those two days, don't be surprised if June 21 turns out to be the shortest day and December 22 the longest.

Ancient peoples were much aware of the day-to-day (and night-to-night) arrangements of the sun, moon, planets and stars. The two solstice days played an important role in the rise of human awareness about the movements of celestial objects and influenced the quest for finding the causes for those movements. The ancients utilized clever mechanisms that would allow the sun to shine on a pre-designated spot on the day of the solstice. Neolithic Stonehenge, built almost 5,000 years ago on the British Isles, was a magnificent structure where the sun used to rise over a particular stone on the day of the Summer Solstice. Observatories with similar functionality were also built in North and Meso-America.

Europe still celebrates the Summer Solstice that originated in those distant Neolithic times, whereas the Winter Solstice (Poush or Mokor Shonkranti) gained in prominence in Bengal and the Indian subcontinent. This is not surprising since the brief summer in Europe brought much desired relief from the prolonged winter months, giving people opportunity to celebrate sunshine and give thanks to nature. In Bengal, the autumn and winter months were for festivals, and variations of the harvest celebrations (Nabanna, etc.) took place around the time of the Winter Solstice.

Last year, Anushandhitshu Chokro Science Club organised a day-long solstice observation (Korkot-Kranti Dibosh) on June 21 in Dhaka. The solstice festival familiarised the attendees with various astronomical phenomena and the role of science in our lives. This year, Chokro is again marking the Summer Solstice with similar educational activities at schools and institutions in the country.

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Biodiversity of Sonadia at stake

SONADIA Island, rich in natural resources and biodiversity, is under serious threat today. The Ministry of environment and forestry declared it an Environmentally Critical Area (ECA) by issuing a gazette in 1999. Nonetheless, the invaluable biodiversity of this island is now on the verge of extinction. It is high time to take necessary measures for the recovery and preservation of the remaining bio-diversity of this island.

Sonadia Island lies at the southernmost end of the Kutubjura union under Maheshkhali Thana in the district of Cox's Bazar. A special kind of mangrove forest, long beach, different species of birds and some wild animals have enriched the environment of this island. The valuable natural resources of this island include rare species of oyster, turtles, red crabs and different species of fishes. Many such species have become extinct in the meantime. In this circumstance, it is essential to restore and conserve the remaining species.

Widely significant this island is now under the grasp of land grabbers which is the main reason for the reduction of bio-diversity on this island. They are continuously destroying the mangrove forest and other natural resources for shrimp culture and salt farm. Salinity of soil of this island is

increasing for these farms, which is also hampering local agriculture. The indiscriminate collection of snails, oysters and eggs of turtles, killing of sea birds and over catching of fishes are destroying their natural habitat. The lack of adequate employment of the local people is another major reason for the reduction of bio-diversity of this island.

To conserve and improve the bio-diversity of this island, the government should immediately take necessary measures. Otherwise the invaluable natural resources of this island will soon become extinct. The implementation of any plan to recover and conserve the endangered resources would require the participation and awareness of local people. Without the involvement of local people it is impossible to restore and conserve the natural resources. Since, in reality, when the people of an area are benefited by its natural resources, they become the main contributors to the conservation of those resources, the government must create alternative source of income for the local people to keep them away from engaging in activities that lead to the destruction of the bio-diversity of the island.

The government has already taken various steps for conservation of nature of Sonadia Island.

'Coastal and Wetland Bio-diversity Management Project' is one of them. As part of this project, the government has declared prohibition on cutting trees of the forests in order to conserve the bio-diversity. Indiscriminate catching of fish, collection of oysters and illegal killing of birds are also prohibited. Some necessary measures have also been adopted to safeguard the habitat of sea turtles and wild animals. Nevertheless, the critical resources of this island are on the verge of extinction for the lack of proper implementation of these policies. In order to conserve these resources, more measures and regular supervision are required.

Although there've existed relevant laws even at the grassroots level, in reality they do not find any application. The government should strengthen the existing laws and ensure their appropriate use. Besides it should create awareness among local people through advertisements in mass media, documentary films and other means of propaganda and motivation. All these measures would prevent the extinction of natural resources and bio-diversity of many fold important Sonadia Island.

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ozone by chemical reaction, adjustment by alteration of metabolic pathways, and repair of injured tissue. However, these factors depend on the intensity of ozone exposure.

On crop yield

Ozone may reduce the intended use or value of the plant species, plant communities, or ecosystem. The impact of ozone on crop yield was identified through foliar injury symptoms in the 1960s. Injury symptoms and crop yield are usually not directly proportional because of the importance of variation in allocation processes and metabolic factors in determining plant yield. For instance, much more loss of yield can occur with little foliar injury; on the other hand, foliar injury can be much greater than yield loss. This means the injury -- yield loss relationship may depend on the ozone exposure.

As an example, for corn, foliar injury occurred at lower ozone concentration than yield reduction; but as the ozone concentration increased, yield is reduced to a greater extent than the increasing foliar injury. Numerous studies indicate that ambient oxidants reduced the yield and quality of citrus, grape, tobacco, cotton, and potato. The impacts of ambient ozone of oxidants are comparatively much higher than other oxidants. However, studies confirmed that ambient ozone levels are sufficient to reduce crop yields. Higher losses depend on several factors such as ozone concentrations, environmental conditions, and crops that are more susceptible to ozone. Table shows typical ozone injury symptoms of some crops.

Plant	Foliar Symptoms
Bean	Bronzing and chlorosis
Cucumber	White stipple
Grape	Red to black stipple
Onion	White flecks and tip
Potato	Grey fleck and chlorosis
Soybean	Red-bronzing and chlorosis
Tobacco	Metallic to white fleck

In fact, ozone can change the integrity of the cells through entering inside a leaf. If the cells collapse and die, then symptoms occur on the leaf surface.

Conclusion

Intrusion from stratospheric ozone and photochemical production are the two main sources of ozone in the troposphere. The photochemical formation of ozone depends on some precursors as discussed earlier -- VOCs, NO_x, and CO. Due to world expansion in agriculture, transportation, and industry, huge amounts of these precursors are emitted into the troposphere. The concentrations of ozone have risen from pre-industrial times to the present because of increased emissions from anthropogenic sources. Ozone, like other pollutants, does not stay in the source region, rather it can transport throughout the global atmosphere. As the fossil fuel emissions are mainly responsible for the photochemical production of ozone, it is therefore important to control the emissions from anthropogenic sources because the global atmosphere is common to all countries and all lives.

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