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Conserving Turtles in Tamil Nadu's Fishing Village

With Collaborative Efforts

TERRA YOUTH

Environment Education:
A Way of Life

IN CONVERSATION

Mr Atul Bagai,
Head of Country Office (India), UNEP

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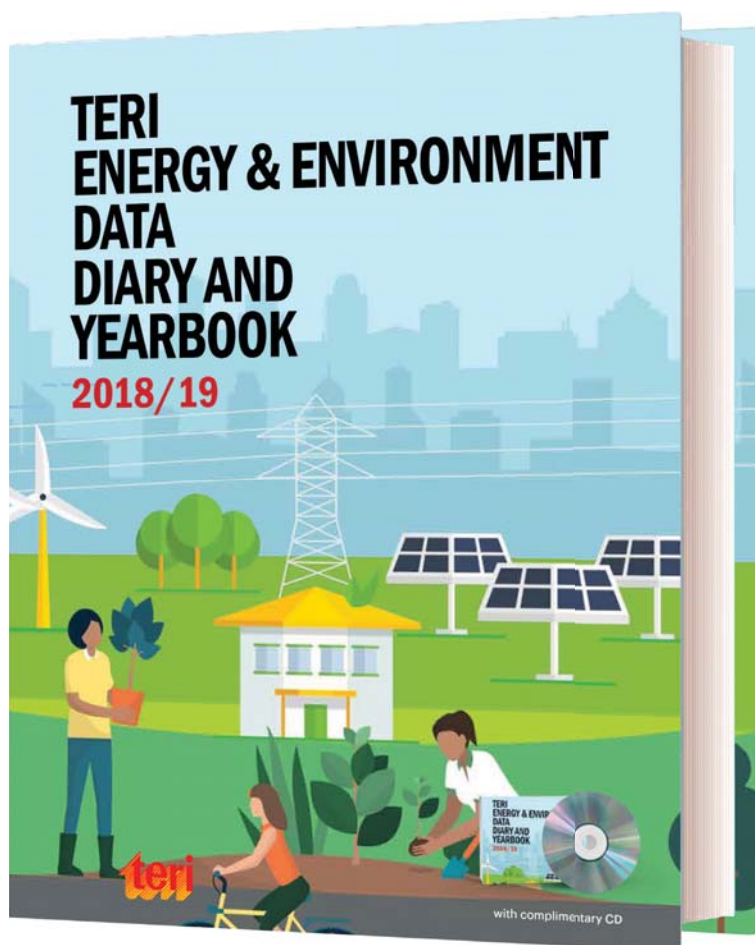
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EDITORIAL



“

In this issue of *TerraGreen*, we look at conserving turtles as part of fishing.

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As on August 20, 2020 there were 29.05 lakh confirmed COVID-19 cases in the country. The halfway stage to this number was crossed on July 27, which means the present doubling has happened in 24 days. But the next doubling, at the current rate of growth, would happen only after 30 days, signalling a possible slowdown. Close to three-quarters of the infected people have already recovered from the disease. However, till date around 60,500 people have succumbed to the disease. This suggests that: the infection is still increasing but at a lower pace than before; most people recover, but there is (low?) mortality. This means we need to learn to live with COVID-19—much as we have learnt to live with common cold (also a coronavirus) from which also most people recover, but to which some of the infected people do succumb. Consequently, today personal safety is important—include the wearing of masks, social distancing, and frequent hand washing, sanitization of workplaces and temperature screening. I would stress that we need to reclaim and regain our lives and lifestyles—but with these significant changes.

In this issue of *TerraGreen*, we look at conserving turtles as part of fishing. Each year, many sea turtles are accidentally captured, injured or killed by fishermen. Many of these injuries and deaths take place while turtles are migrating through fishing areas. The turtles, attracted to the bait, get caught on the hooks used to catch fish. With each passing day, due to different anthropogenic activities and climatic conditions, the turtle population is declining throughout the world. This month's cover story 'Conserving Turtles in Tamil Nadu's Fishing Village' highlights that in the small coastal fishing village of Vanagiri, in the Nagapattinam district of Tamil Nadu, some fishermen have turned into environmental conservationists by conserving turtles since 2009, while continuing their own fishing lifestyles. Part of this is by adapting changed fishing practices. This is because turtles face many hurdles due to current fishing practices. Modern fishing nets and speeding boats challenge their very survival today. With the collaborative efforts of the Forest Department and NGOs, local fishermen have modified their fishing habits due to the increased awareness, and their actions conserve turtles in this village. This is a good omen—and this practice should be followed in other coastal areas, not only in India but globally as well.

In this month's feature article, 'Making Space for Nature in Our Cities', the author makes a strong case for preserving and enhancing urban biodiversity, not only to ensure a proper functioning of ecological processes, but also for the capacity of the urban area to absorb changing ecological conditions. Biodiversity in cities also helps in regulation of ecosystem processes such as urban temperature regulation, noise reduction, air purification, run-off mitigation and pollination, pest regulation, seed dispersal and waste treatment. Ecological infrastructure like water areas and vegetation in cities regulates local temperatures and buffers the effects of urban heat islands. Significantly, maintaining healthy biodiversity contributes significantly to the enhanced resilience of a city in the face of climate emergency. Trees in cities act as carbon sinks by storing carbon as biomass during photosynthesis that can potentially slow down the accumulation of atmospheric carbon. Biodiversity parks, theme gardens and parks are good public spaces within cities that are home to large tree cover, as well as provide environmental, economically and recreational benefits.

With these articles and many other current stories, we hope that you enjoy reading this issue of *TerraGreen*. Do share your feedback with us.

A handwritten signature in black ink, appearing to read 'Ajay Mathur', with a stylized flourish at the end.

Ajay Mathur
Director General, TERI



The online issue of the August 2020 issue of *TerraGreen* is quite a pertinent one. The authors of the cover story are very correct in saying that nature has remained a silent spectator, tolerating the arrogant and defying attitude of the humans for much too long. But when this hegemony and high handedness reached the brim, nature could not take it anymore and now has started paying in the same coin. It is very sad that humans have been consuming those animals that harbour different types of pathogens. Thanks for such analytical articles that help us in self-introspecting.

Anil Chaudhary
Vadodara, Gujarat

I enjoyed reading the August 2020 issue of *TerraGreen*. The article published in the Wildlife section highlights Laxmirani's chronicles as lessons in learning the interrelationships between resilience, food security, coping and

adaptation in avoiding trade-offs, and creating synergies. In the Special Report published in this issue, the author rightly stresses on how art can facilitate a transition process towards a more sustainable future. And how would the diffusion of experience and South-South cooperation provide added value to the construction of more stable societies. The recently celebrated World Environment Day and the World Day to Combat Desertification and Drought are not mere celebrations. They are rather platforms that will help us define our stance on relevant environment matters and provide us with an opportunity to broaden the basis for a learned opinion in preserving and augmenting the environment.

Gayatri Kumar
New Delhi

I liked reading all the articles published in the latest issue of *TerraGreen*. The Feature story published in this issue is quite interesting. The ongoing pandemic situation can be utilized to test whether wastewater-based epidemiology (WBE) can act as an effective technique to observe and manage public health globally. WBE can be an important tool as most infections are thought to be asymptomatic or undiagnosed infections. WBE can provide critical knowledge on identification of hotspots and understanding the dynamics of the infection thereby alerting the public health community to take up effective preventive measures.

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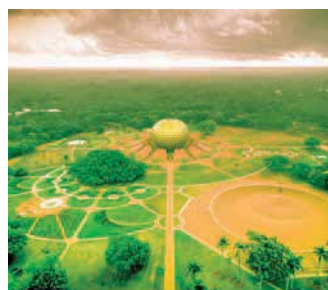
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Scientists Recommend 40 Per Cent Humidity in Public Buildings to Curb COVID-19

In addition to measures like social distancing and wearing masks, an Indian-German team of scientists recommend controlling indoor humidity conditions to contain the spread of the novel coronavirus. The researchers, including those from CSIR National Physical Laboratory in New Delhi, said in order to contain the pandemic, it is extremely important to implement standards for indoor air humidity in rooms with many people, such as hospitals, open-plan offices, or public transport. In their review of studies, published in the journal *Aerosol and Air Quality Research*, the scientists specifically drew focus on relative humidity, which is a measure of water vapour in the air compared to the total saturation of vapour that can exist in the air at its current temperature.

Source: <https://www.deccanherald.com/>

Environment Ministry Creates 19 Integrated Regional Offices

The Union Ministry of Environment, Forest and Climate Change (MoEFCC) has issued a notification recently regarding the reorganization of regional or sub-regional offices of various authorities into 19 integrated regional offices (IROs) of the ministry across the country. The IROs will be established with the redeployment of resources from 10 regional offices of ministry; three regional offices of the Forest Survey of India (FSI); three regional centres of the National Tiger Conservation Authority (NTCA); four regional offices of the Central Zoo Authority (CZA), and five regional and three sub-regional offices of the Wildlife Crime Control Bureau (WCCB).

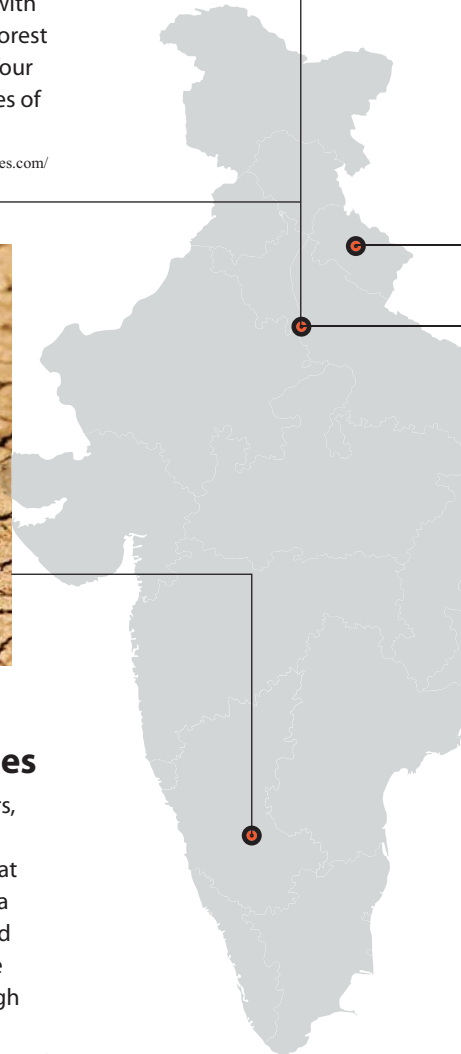
Source: <https://www.hindustantimes.com/>



Climate Crisis to Take a Larger Toll on Some Butterfly Species

Some butterfly species are more prepared to survive displacement from their habitats than others, a new study by researchers from Bengaluru's National Centre for Biological Sciences (NCBS) has said. The study, which was published in Royal Society's *Biology Letters* recently, has also warned that loss and fragmentation of habitats through urbanization, agriculture, and climate crisis may take a heavier toll on other species. Some butterfly species disperse for several hours or days to find food or breeding grounds. The researchers found that increased flight burden puts additional pressure on the egg-carrying female butterflies, which are physiologically less prepared to navigate through unknown fragmented habitats in search of larval host plants.

Source: <https://www.hindustantimes.com/>





Receding Glaciers in Nanda Devi Region Affecting Lifestyle, Agriculture

The changes in glaciers in the Nanda Devi region of Central Himalayas in Uttarakhand in the last three decades have majorly affected the lifestyle, culture and agricultural practices of people living in nearby villages, says a study carried out by experts from major institutes including IIT Kanpur, Wadia Institute of Himalayan Geology (WIHG), Uttarakhand Space Application Centre (USAC), and HNB Garhwal Central University in Uttarakhand. The research conducted on the 'changes in glaciers and associated drivers for the last three decades, Nanda Devi region, Central Himalayas' was done by studying the state of glaciers from 1980 till 2017 through extensive ground surveys and satellite imagery.

Source: <https://www.hindustantimes.com/>

Centre to Launch Project Lion, Dolphin

Prime Minister Shri Narendra Modi has announced that the government would soon launch programmes to conserve India's lion and dolphin population on the lines of Project Tiger and Project Elephant. A report released by the Ministry of Environment, Forest and Climate Change earlier this year had flagged an increase in the number of Asiatic lions in Gujarat's Gir forest from 523 in 2015 to 674 in 2020. This period also witnessed a distributional increase in the lion population—from 22,000 sq. km in 2015 to 30,000 sq. km in 2020.

Source: <https://indianexpress.com/>



Forest Dept. Officials Rescue Rare Animals During Lockdown

West Bengal State forest department has recovered many rare birds, snakes and other animal species in Burdwan (W) in the state during lockdown when creatures began reclaiming their lost space without human activities. Talking to *The Statesman*, Milon Kanti Mondal, divisional forest officer (DFO) of Durgapur, said, 'In the past few months since the lockdown period started, our forest department has rescued and saved nine pythons, two falcons, three eagles, big turtle, three big and rare owls, rare sand boa, krait, cobra, Russel viper, monkey, etc. Most were injured. Birds have been treated and released in the dense forest parts.'

Source: <https://www.thestatesman.com/>



Greenland Ice Sheet Has Melted to a Point of No Return

Researchers claim that Greenland's glaciers have shrunk so much that the ice sheet would continue shrinking even if global warming were to stop today. The findings have been published in the journal *Nature Communications Earth and Environment*. Michalea King, the lead author of the study claims that Greenland's ice sheet dumps more than 280 billion metric tonnes of melting ice into the ocean each year, making it the greatest single contributor to global sea level rise. The researchers found that, throughout the 1980s and 90s, snow gained through accumulation and ice melted or calved from glaciers were mostly in balance, keeping the ice sheet intact.

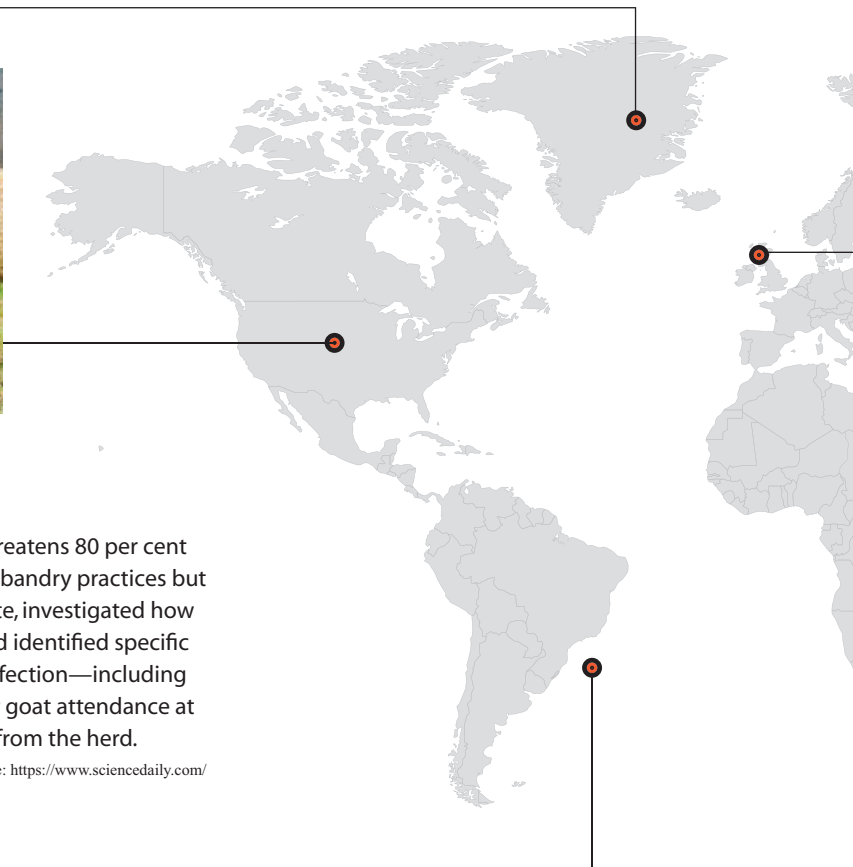
Source: <https://m.dailyhunt.in/>



Reducing Transmission Risk of Livestock Disease

The risk of transmitting the livestock virus PPRV, which threatens 80 per cent of the world's sheep and goats, increases with certain husbandry practices but not herd size. A new study, led by researchers at Penn State, investigated how transmission of PPRV might change at different scales and identified specific husbandry practices associated with increased odds of infection—including the introduction of sheep and goats to the herd, sheep or goat attendance at seasonal grazing camps, and the sales or gifting of goats from the herd.

Source: <https://www.sciencedaily.com/>



Agricultural Pesticides Can Affect Prawns and Oysters

Researchers from the University's National Marine Science Centre have demonstrated that imidacloprid, a neonicotinoid insecticide, can impact the feeding behaviour of prawns in a laboratory environment, leading to nutritional deficiency and reduced flesh quality.

'The sobering thing with this study is that it shows that the exposure of prawns to high concentrations of neonicotinoids can have such a significant impact,' said lead author and PhD candidate Peter Butcherine whose study focussed on adult black tiger prawns. This latest study builds on Peter's earlier work reviewing the risk of neonicotinoid exposure to the shrimp aquaculture industry where he identified a significant problem with these water-soluble pesticides increasingly being detected in coastal waters worldwide.

Source: <https://www.sciencedaily.com/>





Air Pollution in Ireland Associated with Strokes

Scientists have found that air pollution in the winter is associated with more hospitalizations for all strokes in Dublin, Ireland. The study, led by researchers from RCSI University of Medicine and Health Sciences, is published in the current edition of *Cerebrovascular Diseases*. During winter months in Ireland, particularly in Dublin, higher levels of fine particles, coarse particles, sulphur dioxide, and nitrogen dioxide are found in the air. The sources of these are solid fuel burning, such as coal, peat, and wood, as well as road traffic, especially diesel engines. After accounting for other variables, such as temperature, humidity, the researchers found that there was a statistically significant rise in the number of hospitalizations for strokes in Dublin after a rise in air pollution.

Source: <https://www.sciencedaily.com/>



Nutrients Make Coral Bleaching Worse

A new study shows nutrients can aggravate the already negative effects of climate change on corals to trigger mass coral bleaching. Coral reef environments are typically low in naturally occurring nutrients such as nitrogen and phosphorus compounds. But ocean currents passing by can bring in a concentration of nutrients from elsewhere. Similarly, nutrients from human-made fertilizers and stormwater runoff enter reefs from adjacent coastlines. Lead author Dr Thomas DeCarlo from the King Abdullah University of Science and Technology (KAUST) says corals are sensitive to high levels of nutrients. 'As the climate warms, mass coral bleaching could occur as often as annually within this century,' Dr DeCarlo said. 'In our study, we found that already heat-stressed corals exposed to excess nutrient levels were even more susceptible to bleaching.'

Source: <https://www.sciencedaily.com/>

Global Impact of Wildfires to Intensify Due to Human-Induced Climate Change

The global economic and environmental impact of wildfires is likely to worsen as a result of human-induced climate change and land-use patterns, according to a team of international fire researchers. In a paper published in the journal *Nature Reviews: Earth & Environment*, the researchers describe global and regional trends in fire activity and project what is expected to come down the pipeline in the future. Fire has been a natural feature of the Earth system for the last 420 million years and has shaped the evolution of plants, animals, and natural and chemical processes, says University of Tasmania Professor of Pyrogeography and Fire Science David Bowman.

Source: <https://www.miragenews.com>



Flood Control to Flood Management

Shifting Focus

Floods in India have become an annual occurrence which abolishes lives and livelihoods. In this article, **Mayuri Phukan** and **Niyati Seth** say that there is an urgent requirement of conducting scientific studies that look at the nexus of hydrometeorological, economic and social dimensions related to floods. Flood management strategies should consider the river basin conditions and policy guidelines should incorporate adaptation measures in consultation with different stakeholders.

Floods destroy villages, croplands and basic infrastructure (transport, healthcare, communication network, etc.), thereby impacting the Gross Domestic Product (GDP) of the country. This year, the flooded regions of the country had to battle twin disasters of flood and COVID-19. As on July 2020, at least 11 million people have been affected by floods in the states of Assam and Bihar and 352,000 people have been displaced.¹ The most flood-prone region of the country is the Indo-Gangetic-Brahmaputra River basin, which carries about 60 per cent of the total river flow in the country.² According to an estimate by the Planning Commission in 2011, 49.8 mHa out of a geographical area of 329 mHa of India is prone to floods.³ Flooding is a regular occurrence in the terai region of Himalayas and Brahmaputra valley—the multiple river systems that flow from hills of Nepal to north Bihar and Brahmaputra that flows from Tibet and its tributaries. The region receives high volume of rainfall and is susceptible to erosion, which further reduces carrying capacity of the river channels.

Studies have observed a significant increasing trend in the frequency of rainstorms in the last 65 years (1951–2015) in India and the duration of rainstorms have increased by about 15 days during this period. This increasing rainfall intensity causes extreme flood events, which causes large-scale destruction.³ Rise of such extreme events can be attributed to the impact of climate change; the rise in temperature is a result of increase in atmospheric greenhouse gases (GHGs) which has also led to changes in characteristics of rainfall.

The response to flooding has majorly been construction of embankments to seek protection from spillage of water. However, such structural measures are not entirely effective in controlling floods. Further, when a heavily silt laden river is embanked; alluviums are prevented from being deposited to flood plains, while also leading to successive rise of the riverbed. Embankments also isolate river systems from open water bodies and wetlands that were natural storage areas for flood water. Thus, severity of flood damages increases due to breach in embankments. The question



of lost accountability, corruption and role of vested interests surfaces which questions the quality of the constructed embankments. The problem of flooding and drainage congestion is also getting accentuated due to large-scale encroachment of flood plains of the rivers for habitation and various developmental activities.

Analysis of data for the period of 1953–2016 by Central Water Commission

¹ <https://reliefweb.int/disaster/fl-2020-000164-ind>

² https://www.nrsc.gov.in/sites/default/files/pdf/ebooks/Chap_12_FloodDisasterManagement_p1.pdf

³ Karuna Sagar, S., Rajeevan, M., and Vijaya Bhaskara Rao, S. (2016). On increasing monsoon rainstorms over India. *Natural Hazards*, 85(3), 1743–1757. doi: 10.1007/s11069-016-2662-9

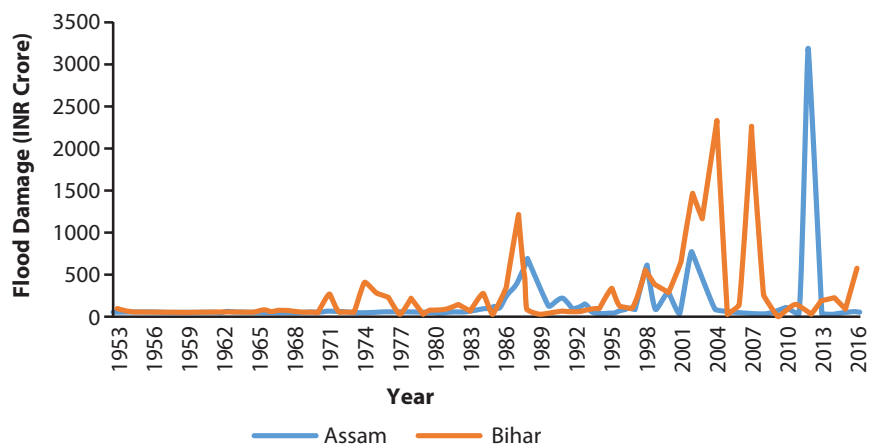


Figure 1: Flood damage during 1953–2016 (Source: CWC)

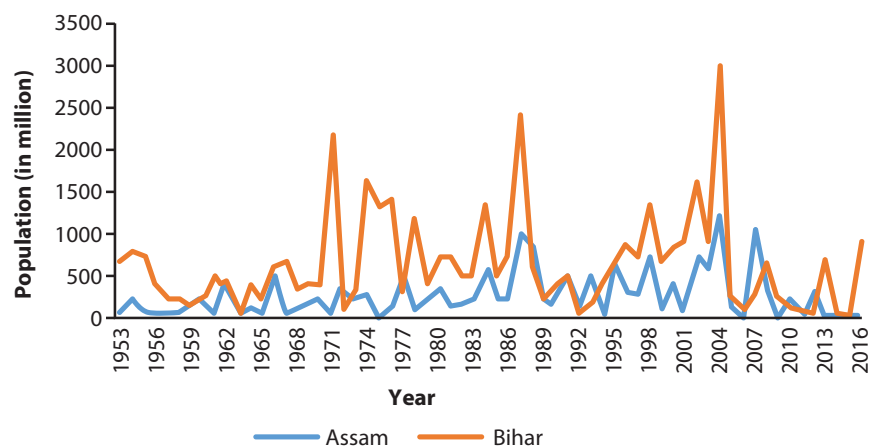


Figure 2: Population affected by flood during 1953–2016 (Source: CWC)

for the states of Assam and Bihar has shown an increasing trend in the total damage caused by floods including damage to crop, houses, and public utilities. The highest damage reported for the two states were ₹3200 crore in 2012 for Assam and ₹2310.65 crore in 2004 for Bihar. In 2004, both the states reported the highest number of people affected by floods, that is, 12.637 million and 29.985 million for Assam and Bihar, respectively.

For managing flood disaster, the Government of India had constituted the Rashtriya Barh Ayog (RBA) in 1980, which observed that increase of flood was due to anthropogenic factors and made 207 recommendations for flood management. It laid the responsibility of timely evaluation of flood management

projects to State irrigation and flood control departments.⁴ However, an Expert Committee set up in 2001 to review the implementation of the RBA recommendations mentioned that flood assessments have not been conducted or at best, partially conducted by State Governments. Most of the recommendations provided by RBA are also yet to be implemented.⁵ The Central Government has also invested in weather forecast technologies under the mandate of National Disaster Management

⁴ <https://www.downtoearth.org.in/blog/governance/what-happened-to-india-s-flood-management-plan--72405>

⁵ <http://whrm-kamoto.com/assets/files/TARUN%20MINORU%20ICHARM%20REOPRT%20ON%20INDIAN%20FLOOD%20MANAGEMENT%20INSTITUTIONS%20JANUARY%202015.pdf>

Authority (NDMA). The State Disaster Management Authorities (SDMA) perform functions related to disaster management including flood relief measures at the state level. However, there is a requirement of a transition from flood control to flood management in the policy space.

There is also a need to learn from the international examples for better flood control measures. One such measure is the system in Ladybower Reservoir in Derbyshire, England. The Reservoir has a shaft spillway that acts as an overflow duct and it ends in an outlet tunnel; it transfers the excess water in the reservoir to avoid flooding. However, such flood control measures adapted from international examples should be modified according to the river basin conditions in India.

Thus, there is an urgent requirement of conducting scientific studies that look at the nexus of hydrometeorological, economic and social dimensions related to floods. Flood management strategies should consider the river basin conditions and policy guidelines should incorporate adaptation measures in consultation with different stakeholders. Catchment-based solutions also have the potential to minimize the destruction caused by floods. The focus should move from construction of embankments and reservoirs in large river basins as they have been found to intensify flood in downstream regions. Rivers are required to be connected to the floodplains to allow absorption of excess flood water and hence constructions, commercial activities and flood plain degradation should be discontinued. It is also required to look at international case studies and build a framework for incorporating flood management measures by adapting to Indian conditions. The community should be mobilized for effective utilization of flood early warning systems. It is time to follow policy over politics, when it comes to flood management in the country. ■

Mayuri Phukan and Niyati Seth, Water Resources Division, TERI, New Delhi.

Grilling About Spilling

New Research Renews Hope

May 29, 2020 is a day which will live in infamy in Russian environmental history. The leak of more than 20,000 tonnes of diesel from a power plant in Norilsk, Russia turned the Ambarnaya River crimson. More perturbing, environmentalists warn, is that the river culminates in the ecologically fragile Arctic Ocean. The massive oil spill, the most voluminous and disastrous of its kind in the region, has coerced the Russian government to issue a state of emergency, order an investigation, and ramp up cleaning efforts. Notwithstanding the clean-up measures, the fuel has now polluted



nearby pristine freshwater lakes and threatens to contaminate the Arctic. The episode has brought one of the most frequent yet widely unheeded environmental hazards into the spotlight—oil spills.

Unravelling the Statistics

Unfortunately, oil spills are more commonplace than most of you may think. A few major events receive media coverage while many go largely undocumented. The International Tanker Owners Pollution Federation (ITOPF) reports that there have been around 10,000 incidents of oil spills since 1970. In some 'hotspots', oil spills may seem more commonplace; these prime locations include the Gulf of Mexico, the northeastern US, the Mediterranean Sea, the Persian Gulf among others. The report estimates that between 1970 and 2016, approximately 5.86 million tonnes of oil were lost as a result of tanker incidents.

However, here is some news to cheer you—there has been a consistent decline in incidences of oil spills since the last few decades.

Estimating the Aftermath

It would be no hyperbole to say that the sea birds bear the brunt of the detrimental effects of oil spills. Oil spills

can penetrate into the plumage of birds, making flying impossible and removing the natural insulation and waterproofing provided by the feathers. Consequently, the birds may experience hypothermia or overheating. As birds frantically preen their feathers to restore their natural protections, they often ingest oil, which can severely damage their internal organs and lead to death. To give you an estimate of the toll oil spills can take on marine life, the 1989 Exxon Valdez oil spill in Alaskan waters is estimated to have killed 250,000 seabirds.

Oil spills may also harm nesting grounds, potentially jeopardizing entire species. The 2010 BP Deepwater Horizon offshore oil spill in the Gulf of Mexico, for example, occurred during prime mating and nesting season for many bird and marine species, such as the sea turtle, and its repercussions are hard to gauge. The spill also heavily stressed coral reefs within a 12 km radius. Though oil spills primarily and severely affect animals within close proximity to the site of spill, other areas miles away from the epicentre may well feel the heat.

Marine animals are ravaged by oil spills as well. Oil can clog the blowholes of whales and dolphins, making it impossible for them to breathe properly and disrupting their ability to communicate through echolocation. Oil can coat, in a manner similar to seabirds,

the fur of otters and seals, leaving them vulnerable to hypothermia. Exposure to oil can affect fish's fins, respiration, and reproduction. Even if marine animals emerge unscathed from the immediate effects of an oil spill, they may succumb to the wider consequences. If a small prey fish poisoned by oil is consumed by its predator, the predator is subject to risk. And you can only imagine the cascading effect on the food cycle. Here too, the stats say it all: The Exxon Valdez oil spill exterminated 2800 sea otters, 300 harbour seals, and up to 22 killer whales. In the aftermath of the Exxon Valdez spill, scientists noted higher death rates and stunted growth among sea otters and other species affected by the spill.

Foiling the Spoil

As with any other human-induced environmental hazard, the panacea to oil spills lies in prevention of oil spills. Although oil spills are mostly accidental in nature, they can be averted by routine check-ups to detect sources of leak and adherence to standard practices. How to handle an oil spill? There are some methods to clean the sea after a spill, the choice of which depends on the site and quantum of the spill.

Your oil spill kit must include:

- **Oil booms** are the most popular equipment to deal with oil spills. They can effectively fence the oil and restrict the oil from drifting away further. However, it does have its bag of drawbacks. It can be employed only when the radius of the spill is small and the sea is smooth (no tides, no waves).
- **Skimmers** act more or less like vacuum cleaners sucking up oil from the surface of water, but the presence of debris in water poses a stumbling block as debris can clog the skimmers.
- **Sorbents** are materials that simply soak up the oil by either absorption or adsorption. They are highly efficient but can become too dense by absorbing oil to float on water. This



makes their retrieval a weighty task.

- **Dispersants** can be used as the last resort. Dispersants affect the disintegration of oil. Once broken down, the oil molecules are in a position to chemically bond with water. The resultant molecule can be readily degraded by microbes underwater. Reiterating that they are to be used only when all other options have been exhausted because they can have sinister effects on marine life especially corals and seagrass due to their toxicity.
- **Burning** the floating oil can remove 98 per cent of the oil spilt. However, this comes at enormous environmental costs with toxic fumes engulfing the location of spill. The method is advocated only when the thickness of the slick is more than 3 mm.

Cleaning up oil spills which occur in regions with difficult climatic conditions, such as the Arctic, can be quite gruelling.

New Research Renews Hope

As you may have reasonably inferred, none of the approaches mentioned above is sustainable or flawless. However, a research by a team of researchers at Northwestern University proposes a solution that surmounts most of the inefficacies of the discussed methods and promises to be a game changer.

A team from Northwestern University has developed a highly porous smart sponge that can selectively soak up oil spills in water. The speciality of the sponge is inherent in its ability to absorb more than 30 times its weight in oil. After squeezing the oil out of the sponge, the sponge can be reused multiple times without losing its effectiveness. It could absorb oils of different densities and viscosities, and tests conducted mirroring natural conditions have proven its efficacy. How does it do the trick? The key to its smartness lies in a nanocomposite coating of magnetic nanostructures and a carbon-based substrate that is oleophilic (attracts oil), hydrophobic (resists water), and magnetic (OHM). The application of the OHM coating to any cheap commercially available sponge converts the sponge into a smart sponge that has selective affinity for oil.

As recent history has shown repeatedly, oil spills, such as the one in Norilsk, could spell catastrophe for our planet. The only silver lining is that the number of such happenings has been on the slump. Oil spills are here to stay until the trade of oil is totally eliminated. This could happen only when the whole world is powered by renewable energy. ■

Article contributed by Karthik Ramakrishnan, who is an avid science reader and writer based in Mumbai. His subjects of environmental interest include bleaching of coral reefs and development of renewable energy.



Making Space for Nature in Our Cities

Promoting Urban Biodiversity and Landscape

The continuous urban area expansion is causing a direct impact on nature in terms of biodiversity loss and environmental degradation due to changing urban landscape and natural habitats. Here, **Pratiksha Baruah** says that urban biodiversity is crucial not only for a proper functioning of ecological processes, but also for the capacity of the urban area to absorb changing ecological conditions. Urban lakes are important part of urban ecosystem that perform significant environmental, social and economic functions, ranging from being a source of drinking water, recharging groundwater, supporting biodiversity, and providing livelihoods.





Globally, towns and cities are rapidly growing in area and population. If current trends continue, the global urban population is estimated to be 6.3 billion with more than 60 per cent of the projected area to be urban by 2030 as predicted by the United Nations. High proportion of built-ups and impervious surfaces like roads, concrete playgrounds, etc., as a result of urbanization induces a profound pressure on natural resources, especially on protected areas, natural forests, water bodies, hills and other spaces with rich ecological values. Studies reveal that in 2005, cities occupied 2 per cent of the earth's surface, but the inhabitants used 75 per cent of the planet's natural resources.

Therefore, it is inevitable that life on earth would not be possible without nature's services. It is time that we all rethink about how growing cities are continuously affecting biodiversity with urban land development and increasing population. Even though cities only account for approximately 3 per cent of the earth's surface, they are often located at important ecosystem junctions or in areas of high pre-

development biodiversity. Urban areas with rapid human-caused changes to local ecosystems are accepted as a major driver of biodiversity change at various spatial scales. Presently, around 35 per cent of India's population is urban. This situation of overpopulation along with other developmental activities for the better living exerts ever-increasing pressure on the country's environment. For instance, the removal of vegetation cover in the forest area and exposed surface as a result of growing constructions on the hills in the Guwahati city in Assam has led to issues, such as soil erosion, water logging, flash floods, and dusty environment on sunny days. Statistics show that 8 per cent of terrestrial vertebrate species have been labelled as endangered as a result of rapid urban development. Introduction of exotic species into some habitats has had devastating impact on the native biodiversity. Exotic or non-native species to an ecosystem introduced by humans have exterminated and dispersed the native species. In the biodiversity rich Western Ghats of India, vast plantations of eucalyptus and wattle were raised by converting grasslands and shola forests

disturbing the original habitat of the Nilgiri tahr that led to their frequent visits to the towns in Tamil Nadu because of the non-availability of food plants due to extensive plantations of alien species. Pollution is another major and growing threat to biodiversity, with devastating effects on freshwater and marine habitats. Urban wetland degeneration as a result of urbanization is described as a noteworthy problem in Guwahati that is resulting into shrinking of Ramsar site—Dipor Beel wetland and other wetlands in the city by encroachment, natural siltation, earth filling, and garbage dumping.



Need

It is important to highlight that urban biodiversity is crucial not only for a proper functioning of ecological processes, but also for the capacity of the urban area to absorb changing ecological conditions. Urban biodiversity is the variety and variability among living organisms found in a city and the ecological systems in which they occur. Biodiversity, or biological diversity makes up life on the earth. It encompasses around 8 million species on the planet that ranges from plants and animals to fungi and bacteria and the ecosystems that house them. Making cities engaged with nature sustains life of city dwellers and offer ecosystem services in myriad number of ways. By incorporating environmental spaces with plants and water courses, we can establish urban ecosystem services.

Both network of green spaces and aquatic ecosystems play a crucial role by providing habitats to numerous endemic, migratory and endangered species as well as provisional services to urban dwellers. Urban landscapes may consist of a diversity of terrestrial and aquatic ecosystems that harbour rich biodiversity. Terrestrial spaces may include roadside greenery, vegetation or tree canopies, meadows, green trails, grasslands, landscaped gardens, and urban agricultural lands. Preserving aquatic features of high biodiversity like lakes, wetlands, bio-swales, swamps, streams, natural drainage systems, backwaters, mangroves, coral reefs and rivers within the urban landscape, play a major role towards an efficient ecological and biodiversity-related performance of urban development. Public spaces and recreational areas like community gardens, urban forests and natural wildlife areas, biodiverse playgrounds, ponds, pools, hedges, flowers under tree canopy, river banks, butterfly paradises will contribute to a healthy living environment for wildlife and people, as well as to pleasant, relaxing living



environments that encourage exercise and play.

Urban agriculture can play an important role as an urban biodiversity for food security, especially during economic and political crises. Auroville Urban Farming located at the city centre of Auroville, Tamil Nadu, is a great example of how a city has built a deep harmony with nature. It addresses innovative concepts as integral landscaping, rooftop gardening, agroforestry, grey-water system recycling, participative and community building efforts. Another example is the Yamuna Biodiversity Park, on the flat of alluvial plains of the River Yamuna in Delhi. It is a biologically-rich landscape of grassland communities, a wide variety of fruit yielding species of plants, a rich repository of medicinal herbs, and native locally extinct century old flora and fauna. Urban lakes are important part of urban ecosystem that perform significant environmental, social and economic functions, ranging from being a source of drinking water, recharging groundwater, acting as sponges to control flooding,

supporting biodiversity and providing livelihoods. Kaikondrahalli Lake in Bengaluru is a unique example which was restored using a socially inclusive model that was once on the verge of extinction and has been ultimately restored with clean water flowing in. Around 37 bird species, including migrant birds, have been spotted at the lake. One of the most widely cited examples of the importance of functioning ecosystems for city water supply is the New York City Watershed. This watershed is one of the most important natural resources and also the largest unfiltered water supply in the United States, providing approximately 1.3 billion gallons of clean drinking water to roughly nine million people every day.

Biodiversity in cities also helps in regulation of ecosystem processes such as urban temperature regulation, noise reduction, air purification, runoff mitigation and pollination, pest regulation, and seed dispersal and waste treatment. Ecological infrastructure like water areas and vegetation in cities regulates local temperatures and buffers the effects of urban heat islands. Urban soil and vegetation belts have the ability to attenuate noise pollution through absorption, deviation, reflection, and refraction of sound waves. As air pollution from transportation, industry, domestic heating and solid waste incineration is a major problem for environmental quality and human health in the urban



environment, promoting and protecting vegetation cover in urban systems can improve air quality by removing pollutants from the atmosphere.

With climate breakdown affecting the environment, ecological features have a capacity to adapt to its consequent challenges for cities. Healthy wetlands and other aquatic ecosystems protect communities from catastrophic flooding by absorbing floods. The aquatic ecosystems also act as natural barriers to cities from storms, heat waves, sea-level rise and play a crucial role as freshwater reservoir in drought-prone areas. Vegetation cover and its underlying soil reduce surface runoff by intercepting water through the leaves and stems.

Furthermore, ecosystems like wetlands filter out and decompose organic wastes from urban effluents by storing and recycling waste through dilution, assimilation, and chemical re-composition. Likewise, plant communities can play an important role in the decomposition of many labile and recalcitrant litter types. In urban streams, nutrient retention can be increased by adding coarse woody debris, constructing in-channel gravel beds, and increasing the width of vegetation buffer zones and tree cover.

Pollination and seed dispersal are important processes in the functional



diversity of urban ecosystems. However, habitat loss and fragmentation due to urban development and expansion is causing threat on the pollinators such as insects (bees, wasps, moths, butterflies, flies, beetles), hummingbirds, perching birds, etc. Therefore, green spaces like community gardens, private gardens and urban grasslands are important source areas that can enhance the diverse communities of species, which in turn enhance seed dispersal.

At the same time, maintaining healthy biodiversity contributes significantly to the resilience of a city in the face of climate emergency thus managing greenhouse gas emissions. Trees in cities act as carbon sinks by storing

excess carbon as biomass during photosynthesis that can potentially slow down the accumulation of atmospheric carbon in urban areas. Biodiversity parks, theme gardens and parks are good public spaces within cities that can have massive numbers of tree covers that can help both environmentally and economically. Cultural and economic benefits earned from an urban landscape include recreation services, thereby enhancing human health and well-being and aesthetic services that may form an identity to the region.

Way Forward

But the good news is that, *better late than never*, we still have a chance to reverse the trends of biodiversity loss by reimagining our relationship with nature and taking steps to increase ambition and accountability for further urban environmental protection. Local governing bodies like Municipal Corporations and State Biodiversity Boards should step ahead for preparation of City Biodiversity Index (renamed as Singapore Index on Cities' Biodiversity, or Singapore Index) as a monitoring tool for evaluation of their progress in urban biodiversity conservation and also preparation of natural asset maps showing blue-green infrastructure of the cities to strengthen integration of biodiversity management at all levels of governance and communicate the



significance of ecosystems to the city dwellers.

Cities have been called 'one of mankind's greatest inventions'. However, instead of being blindsided by the increasing detrimental implications of ongoing rapid urban expansions, we should consider it as a fleeting opportunity to act in a way that safeguards the urban ecosystems critical for human and overall environmental well-being. Effective integration of local governments through protection of biodiversity and ecosystem services in their planning efforts can help tremendously in creating and protecting natural habitats in cities. Natural ecosystems harbour more species than disturbed or manmade landscapes, hence, there is a need to protect natural areas which includes natural water bodies, river, dense green areas, natural grasslands and open spaces, in a city for a sustainable urban biodiversity. While according to the Ministry of Environment, Forest and Climate Change (MoEFCC) guidelines, a city should have 33 per cent green cover of its total area, Pimpri Chinchwad Municipal Corporation (PCMC) has prepared its City Biodiversity Index showing an appreciable rate of 30.2 per cent of natural areas. It is recognized that the fragmentation of natural areas affects different species differently. For example, a road may not be a barrier for birds but it can seriously fragment a population of arboreal primates. Furthermore, to encourage positive action to increase connectivity or reduce barriers to connectivity, it would be more meaningful to measure connectivity rather than fragmented plots. Hence, different patches of natural areas like agriculture, dense green areas, gardens, grasslands, open patches, river and water bodies, can be considered as connectivity measures or ecological networks to counter habitat fragmentation.

Governance and management towards the maintenance and enhancement of biodiversity by city administration is another important



component to ensure the maintenance and enhancement of biodiversity in cities. Immediate focus should be given by local bodies on the total budget of the city to biodiversity-related administration as a representation of the city's commitment towards environmental stewardship. The cities also need to increase the number of outreach programmes, biodiversity-related institutions such as zoological parks, floral recreational gardens and bird boards, medicinal plants gardens, etc., that will strengthen the institutional capacity and enhance biodiversity conservation in a city through public awareness and education.

Kochi Municipal Corporation prepared an urban biodiversity map as a visual interpretation of the existing urban ecosystems and key animal and plant species to communicate the richness of the city's biodiversity to its inhabitants. The infrastructure mapped includes rivers, estuaries, wetlands, beaches, backwaters and ponds, cultivation lands, mangrove patches, home gardens, playgrounds, open spaces, inland fisheries, hill forests, and marshlands. While drawing attention to the fact that even urban landscapes have their own biodiversity, the map is the first step towards preparing a local biodiversity strategy and action plan for Kochi. The GIS-based survey is also a need of the hour within city limits that identifies ecologically sensitive and biodiversity-

rich areas along with pictorial handbooks on species of trees and labelling of trees as part of biodiversity conservation initiatives.

At an individual level, we can also help integrating biodiversity in our surroundings by making permanently available resting sites for the species. We can equip special recessed nesting bricks, stacked bricks, bio-swales, gardens, green roofs and green façades to enrich the urban landscape with biodiversity and promote health and well-being through recreation. They provide an excellent surface habitat for a wide range of plants and have a lot to offer mammals, birds and insects as very substantial contribution to biodiversity. Green roofs and façade garden are a perfect solution for recovering rainwater and the plants that have been planted are a source of food such as nectar, pollen or berries, nesting sites for birds, making a substantial contribution to biodiversity.

For a megadiverse country like India enriched with different ecosystems and presently where the government has taken major national level initiatives towards securing environmental conservation, it is much needed to contribute towards strengthening the biodiversity conservation across our cities. ■

Pratiksha Baruah is Architect, IGBC Accredited Professional and Urban Planner, IPE Global Ltd, Shillong Smart City Project, India.

“India Could Pave the Way for Sustainable Air Conditioning Systems”

Mr **Atul Bagai** is Head of Country Office (India), United Nations Environment Programme (UNEP). Here, he is in an exclusive conversation with **Abhas Mukherjee** for *TerraGreen* magazine.



Ozone depletion is gradual thinning of Earth's ozone layer in the upper atmosphere caused by the release of chemical compounds from industry and other human activities. Could you elaborate on how dangerous this phenomenon is, keeping in mind our future on planet Earth?

This question was a key concern for the whole world and its political hierarchy in the early 1980s. That was a time when science had informed the world that ozone depletion can lead to drastic health effects—not only for humans, but also for other terrestrial and ocean life. Two of the great health impacts which were found to be increasing as a result of ozone depletion were skin cancer and eye cataracts. That sent an alarm notice, especially in the developed world, as its impact was primarily in the colder climates, and led to the signing of the Vienna Convention and the Montreal Protocol. The projected impacts were huge, but fortunately timely action in the 1980s led to addressing of these issues through the successful Montreal Protocol. In fact, there were studies done which showed that skin cancer and cataract cases have drastically come down in the countries which were supposed to have been impacted, and the hospital costs saved run into hundreds of millions of dollars. So both from the impact perspective and the mitigation perspective, the Montreal Protocol has been a very successful environmental agreement.

Talking about building the capacity of subregional networks in Asia and enabling them to meet the compliance targets under the Montreal Protocol. How was your experience regarding this in your capacity at UNEP?

When you ask countries to bring in new technologies and phase out older technologies, there are many issues which impact the adaptation and implementation, especially in the developing world due to the enormous

costs associated with the process. In technology transfer, the main costs are those which are associated with the costs of technology and implementation strategy. In the Montreal Protocol, a very successful innovation was brought in light in the beginning (almost in the early 1990s), of seeing how capacity building can motivate technology transfer, and how it can help in the seamless transfer of technology from the developed world to the developing world. Doing this was important because it would have an impact on not only the socio-economic conditions, but also on the technology handlers and consumers in countries. A very effective approach proposed by Sweden was of forming small networks of stakeholders from the governments, sub-regional or regional wise. The very first network was started in South-East Asia, and it was such a successful approach that within the next 5–6 years there was a network of ozone officers in all the regions of the world.

The networking approach has a few big advantages. First, it gives a platform for, and facilitated, multilateral approaches (though bilateral approaches could be cumbersome). Second, it also created a platform to support developing countries, where knowledge and experiences could be shared. Third, it provided a platform for the developed countries (who were the finance and technology providers) to make the technology transfer easier, by building the capacity of the policymakers through the networks. The networks were one of the most successful components—and it was a very cost-effective method. With very little resources, the networks were able to achieve this entire technology transfer that has taken place in the refrigeration and air conditioning industry in the last 25 years.

Was India also a part of this?

South Asia was in fact the last network that was set up—all the other regions had already had their networks running for 10–15 years. The South Asia ozone



network was set up in the late 1990s, and India played a leadership role in setting up this network. Over the last 20 years, it has played a very prominent and positive role in disseminating their actions and policies and has assisted the South Asian countries in building their policies for impact on ozone depletion. So yes, India has certainly played a very important role.

Could you talk a little about the recently launched Cool Coalition?

In the developing world, cooling demands are going to increase enormously, and there is an urgent need to bring in energy-efficient technologies. It is a battle that needs to be fought on two fronts—first, on how to meet the increasing cooling demand through new technologies which are sustainable, and the second is on how this increase (that is going to definitely come) can be made more energy efficient. In order to bring governments, businesses, and civil society together to come up with effective solutions, the UNEP-led Cool Coalition was launched. We are looking at promoting and making businesses aware of the best practices that can be adopted in this regard. One of the best practices which is right now being promoted is the development of the India Cooling Action Plan which the Government of India has brought out. India was likely the first country in the world to have come up with a very strategic and holistic National Cooling Action Plan. This is an approach

which not only strategizes on how you are approaching the cooling demand of the next 20–30 years, but also focuses on finding solutions which are very energy efficient. This best practice is something through which India can show its leadership by disseminating that to other developing countries. We are hoping that through the Cool Coalition we will be able to support dissemination of India's learnings and experience.

The India Cooling Action Plan (ICAP) has set targets to reduce cooling and refrigerant demand 20 per cent to 25 per cent and cooling energy requirements by 25 per cent to 40 per cent by 2037–38. Could you talk about which strategies you think would be most suitable in helping achieve this? Are there any low-hanging fruits which would help us achieve our targets more easily?

This is an issue that should be addressed at various levels. Policy is certainly one level where this problem will need to be addressed through adequate measures. For example, strengthening the ECBC (Energy Conservation Building Code) and its implementation would be one level of intervention which would be needed. The second approach—of actually implementing the ICAP—will

be in bringing about a technological revolution in terms of bringing innovations and technologies which, are not only indigenous, but also cater to the climatic variations in a country like India. Nature-based solutions are another very big approach that need to be strengthened in the coming years in terms of how they can be found and applied for cooling, especially through urban forestry initiatives whereby creating corridors through urban areas we can reduce cooling demand. Finally, I think there needs to be a big push for behavioural change. That will be a key factor to address the growing cooling demand but in a way that limits our excessive energy use. I'll give you a small example—in households, offices, or in other complexes, the setting of cooling temperatures at 16 or 17 degrees Celsius is certainly not advisable. Behavioural change—through people getting adapted to 24–25 degrees Celsius—is the kind of policy and approach we need. In fact now, many of the air conditioning manufacturing industries are now putting 24 as a default temperature, instead of 16 and 17, and that change is going to bring in huge benefits.

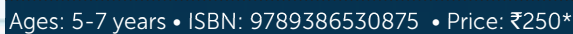
If you are looking at India, one of the low-hanging fruits is that we are one of the only countries in the world that

has experimented with one of the most environment-friendly technologies for air conditioning: Godrej's manufacturing of R290 air conditioners is actually one of the most sustainable air conditioning systems globally that you can adopt—and they have successfully brought into market almost 1.5 million such air conditioners. There are issues of safety that are often cited in the use of R290, but there is great experience that Godrej now has with manufacturing and maintaining 1.5 million such air conditioners. Another low-hanging fruit is the wide base of manufacturing that we have in India of air conditioning—if that base can adopt such new technologies, India could pave the way for sustainable air conditioning systems. A third low hanging fruit from a technology and design point of view is the very strong architectural expertise we have in this country, who can easily adapt building design to be more effective and efficient buildings that need less cooling. Finally, there is significant traditional knowledge in the building sector that we must tap into; knowledge that has been used for hundreds of years which can be incorporated by architects and designers who are building the new stock of buildings.

India and the whole world are grappling with climate change in various forms such as incidences of heat waves, cold waves, floods and so on. How do you think India can deal with such climate change pressures, especially in the context of the cooling industry?

An important first step India should take is to ratify the Kigali Amendment to the Montreal Protocol. However, that is an international legal process on which India needs to decide. India is taking major steps through a variety of policy, technology, and capacity-building interventions to address CO₂ emissions through cooling, and I think all of those can be subsumed under a very big leap which can be taken after they are able to ratify the Kigali Amendment. ■

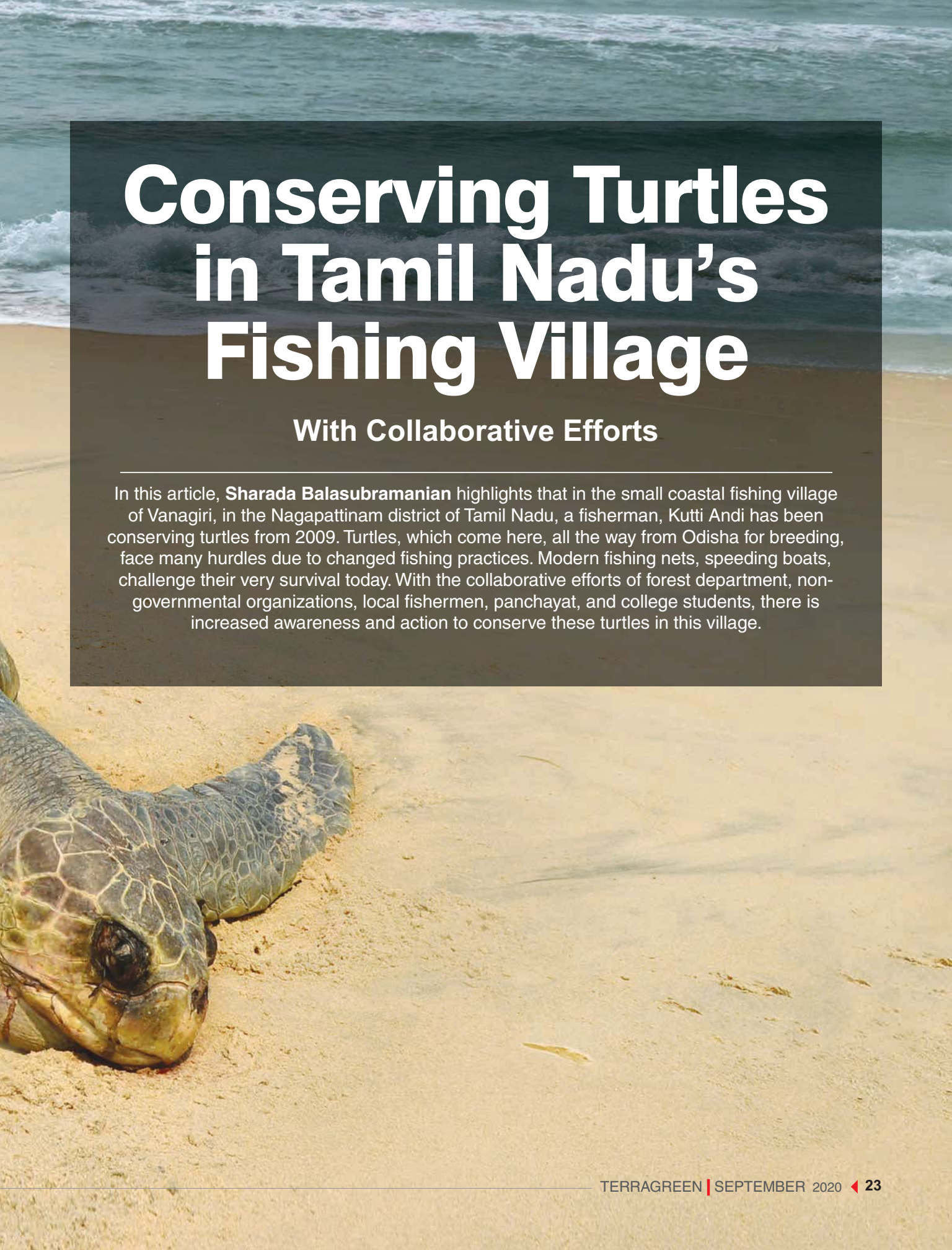




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A large sea turtle is resting on a sandy beach. The turtle's head is in the lower-left corner, facing towards the right. Its body extends towards the upper-left. The background shows the ocean with waves breaking on the shore. The text is overlaid on a dark, semi-transparent rectangular area in the upper half of the image.

Conserving Turtles in Tamil Nadu's Fishing Village

With Collaborative Efforts

In this article, **Sharada Balasubramanian** highlights that in the small coastal fishing village of Vanagiri, in the Nagapattinam district of Tamil Nadu, a fisherman, Kutti Andi has been conserving turtles from 2009. Turtles, which come here, all the way from Odisha for breeding, face many hurdles due to changed fishing practices. Modern fishing nets, speeding boats, challenge their very survival today. With the collaborative efforts of forest department, non-governmental organizations, local fishermen, panchayat, and college students, there is increased awareness and action to conserve these turtles in this village.



It is a quiet afternoon in the fishing village Vanagiri. The village is almost four kilometres from the ancient town of Poompuhar in the Nagapattinam district of Tamil Nadu. In this quaint little village, turtles come all the way from Odisha for breeding, crossing Andhra Pradesh. Swimming in high tides, the journey is long and arduous for these turtles. Enroute, these turtles face many battles for their survival. Change in fishing habits, including modern boats, fishing nets, have been major obstacles for these turtles. Changing climate also adds to this problem.

At the beach in Vanagiri, fishermen steered away their boats to anchor. There was a change in this practice too. Earlier, boat anchoring was a muscle-pulling activity, where a group of men got together, mooring away the boats. Today, heavy vehicles do this, instead.

It was January, the usual breeding season, but fishermen had not seen any turtles or their eggs. They said that their numbers have been declining every year, and also their time of arrival has been changing. They would probably be on their way here.

As one moves further away from the shore, there is a makeshift hut made from dried coconut leaves on

one corner. Here, turtle eggs were stored during the breeding season. A board from the forest department lies at the entrance—and it comes with a message that attempting to harm the turtle eggs or the hatchlings is a serious offence.

Threats to Turtles

In the east coast of India, the breeding season of turtles is between January and March. S Velvizhi, Scientist, MS Swaminathan Research Foundation (MSSRF) says, 'Day by day, due to different anthropogenic activities and climatic conditions, the turtle population is declining. When it comes to anthropogenic reasons, fishermen have less awareness. They throw away the eggs if they are in the way, without knowing. Some people even eat their eggs, and it is all wasted.'

Infrastructure development along the coast also exacerbates the issue. In Poompuhar, earlier turtles were coming in. However, to prevent erosion, boulders were placed all across the sea shore. 'The turtles hit on these boulders and die,' says Velvizhi. The turtles which earlier entered Poompuhar, have now shifted their location to another nearby village, Chinnamedu.

Apart from this, trawling and engine propeller in the boats are also hurdles. When people use trawlers, turtles are caught in those nets. Engine propeller leads to fatalities of the turtle. 'Turtles come up for breathing, and when they do that they are caught in engine propeller,' says Velvizhi. 'Turtle's carapace (the head) gets hurt by boat propellers. Some turtles, when they arrive at the shore, are hurt,' says Selvaganapathy, who heads the community mobilization arm of MSSRF. That is not all. Plastics are another threat, and here is why. Jelly fishes float along the waves of the sea. The turtles consume these jelly fishes. When plastic is thrown in the sea, turtles consume this, thinking it is jelly fish. They eat them, and die.

Selvaganapathy is a witness to this. He says, 'I have seen many mortalities. I even have many photos of such turtles. When the death happens, forest department investigates. When we did post-mortem, cut them open, we found plastic inside the turtles.' Kutti Andi, a fisherman adds, 'In the last 2-3 years, many steamer boats are going into deep sea. Because of that, dolphins, turtles, and big fishes are all hit. In the last 10-11 years, destruction has increased, from whatever I have seen.' Selvaganapathy recounts an episode on how they rescued a turtle that was trapped in nylon wire. He says, 'On an early morning, a turtle was slowly coming up to the shore, the leg torn by nylon wire. At that time, we were a group of people, including those from the media. We all spoke in signals, ensuring we did not disturb the animal. We all got together and lifted the turtle. The



turtle's neck was broken. We did not even have a knife. On the sea shore, there were some alcohol bottles. We broke them and cut the nylon wire with the glass. The turtle gave a heavy breather, and then slowly lifted its neck. We felt happy. We thought we could fix the legs, but we could not. We released the turtle. The turtle then swam into the sea with just three feet.'

Why Fishers Should Conserve Turtles

In the past, turtles were worshipped by the local communities. 'Back then, fishermen released if they caught them as they believe that turtles are bad omen. It was due to fear. Our forefathers have told this for a reason—maybe it was just another tool of conservation





of these turtles,' says Velvizhi. Selvaganapathy says, 'Then, if turtles were caught in the net, they were let out in the sea. Fishermen, then visited the Perumal (Vishnu) temple, and lit a ghee-filled lamp. In essence, our



ancestors looked at them as God. And this is all there in the traditional knowledge.'

Now, the fishermen are given various training programmes to better their understanding on the species. 'Fishermen do not know about the habit of these turtles. It is important for them to know the turtle's behaviour first,' says Velvizhi. Further, attaching conservation of turtles to their livelihood was also emphasized. For instance, the fact that turtles are 'ocean cleaners'—they actually keep the ocean clean. If turtles are conserved, fishes would breed healthily, and this in turn, would take care of the fishermen's livelihood. 'If the ocean has to be clean, and if fish population has to be maintained and increased, we need to protect the turtles,' says Selvaganapathy. Many countries that export from India, like the USA, Germany, are particular that ETP species—endangered, threatened and protected species, are not caught. Velvizhi says, 'If these species are caught, products should not be procured from that country. And they are very clear about this. Fishermen did not understand this earlier. Even when they understood, they did not know what to do. We give them that awareness.'

Emotional and sentimental aspects of turtle breeding is also talked about, as fishermen are

not aware about it. Velvizhi says, 'There is a unique feature about turtles. After the turtle eggs hatch in Poompuhar, they go into the sea. They go far away, we don't know where they go. They may go to Sri Lanka or Rameswaram or anywhere. When that turtle grows up, where does it come for breeding? To the same place where they hatched. So we tell fishermen, the turtles come to the same place where they were born. And when they come to the place where they were born, how can you destroy them?' To ensure that fishermen do not get turtles in their fishing nets, they are encouraged to use turtle excluder devices (TEDs). Velvizhi says, 'In the Palk Bay region, we tell fishermen about the importance of turtle excluder device. We tell them that they can fix this device on their trawl net. If turtles are caught in the net, they can escape. TED was designed by the Central Institute for Fisheries Technology (CIFT). Fishermen gave feedback for this device—that some modification would be good. CIFT is now working on that modification.'

What should fishermen do when they see a turtle in their net? Velvizhi says, 'If you accidentally see a turtle in the sea, how do you handle it? Sometimes, they are caught in the trawl net. People throw them away, but that should not be done. The turtle has to be put to rest for sometime. And then, the condition of the turtle needs to be examined. We need to see if they are in an unconscious state. If the turtles are in an unconscious state, after they regain consciousness, how should they

be let into the sea? This is shown diagrammatically to the fishermen. When we explain to them in detail, and they listen. Because, they are scared of encountering turtles. And just for the reason that something bad might happen to them. And, when we tell them to do something, they will do it.' Today, if turtles lay eggs, fishermen directly call the forest department.

Fisherman Turns Conservationist

Kutti Andi, a fisherman from Vanagiri has been into turtle conservation since 2009. His interest and knowledge goes back to the time when he went to Kodikkarai (Point Calimere) for work. That was just the time when the Wildlife Protection Act (WPA) was enforced in India. While he worked there, he saw how turtle hatchlings were released into the sea, and how their eggs were protected by the forest department. The local authorities, including the Collector and the forest department believed that Kutti Andi should be given the task of conserving turtle eggs. And from there, he started working on conservation of turtles.

He says, 'If the turtles come here, I collect their eggs; and when they hatch, we let them into the sea.' Kutti Andi also rescues and saves these turtles. He says, 'Some of them collide with catamaran or steam boat, and die in one corner. We bury them, and also keep the shore clean. I have been on this sea for hours together, rescuing the turtles, making them walk, run and survive.'



After the first year, he collected 5000–6000 eggs every year. He says, 'I have single-handedly saved the eggs, protected the hatchlings and let them into the sea, without the help or support of anyone. We were told that our livelihood would be better if we protected these turtles. We are not educated, but know it from our experience. We have also seen it in television.'

Addressing Solutions

Today, Kutti Andi is not alone in conserving the turtles. When the turtle population was declining, MSSRF brought in many awareness campaigns. This was done with the fisheries department and the government college students, with a focus on youth groups. 'When we tell them, the message gets spread easily,' says Velvizhi. A group of students from the zoology department in Poompuhar, walked from Pazhaiyar to Poompuhar, collecting eggs, and then handing it over to the forest department.

The local people are also involved in data collection and monitoring of activities in the sea. Selvaganapathy says, 'We collect data every day from 6 a.m. for a couple of hours. We look at how many boats have gone into the sea—how many of them are small boats or large boats. How many people are there in each boat? What species of fishes are caught on that day? Which places do these fishes go to? What is the price of the fish catch?'

On early mornings, they walk along the track of the turtles, searching for eggs. The forest department has a hatchery centre in 10 villages including Vedaranyam, Vanagiri, etc. Selvaganapathy says, 'We collect the eggs safely, in the same position, and we make a large hollow. We also give a packing to this for support. We tag the eggs, with numbers and the date. We usually take 5600 eggs. About 50 per cent of them survive. It takes 50–55



days for eggs to hatch.' He adds, 'If the temperature is warm, we spray some water on the eggs. We also place some palm leaves to keep them away from heat, else eggs will get burnt in the sun. In the moonlight, hearing the sound of the waves, these turtles find their way to the sea. We bring out the hatchlings in a tray. The panchayat officials, forest department officials, are all there when we release the hatchlings into the sea. The fishermen, traders, women from self-help groups, companies, individuals, all are also told about this.'

They also ensure that they use cotton bags, and not hand, to handle the hatchlings before releasing them into the sea. Today, if fishermen find eggs, they come forward and inform the authorities. This year, people from Chinnangudi and Kizhamookarai villages collected three sets of eggs, and handed them to Kutti Andi. 'We have also worked with Karaikal and Pondicherry forest department, and given training to them on how to do this,' says Selvaganapathy.

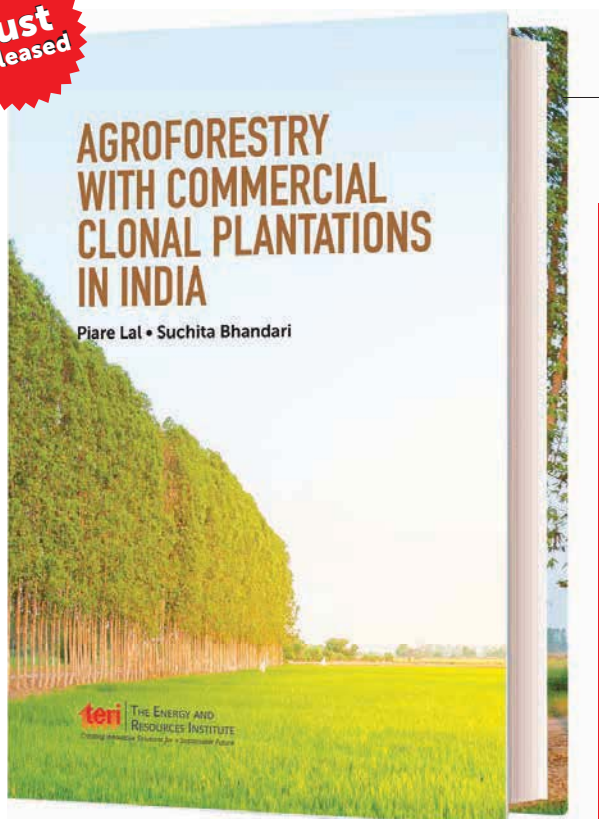
Kutti Andi says that deep sea fishermen cannot be controlled. However, the net used to catch big fishes—there is a need to find who manufactures them, identify and address where the problem peaks. He says, 'We cannot touch the fisherman's livelihood. It will become difficult. We should talk to these manufacturers through the government, only then there will be a middle ground. If that can be done, fishermen can live happily, and fishes will also thrive.' ■



Sharada Balasubramanian is the recipient of the Asian Environmental Journalism Award 2019, Environmental Journalist of the Year, Environmental Story of the Year, and the Prem Bhatia Award for Excellence in Environmental Reporting 2019, amongst several other prominent environmental journalism awards.

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Immunity Insights

To Fight Against COVID-19 Pandemic

Dr Anil Pratap Singh throws light on some immunity-boosting measures that would surely go a long way in preparing individuals and the society to bravely face the current coronavirus pandemic.

People around the world are suffering due to COVID-19 or coronavirus disease which was asserted as a global pandemic by the World Health Organization (WHO). Hundreds of millions of people are presently suffering from severe health, social, and economic impact of COVID-19. Elderly population, children and those with comorbid conditions are more vulnerable to this infection and require

special attention. Individuals with ailments like diabetes, hypertension, respiratory, and cardiovascular diseases are at higher risks. Moreover, a person's general immunity reduces at older age which also magnifies complications. Concerted efforts are also being made towards development of vaccines, treatment, and diagnostics. However, in such a crucial time, several key measures are advised in order to enhance general

immunity. In addition to maintenance of hygiene standards such as frequently washing hands, using alcohol-based hand sanitizer for disinfection, wearing masks as well as avoiding touching hand or mouth, social distancing, staying indoors and avoiding non-essential travel, etc., in order to prevent the virus infection; immunity boosting measures are vitally important at this juncture. So, in order to augment immunity, some of



the imperative measures are discussed here.

Diet Amelioration

Nutrients play vital role for key functions of the immune system of an individual which include the role of macronutrients, micronutrients as well as gut microbiome in mediating immunological effects. Under-nutrition impairs immune function of the body. Specific nutrient interventions such as taking probiotics enhance immune function and also prevent the onset of infections or chronic inflammatory diseases.

Diet high in sugar, trans and saturated fats, but low in complex carbohydrates, fibres, micronutrients, and other bioactive molecules such as polyphenols and omega 3 polyunsaturated fatty acids; put the person on higher risk for a number of chronic diseases like cardiovascular disease, stroke, type 2 diabetes, chronic liver disease, etc. Low-carb diets help in controlling high blood sugar and pressure. Vegetables and fruits which are rich in beta carotene, ascorbic acid and other essential vitamins need to be consumed regularly. In addition to these, mushrooms, tomato, bell pepper, and green vegetables such as broccoli, spinach, etc., build the body resistant to

infections. Diet rich in vegetables, fruits, nuts, legumes, fish, and 'healthy' dietary fats are associated with a reduced risk of chronic diseases such as cardiovascular disease, cancer, and Alzheimer's disease.

Moreover, ginger, gooseberries (amla), garlic, black cumin, turmeric, and basil leaves are considered to be natural immunity boosters. Nutrients may impact directly or indirectly upon immune cells causing changes in their function or may exert effects via changes in the gut microbiome. A better understanding of the role of nutrients in immune function is highly important in an era of coronavirus pandemic.

Proper Sleep

Poor sleep disrupts some important hormones including those that are essential in metabolism. Sleep deprivation adversely affects immune system and leaves the person susceptible to a bad cold or a bout of flu. During a person's sleep, cytokines are produced and released in the body and without sufficient sleep the body makes fewer cytokines. These are a kind of proteins that target infection and inflammation, and effectively create an immune response. Medical experts recommend seven to eight hours of sound sleep,



especially during the influenza season, in order to have an immune system that responds properly. Good sleep also protects our body from serious health issues such as heart disease, obesity, diabetes, and so on. Experts advise that missed sleeps are to be replenished by untailored naps which help decrease stress and offset the negative effects that sleep deprivation hampered on immune system. Scientists agreed that sleep and the circadian rhythms exert a strong regulatory influence on immune functions and also put forth proper function of endocrine systems.





Staying Hydrated and Espousing Regular Exercise to Boost Immunity

Water is essential for oxygenation of the blood found in body which pumps up cells towards their proper function. Oxygenated cells fight better against foreign invaders like germs and help in providing superior immunity. It is worthwhile to mention that the human body is composed of 60 per cent to 70 per cent water.

Drinking more water ensures that kidneys efficiently operate the function of flushing out any undesirable toxins through urine and thus our immune system is empowered significantly. Regular hydration also helps the brain to produce melatonin and other chemicals essential for triggering sound sleep. Drinking sufficient water is necessary to boost up the immune system through the production of lymph as well. Lymph fluid runs throughout the human body which performs the work of collecting bacteria from the body and transporting it to the lymph nodes, where these bacteria are destroyed like the uninvited and unhelpful parasite.

Citrus fruits like lemon with lukewarm water has the potential to benefit and

boost our immune system due to its Vitamin C content. Hydration of the body eventually supports its immune system, vigorously promotes digestion, and provides best defence against various illnesses.

Physical activities have a quality impact on hormones which process consumed foodstuffs and help flushing out bacteria from the lungs and airways, in addition to other health advantages including reduction in the chances of getting cold, flu, or other such illnesses. Exercise triggers positive change in antibodies and white blood cells (WBCs), which are largely meant for body's immunity and thus fight diseases. Exercise is a great way to boost immune response and also helps in moving microbes out of the lungs and airways and reduces chances of getting a cold, flu, or other such illnesses.

During moderate exercise, or from a fever, the human body loses water and electrolytes through sweating, mostly in the form of salt. Upon sweating, the concentration of sodium in the blood rises that triggers thirst and a drink with similar sodium concentration as of sweat balances both sodium and water. Consistent exercise improves immune regulation, delaying the onset of age-related dysfunctions.

Reducing Stress and Avoiding Certain Inclinations

Ambiguity prevails in the current COVID-19 scenario and people are staying indoors which has allusions on mental health and growing stresses. When stressed, the body starts producing cortisol which adversely affects the immunity of a person. There are several methods which can be adopted in order to reduce stress; for instance, yoga and meditation, regular exercise, minimizing work pressure, etc. During meditation, nerves get qualitatively calmed and this process aids in maintaining immunity.

Moreover, some of the habits like alcohol consumption and substance abuse or smoking deteriorate defence mechanisms of the body and also cause respiratory illnesses. Smoking abates the capacity of lung and obliterates the respiratory tract which could have been a boon in the fight against foreign invaders like viruses. Studies further established that heavy consumption of alcohol may also lead to respiratory distresses. Abstinence from substance abuse including tobacco, alcohol and other addictive drugs would be of utmost help.

Role of Supplements, Trace Elements, and Other Immunity Enhancers

Vitamin C

Vitamin C is water-soluble organic compound and one of the potent antioxidant which contributes to immune defence system by supporting various cellular functions of both the innate and adaptive immune system. It is a vital nutrient for health, helps form and maintains bones, skin, and blood vessels. Vitamin C, being essential micronutrient for humans, is obtainable naturally from certain foods, especially, fruits and

vegetables. Its supplements are also accessible. Daily intake of Vitamin C is essential as it cannot be stored in the human body.

Vitamin C supports epithelial barrier function against pathogens and promotes the oxidant scavenging activity of the skin, thereby potentially protecting against environmental oxidative stress. Furthermore, supplementation with Vitamin C appears to be able to both prevent and treat respiratory and systemic infections. Deficiency of Vitamin C can cause scurvy. Its symptoms include swollen joints, bleeding gums and loose teeth, anaemia, and fatigue. Also, wounds took longer to heal if someone had scurvy. Researchers suggest that wounds, cuts, and grazes may heal faster in people with a higher intake of Vitamin C than is usually available from their food. People with adequate levels of Vitamin C are thought to be better able to fight off infections compared to people with Vitamin C deficiency.

Vitamin D

It has been biologically proven that Vitamin D supplements have a mild protection against respiratory tract infections. Role of nutrient Vitamin D in innate and adaptive immune systems has scientifically been established.

Vitamin E

Vitamin E not only plays its important role as antioxidant and inhibitor of protein kinase C activity but it also interacts with enzymes and transport proteins. According to nutritionists, certain seeds and nuts like pumpkin seeds, sunflower seeds, melon seeds, and flax seeds are excellent sources of protein and Vitamin E.

Zinc and Selenium

Zinc supplement is highly advisable for older people. Its deficiency makes the person more susceptible to flu, cold and other viral infections. Selenium, a trace element, like zinc, is important for optimal immune function. It has critical functional, structural, and enzymatic roles. Selenoproteins regulate immunity as was also evidenced by some researchers amongst patients infected from human immunodeficiency virus (HIV).

Elderberry

The berries and flowers of elderberry are packed with antioxidants and vitamins that may boost immune system. They can help tame inflammation, lessen stress and help protect human heart too. Some experts recommend elderberry to help prevent and ease cold and flu symptoms. These berries are full of



nutrients including minerals, such as iron, phosphorus, potassium, copper, and Vitamins A, B and C. Indian gooseberry (*Embolica officinalis* L) is one of the richest sources of Vitamin C, which has many benefits for the body.

Turmeric and Garlic

Turmeric contains a compound called curcumin which helps to heighten the immune function. Garlic has potent anti-inflammatory and anti-viral properties and intensifies body's immunity.

Healthy Body and Healthy Mind During COVID-19

The Ministry of AYUSH, Government of India, has also issued exemplary guidelines for practitioners in Ayurveda, Naturopathy, Siddha, Unani and Yoga wherein measures that can enhance an individual's immunity are duly emphasized. Staying healthy is like a boon for oneself and it is better to adopt immunity measures, furthermore to care exceptionally, for people with diabetes, hypertension, pregnant women, paediatric population, lactating mothers, and geriatric population. All these measures would definitely help individuals and the society in general to fight bravely against the COVID-19 pandemic. ■

Dr Anil Pratap Singh is General Secretary & Founder Director, Global Science Academy (GSA), Basti, Uttar Pradesh.



Let the Wild Rumpus Begin

An Environmental Impact Analysis of Ornamental Gardening

The current trend of gardening in offices, colonies and apartments, and the raging fad of maintaining balcony gardens have a downside as well. **Ankur Srivastava** evaluates the established notion of 'eco-friendliness' on the well-established and commonly known principles of environmental science. He dwells on the ways to align our gardening practices to make them more sustainable.

Climate change has become the talk of the town for the last few decades. And there is hardly any doubt that anthropogenic activities are among major reasons. Every small activity in our daily lives leaves an impression on the environment, and not only human beings, but other living beings are also paying the price of the looming danger of climate change. To address the severity of this global issue, environment

conservation has taken a centre stage in all levels of policymaking. The awareness and the sense of responsibility towards environmental conservation are motivating us to introduce novel 'green' habits in our personal and social lifestyle. The trend of having green spaces in our homes, offices, workplace, and so on, is one such effort in this direction. Lush green lawns, flower beds, vertical gardens, terrariums, balconies, terraces

not only instil a wave of joy, but also gives a proud feeling of satisfaction—from our contribution towards environmental conservation (*Science World*, 2018). Real estate teeming with these green patches are seen as eco-friendly and are the first choice of nature lovers.

Undoubtedly, this preference for gardening is an inseparable part of our religious-traditional heritage and modern architecture. Daily needs such



as flowers, vegetables, and fruits are fulfilled from many such backyard gardens. Similarly, we have a tradition of planting trees as memoirs in many formal and informal events. To inculcate a sense of respect and curiosity towards nature in kids, gardening is an effective tool. These green oases provide us the respite from the hustle and bustle of concrete jungles. Moreover, it is also an excellent stress buster (*Forbes*, 2019). Recently, social media too is teeming with posts related to gardening making it a popular tool to express our concern and consciousness towards environmental issues. Many livelihoods also depend on commercial activities revolving around gardening and landscaping. But is that all which characterizes this raging trend of ornamental gardening or is there another facet as well? Is a shift possible from this traditional frame of thought to a more inclusive viewpoint to analyse this green eco-friendly trend?

Apart from this exhaustive list of positive aspects, there is one more dimension associated with ornamental gardening which is not much in public discourse. If analysed according to principles established by our environmentalists, it is appalling to know that this obsession with unplanned and unsustainable gardening can cause great damage to our environment. This eco-friendly trend is significantly increasing our carbon footprint in many ways, and sometimes acquires a cruel character towards many innocent plant and animal lives. Let us give it a try to visualize this lesser discussed element of unplanned ornamental gardening from a scientific and a moral perspective.

Resource Intensive

Any garden, lawn, terrarium, vertical garden or balcony garden requires a plethora of resources. But these resources cannot be correctly valued only by their monetary cost. In scorching summers of warm-dry regions, when potable water itself becomes scarce,



groundwater or riparian waters are pumped to great distances to maintain these green patches in offices, malls, colonies, apartments, balconies, etc. Upkeep of such gardens requires other costly inputs such as fertilizers, pesticides, phyto-hormones, equipment, and so on, which, if used for professional farming, could have given much better returns. Moreover, for decorative purposes, many structures made up of cement, metals, plastics, ceramics, etc., are employed, which ultimately end up in our waste bins. If this recent trend of gardening is analysed in a wholesome manner, even a cursory cradle to grave analysis will overtly point out that current forms of gardening, which cause undue burden on the planet, is unquestionably wasteful and unsustainable.

Carbon Footprint

If we try to estimate the carbon footprint of a typical garden, many nature lovers will be caught on the wrong foot. Whenever a new park, lawn, or a garden is created in our apartments, colonies, offices, etc., an existing piece of land covered with 'wild' vegetation has to be cleared first. Many plants, shrubs, animal life forms are either displaced or eliminated. Normally, the carbon sequestered in any life form returns back to the environment after completion

of their life cycle (*UNECE Report*). To add to it, the natural cover of that land, which is composed of biomass lying on the surface, underground humus, live and dead roots, undergrowth, fauna, spider's cobwebs, abandoned nests, etc., have to be cleared. Moreover, the local vegetation, which is adapted for that land due to evolution over generations, is replaced with those plant species which require utmost care and resources for mere survival. These synthetically created green patches can rarely compete vis-à-vis self-sustenance with the natural habitat which once existed there. Moreover, these green patches require nourishing media, protection from pests and diseases, moisture supply and drainage facilities, etc. Moreover, the biomass density also gets heavily reduced in these manicured gardens. These days, in most urban settlements, water is pumped to great heights and stored in huge overhead tanks, which consumes a lot of energy. This precious water, which has already caused significant carbon emission due to pumping is fed to these gardens, which are sometimes made for aesthetic purposes only, thus causing a secondary burden on the planet. On a comprehensive level, ornamental gardens emit more carbon than it can absorb.



Biodiversity Repercussions

An examination from the eyes of an ecologist also deems this wanton-unplanned gardening trend nothing less than an anthropogenic calamity. The creation of a garden itself, which starts from the destruction of existing habitat creates perilous circumstances for endemic life forms and migratory birds. To add to it, the craze to plant exotic and rare varieties sometimes ends up inviting invasive species, and becomes a hazard for local biodiversity. Two vividly known examples are *Lantana camera* and water hyacinth (*The Hindu*, 2017). Commonly sighted in the Indian subcontinent, water hyacinth is a blunder of a European gardening enthusiast, who once planted it in his backyard pond. It has already endangered various life forms and has caused a severe reduction in dissolved oxygen levels in numerous water bodies, threatening aquatic life (*Science Reporter*, 2010).

What Can We Do?

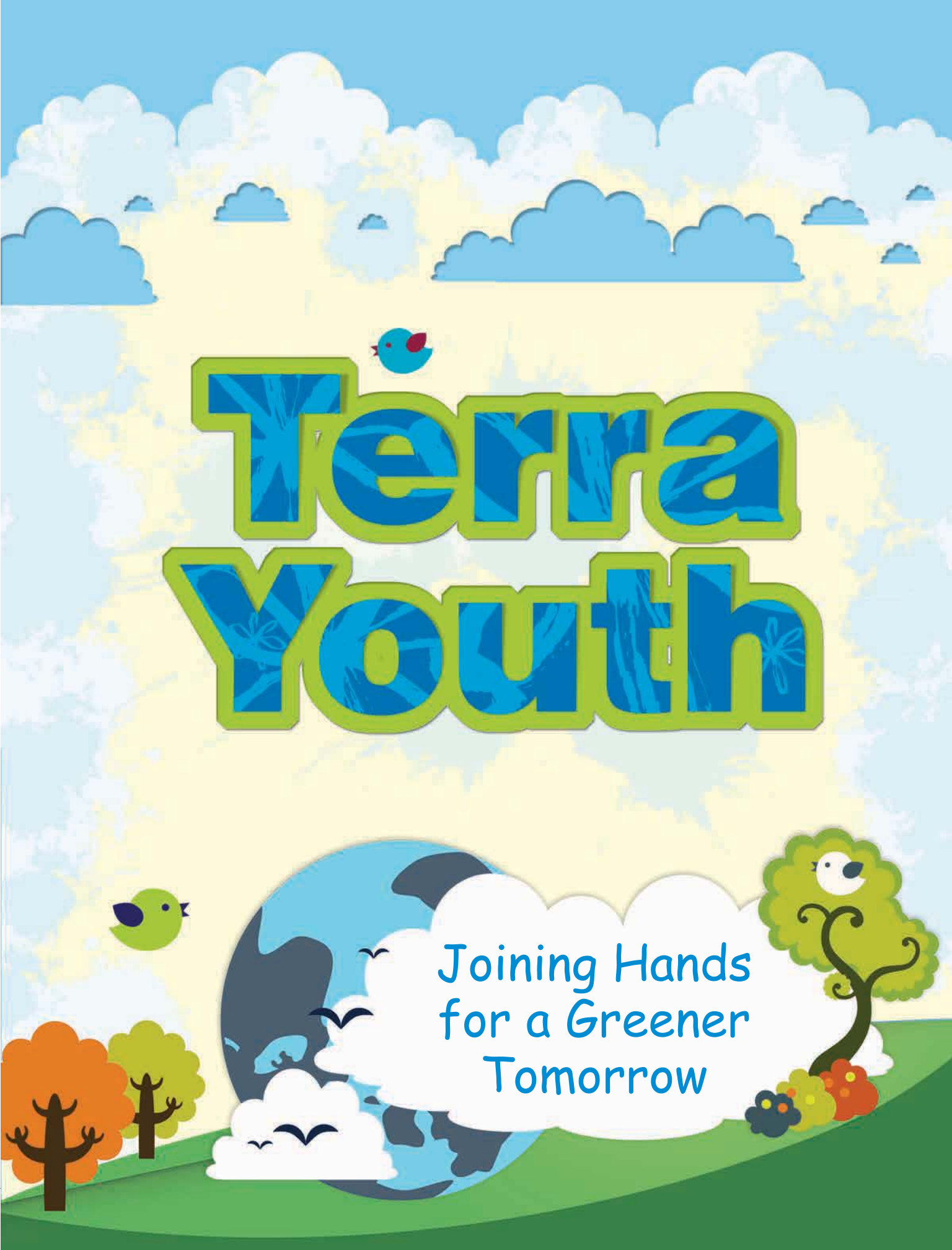
If the above arguments are true, does it mean that this popular hobby is a burden on the planet? Is there any way to

mitigate or avoid the harmful effects of gardening? There is always a ray of hope when the motivation behind gardening is the noble cause to conserve the environment. It is important to evaluate every aspect of our plan for garden in a wholesome manner, supported by a sincere estimate of costs and benefits. Wherever possible, endemic varieties should be preferred and existing trees, shrubs, grasses could be trained to enhance their aesthetic appeal. For balconies, terraces, etc., go for self-sufficient and robust species and as far as possible, use domestic wastes only to maintain and nurture your beloved garden. If you are planning to buy or construct a new property, discuss with your architect and town planner in this regard to explore the scope of aesthetic appeal without tampering much with existing vegetation. For community gardens, localized adaptations of Japanese style can be a viable alternate for landscaping.

Since the last few years, climate change, pollution and loss of biodiversity have become an impending danger to our food security and sustainable development (UN Foundation). It is also a time to imbibe the concepts of 'Vocal for local' and 'Atmanirbhar Bharat' in our

gardening preferences. An integrated point of view needs to be developed to comprehensively examine the effects of gardening in your surroundings. Landscaping preferences could be aligned to mitigate possible harmful effects that can be caused by unplanned gardening. Our architects, town planners, and botanists need to innovate newer designs that are 'wild and eco-friendly'. The utility should be analysed deftly and impartially before laying out lawns for purposes other than playgrounds and community land. Eliminating and displacing local vegetation and the associated habitat just for the sake of aesthetics, needs to be weighed on moral grounds as well. Think twice before starting your own balcony garden of water-guzzling plants, and select the plants judiciously. Producing manure from kitchen wastes and feeding it to a struggling sapling in a nondescript corner is probably a more caring approach towards nature. It would be apt here to recall the words of Maurice Sendak, 'Let the wild rumpus begin!'. ■

Ankur Srivastava is a graduate from IIT Guwahati in Chemical Science & Technology and Master in Business Administration from IIM Kozhikode. His interests include environment, health, and other contemporary issues.



Terra Youth

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Natural Disasters that Rocked 2020

A lot has been said about the year 2020. About how it hasn't started off too well. Or how it desperately needs a reboot. Given the lockdown across the globe, it is a fact for sure where each one of us has sat back and wondered if this is Mother Nature's way to teach us all a lesson! In this article, **Anjali Prasad** lists some of the natural disasters that has rocked the world this year.

Till August 2020, humankind had witnessed every form of disaster, from earthquakes to floods to cyclones to erupting volcanoes. Eighth months to 2020, human civilization has been shaken to the core. Along with the word 'COVID-19', the next buzzword in 2020 has been natural calamity or disaster. And we have experienced quite a few. This year, we have faced disasters ranging from geophysical (e.g., earthquakes, landslides, tsunamis, and volcanic activity), hydrological (e.g., avalanches and floods), climatological (e.g., extreme temperatures, drought, wildfires), meteorological (e.g., cyclones and storms/wave surges), biological (e.g., disease epidemics and insect/animal

plagues) to geopolitical and economic (e.g., stock market crashes, wars).

Bushfires

The year began with Australia engulfed in bushfires. Soaring and record-breaking temperatures coupled with severe drought ravaged much of the country. Many put forth the idea that the bushfires happened because of drought. The fire affected more than 5 million hectares in New South Wales, the worst-hit state, destroying more than 2000 houses and forcing thousands to seek shelter elsewhere. Data shows that since 1910 Australia has warmed overall by slightly more than 1 degree Celsius, with

most of the heating occurring since 1950. As a result, the country recorded one of the driest summers in history. The fire killed over 500 million animals and left koalas in a 'vulnerable to extinct' state. And this was just the beginning...

Earthquakes

According to the UN, Latin America and the Caribbean is one of the most prone regions to natural events, which include floods, storms and hurricanes, droughts, high temperatures, volcanic effects, and, of course, earthquakes. Between January 6 and 7, 2020, Puerto Rico experienced several earthquakes. On January 6, the island was struck by a 5.8 magnitude earthquake while the next day, two earthquakes of 6.4 and 5.8 magnitude shook the south of the island.

Melting Glaciers

The bushfires that crippled parts of Australia became a cause of concern for neighbouring country New Zealand. The world bore witness to images of New Zealand glaciers turning caramel brown after being exposed to dust and dirt from Australia's bushfires. And this was just one of the aftermaths caused by the Aussie bushfire. Experts fear that the raging fire may increase the risk of the glaciers melting faster by as much as 30 per cent. And it is just not the glaciers in New Zealand are retreating. Everywhere





else on Earth ice is melting. The speed at which climate change in the Himalayas have melted the Himalayan glaciers is alarming. This has resulted in vegetation springing up in the high altitude of the mountain, including in Mount Everest. While some of us would ask how growing shrubs and grasses could be a bad idea, this has raised concerns among scientists. The scientific community feel that the expanding vegetation in the high altitude Himalayas could change the land-use pattern or lead to invasion of alien species. They also feel that this could quicken the glacial melting rate and increase the risk of flooding.

Floods

Floods in Dubai, surprising yet true! And quite rare. In 2020 Dubai was heavily affected by floods with many roads waterlogged and numerous flights getting delayed or cancelled. This was very unusual as it was reported that the city received nearly 150 mm/hour of rainfall for 2.5 hours. The record 3-hour

downpour was comparable to a month's rainfall in the city! Heavy torrential rains also caused floods in Jakarta, Indonesia. The flooding in Jakarta is said to be the worst in over a decade. It triggered mudslides and 66 lives were lost to date. This is another glaring example of climate change.

Storms

Severe storms swept across Texas, Alabama, and Louisiana in early January in the United States and claimed 11 lives. It brought with it heavy rains and heavy winds. Hundreds of thousands of people in Deep South faced power cuts while many homes were also destroyed because of the onslaught of floods, high winds, and thunderstorms.

Even as reports maintained that while storms are not unusual during winter, the intensity of them definitely were—and as usual many think it is a consequence of climate change and global warming.

Cyclones

On May 20, 2020, Kolkata, the eastern metropolitan city in India was devastated by the biggest cyclonic storm over the Bay of Bengal in 20 years. Cyclone Amphan rocked West Bengal, Odisha, and Bangladesh. It killed dozens of people, flooded low-lying areas and affected power supply in the eastern coast of India and Bangladesh. In Kolkata, the cyclone claimed at least 72 lives, and the city has been trying hard to restore normalcy. Communication networks were down and electricity disconnected in various pockets for several hours. The cyclone affected the daily lives of some 4.5 million people.

Earthquakes

Since May 11, mild earthquakes in Delhi have raised speculation about a big one, but scientists say that there is no proof that a huge one is on the cards as of now. And it does not end here.



Volcanoes

Scientists have forewarned us many a times that climate change could trigger volcanic eruptions across the world. One such case was the Taal volcanic eruption which occurred 60 km south of Manila. Not the most prominent or even the largest, this is one of the world's smallest volcanoes. Still it managed to wreak havoc on humanity by spewing a massive cloud of ash which generated plumes 14 km above the crater.

Added to this, it will not be the only volcanic eruption in recent times as the Volcanic Ash Advisory has reported that some 25 more volcanoes around the world are currently erupting.

The beautiful and wonderfully idyllic Yellowstone National Park hides a literal ticking bomb under its surface. The park sits on top of an extremely large supervolcano tens of kilometres in diameter. The volcano is still active, and according to scientists could erupt anytime now. The last eruption took place around 630,000 years ago. Even though it sounds a really long time ago, volcanologists have presented their case by discovering that this volcano has a tendency to erupt every 600–700 thousand years.

If this erupts in 2020, it could potentially be a human civilization-ending event. Yellowstone is not the only sleeping giant volcano on the

planet. Lake Toba in Indonesia also sits on top of an enormous supervolcano. The last eruption occurred 69,000 to 77,000 years ago and was a climate changing event. It so devastating that it was believed to have almost made humans extinct. Geologists trust that Lake Toba's magma chamber is far from dormant.

The Hilina Slump

An unstable slump on the South of Hawaii's big island, the Hilina Slump has the capacity to create a landslide that could lead to horrendous tsunamis. As per evidence gathered by myriad geologists, about 120,000 years ago a predominantly bad landslide generated a tsunami that was over 400 m high. Not just that, even as recently as 1975, a movement on the slump led to a significantly smaller, yet powerful tsunami that managed to reach California.

California, Oregon, and Washington Could Witness the 'Big One' This Year

The San Andreas Fault is another impending disaster that could take place in 2020. Studies undertaken by the US Geological Survey revealed the probability of a devastating magnitude 8.0 or a larger earthquake hitting

California within the next few decades is quite a possibility. California's high population density and proclivity to live in high-rise buildings could mean that when the 'Big One' comes, it will be not be a pretty scenario.

A Massive Solar Storm Due in 2020?

While the sun powers every atom we know, it is the same sun that has the power to destroy us too. As proven by scientists, it is known to increase and decrease in activity in a cycle over time. At times it can lead to the release of a coronal mass ejection (CME). These are billions of tonnes of clouds of magnetized plasma. If Planet Earth took a direct hit, it could be utterly destructive for human civilization. The electromagnetic pulses generated by this kind of powerful event could knock out, or severely harm, most of earth's electronics.

Time for Action

We all need to start taking affirmative actions if we want humankind to be part of the future. All of us, the citizens of the world, need to realize how dire the situation has become for each one of us. Our next move is to acknowledge climate change and carry out some really simple yet active steps to battle it. We need to use energy wisely, generate less waste (including limiting the use of single-use plastics), take sustainable actions to save forests (such as planting new trees, use less paper), and reduce emissions (such as walk and cycle more instead of driving cars). It may be late but better late than never! It is about time that we too should be a little more concerned about what is happening around us, wherever we reside. ■

Anjali Prasad is a voracious reader and a passionate writer. With a varied experience in writing for over 17 years, she has dabbled in everything from copy, scripts, blogs, and content.

GlobalShala

Inspired by the United Nations Sustainable Development Goals (mainly Education, Gender Equality, and Women Empowerment), GlobalShala embraces global collaborations and is venturing to make a good world better by extending services, scholarships, and a sundry of programmes.

GlobalShala is providing learners across the globe a platform to express, experience, explore and engage through various learning opportunities and internships to obtain quality jobs and sustainable economic growth through purposeful possibilities that will open up hopes and dreams of lifelong learners around the world!

Edtech venture GlobalShala has recently announced the launch of their one-of-a-kind 'Superhero U' competition with an aim to accelerate United Nation's Sustainable Development Goals and pave the way for a new generation of responsible and sound leaders. Across countries, the winners for the same will be awarded prize money worth \$90,000 which includes scholarships, internship

opportunities, gift cards, and electronic gadgets.

GlobalShala has introduced this unique competition where individuals are to invent a 'Superhero' that essentially takes on universal challenges and strives to make the world a better place. In an industry first, the Superhero U competition aims to tackle the 5 P's of Sustainable Development Goals (SDGs), that is, People, Prosperity, Planet, Partnerships, and Peace. Hence, the Superhero created should address all these goals collectively and promote prosperity while protecting the planet, the theme of the competition which is inspired by the UN's mission.

Talking about the competition, **Anushika Jain, Founder & CEO,**

GlobalShala said 'Taking inspiration from the United Nations, we are trying to nurture creativity to address surrounding critical sustainability challenges around the world. As per the SDG Index 2020, countries across Europe such as Sweden, Denmark, Finland, France and Germany have set the benchmark for adept sustainability practices, India still falls back at rank 117. This needs to be improved upon immensely and therefore more events, programmes and contests need to be introduced across Asia Pacific countries to inculcate awareness about SDGs for the betterment of our society. We at GlobalShala have taken upon this challenge through an out-of-the-box approach with our 'Superhero U' competition to add an element of intrigue and enthusiasm for individuals to take up the challenge. We are excited to see different local as well as global perspectives on sustainability and the challenges each of their Superhero takes on.'

Inspired by the United Nations, GlobalShala focuses on empowering students and educators through experiential learning and education to open up hopes and dreams of lifelong learners around the world. Through the GlobalShala platform, individuals have the opportunity to participate in exciting competitions and events, have a chance to earn global scholarships, receive hands-on training through global internships as well as several certifications and recognitions. ■

For more information, please check <https://globalshala.com/>



Environment Education

A Way of Life

In today's scenario, when the work culture comes to a halt due to excessive pollution, it is indispensable for each responsible citizen to play a unique role in building a perception for reform in nature and directing actions revolving around it. In this essay, **Heemal H Bhat** urges individuals to participate in the effort of saving the environment.

'One of the first conditions of happiness is that the link between man and nature shall not be broken,' said Leo Tolstoy. Abiding by this principle and correlating nature with human race, I constantly contemplate upon environment and livelihood as two sides of a coin. Looking out of my window on serene Sunday mornings, I envisage man and nature as an interactive entity. The environment could be the other side of life in the sense that the very basic support system for life is truly provided to humankind by our environment. I often wonder if nature to us is like blood and veins to our body then are we nurturing it and taking good care of it. Our relentless neglect has brought nature to an extremely sorry state, yet it is a die-hard magnanimous force that keeps giving us all it has. Had nature behaved the same way with mankind, our race would have been endangered and probably extinct by now.

Where are we wrong? Is our education unable to develop the feeling of compassion and empathy for all living beings or are we simply brushing away from the gravity of this concern? I sincerely believe education plays a vital role in bringing constructive change in the world. It is critical for promoting sustainable development and improving

the capacity of people to address environmental and developmental issues. True to the fact that Rome was not built in a day, wonders will not happen all of a sudden. Let us all give a thought to it and move beyond pointing out at the responsibilities of others, be it government, concerned departments, social organizations and so on.

The schools need to help students become conscientious stewards of the environment, protecting it for themselves and for the generations to come. Knowledge, understanding, and awareness of the sorry state of the environment in itself is not sufficient for effective change in the behaviour of learners; participation is an equally essential component in this process of education about our surroundings. While promoting a positive attitude towards the environment, let us also value a few components that are a part of our circle of concern and influence.

Water

Rightly considered as the elixir of life, it is impertinent to talk about saving this essential resource. Support plants that need less water. This will add to greenery in our surroundings and also go a long way in saving water and controlling pollution. In today's city, concrete roads are a regular sight which

has in turn hindered the percolation of rainwater into the grounds. It becomes all the more important to consider rainwater harvesting as the very basis of construction, be it roads, highways, or buildings.

Waste

Though we all are aware of the various ways of disposing waste, yet our actions do not go hand in hand with our knowledge about the same. Waste disposal has become a massive concern and requires stricter laws. Our education is not encouraging us to have manure pits in residential societies where leaf litter can be collected and composted rather than burnt. Is it really such big a step or are we lacking somewhere in performing our part of role? Also creating less waste should be considered as a momentum to a healthy environment. The study of waste management at a micro level should be encouraged.

Paper

While moving on road, at times I feel saving paper is a mere poster activity conducted in schools. I find pamphlets dancing on the roads to the tunes of blowing winds or at times stuck to the wipers of the vehicles parked aside. To my surprise, most of them are not made

of recyclable or handmade paper. In this age of digitization, reducing the use of paper in offices, banks, metro stations or, for that matter any place where slips are generated, can be a mammoth step towards environmental protection. Even the use of tissue paper needs to be reduced to avoid clogging of small drains.

Nurturing Ancient Practices

Promoting the practice of traditional objects such as earthen pots, cloth bags, steel and copper utensils, *khadi* cloth, organic products, bio-degradable materials can undoubtedly play a vital role in safeguarding the environment. Organic agriculture will definitely preserve our land as it will prevent the usage of chemical fertilizers and pesticides. Similarly, synthetic clothes should be discouraged as they do not decompose.

It is equally imperative to think about the natural wealth we are leaving for the generations to come. The degradation of natural environment in its various forms and its impact on human life is a grave concern and also a matter of insistent attention. Our lifestyle is taking us away from nature, our biggest teacher. An

action-oriented approach can be a crucial constituent in exploring and identifying potential issues and thereby acting upon them. Why not take tiny steps to go close to nature at different levels so as to preserve our environment for the good of all. Keeping in mind the need to protect nature, I hereby offer some constructive and long-lasting elucidations to be actualized through actions at different fronts.

At Home

It is essential to begin environment consciousness at a tender age so that all forms of nature are linked to the growth of spiritual quotient of a child. Every bit of nature gives us a lesson for life, be it the shedding and drying leaves of a tree or a blooming flower.

As children grow, consumerism sets in. Here lies the responsibility of each family; take utmost care of the spiritual inclination of the young mind so that responsible consumerism uplifts the environment rather than upsetting it.

At School

The sole intention of the school should be to prepare citizens who can promote readiness to accept responsibility

and creativity required for devising a sustainable environment. The students are undeniably the biggest asset for our nation. They will be the face of the nation in the future, and their actions will definitely reflect the roots of education and upbringing. Give opportunities to students to engage in projects focussing upon identifying issues and carrying out actions to address issues that can evaluate the impact of environmental actions taken to resolve these issues, all leading to build a scientific temperament in young citizens. The schools should take up initiatives acknowledging their exclusivity quotient. Why not take a stride in this struggle for environmental conservation and talk about new professions such as Soil Health Managers, Eco-sensitive Chief Executive Officers, Conservation Experts and so on. Requisite for eco-sensitivity should become a part of every resume while applying for jobs.

In the Society

We all need to work as a unit in this tussle for saving the future. Our synchronized efforts can reap in fruitful results for the generations to come. With this perspective, regular audits should be conducted in earnest and residential welfare societies of every area should be given rewards and incentives on achieving desirable targets. Such efforts do not take massive planning but definitely produce substantial results. The drive to earn points for environment consciousness at an early age will have a considerable influence and enduring impression on the future torch-bearers of the society. Promoting the use of bicycles to an extent that people are not hesitant in using them for short distances is the need of our time. Let us all integrate our meaningful and logical concerns as tools *for the environment, in the environment, and about the environment. Keep loving nature and nature will inspire you at its best.* ■

Heemal H Bhat, Principal, Hans Raj Model School, Punjabi Bagh, New Delhi.





Genomic Analysis Reveals Many Animal Species Vulnerable to SARS-CoV-2 Infection

Humans are not the only species facing a potential threat from SARS-CoV-2, the novel coronavirus that causes COVID-19, according to a new study from the University of California, Davis. An international team of scientists used genomic analysis to compare the main cellular receptor for the virus in humans—angiotensin converting enzyme-2, or ACE2—in 410 different species of vertebrates, including birds, fish, amphibians, reptiles, and mammals. Analysis of ACE2, the main receptor that SARS-CoV-2 uses to bind and enter cells, across 410 vertebrate species reveals that many are potentially susceptible to infection by the novel coronavirus. They include a number of endangered and threatened species, notably apes and old world primates. The study could also reveal potential intermediate hosts and animal models for the virus.

Source: www.sciencedaily.com

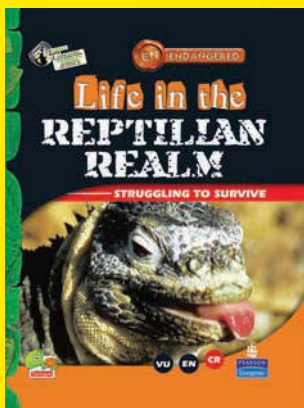
Treating COVID-19 Could Lead to Increased Antimicrobial Resistance

The use of antibiotics in people with COVID-19 could result in increased resistance to the drugs' benefits among the wider population, a new study suggests. Patients hospitalized as a result of the virus are being given a combination of medications to prevent possible secondary bacterial infections. However, research by the University of Plymouth and Royal Cornwall Hospital Trust suggests their increased use during the pandemic could be placing an additional burden on waste water treatment works. Writing in the *Journal of Antimicrobial Chemotherapy*, scientists say this could lead to raised levels of antibiotics within the UK's rivers or coastal waters which may in turn result in an increase in antimicrobial resistance (AMR), where bacteria become resistant to the action of antibiotics.

Source: www.sciencedaily.com



To know more... Read



ENDANGERED LIFE IN THE REPTILIAN REALM

Shruti Sharma

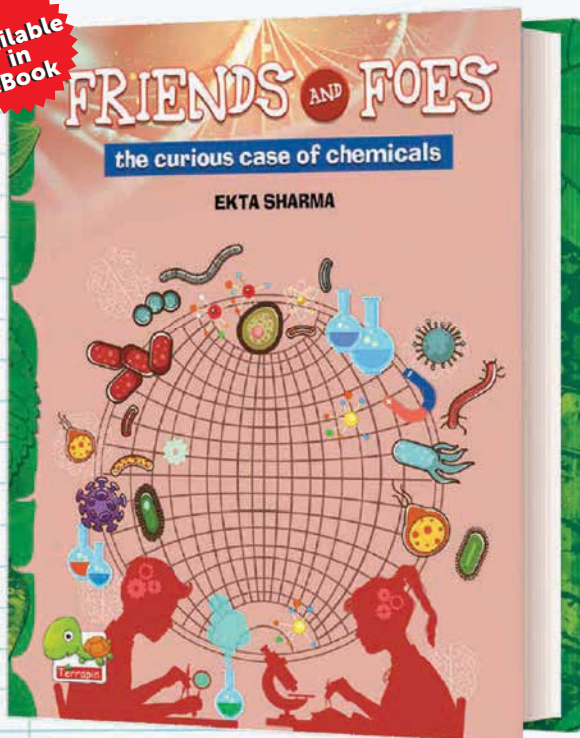
There are about seven thousand species of reptiles, belonging to the four main groups: turtles and tortoises; snakes; lizards and worm-lizards; crocodiles, alligators, caimans, and gavials, and tuataras. Reptiles live in all continents of the world except Antarctica. Unfortunately, many of them are losing their homes, and unless we take action to save them, the oldest living animals in the world may soon become extinct.

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Chemicals: Good or Bad?

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- Medicines That Heal
- Chemicals We Eat
- Chemicals We Use at Home
- Industrial Mishaps
- Making Sense of Chemicals

What's the first thing that comes to your mind when you hear the word 'chemicals'? Friendly, hostile, smelly, radioactive, volatile—chemicals are all these and much more. And it's not possible to do without them in our daily lives because they are present in just about everything. So the next best thing to do is to separate the good chemicals from the bad ones and the absolutely deadly ones! Peppered with curious facts and useful information, *Friends and Foes* explores the lesser-known, mystifying universe of chemicals and guides you towards a better judgement of what chemicals to avoid and what to limit. It is your guide to the most pressing need of the hour—a healthier and environment-friendly life.

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Red Panda

Let's Stop this Animal from Going into the Red!

If you ask for a list of the cutest animals, the red panda ranks among the toppers, says **Benita Sen**. With less than 10,000 adults left, she hopes that the tide will turn for the adorable red panda.

Sadly, looks can't save your skin. High up in the Himalayas, there is an animal that finds itself on the IUCN Red List of Endangered Animals since 2008. The red panda (*Ailurus fulgens*), in honour of whom September 19 is earmarked, a mammal found in the eastern Himalayas and also in the south-western tips of China, is fighting a battle for survival. The worrisome thought is that it is the only member alive of the *Ailurus* genus. Incidentally, *Ailurus* means, cat, in ancient Greek. *Fulgens*, in Latin, means, bright. A bit of a linguistic mish-mash, but you get the thought.

Although the colour red has attached itself to the name, the thick fur of the red panda is really more russet. If you see a long, bushy russet tail with multiple cream or white rings, high up in the trees around, say, Darjeeling, you can guess who the proud owner is. Yes, this is an arboreal creature, mostly active from dusk to dawn. It does come down once in a while, but even sleeps or rests spread out on branches. The muzzle is white, highlighted by the black snout and beady black eyes. The cheeks have two white patches. The front legs are shorter, so it shuffles a little. Not a very graceful walk.

But the red panda can stand upright, for short durations! At a length of about 60 cm (25 inches), it is barely the size of your neighbourhood cat, it has a fuller and therefore, heavier body. The soles of the feet have thick fur that act like a carpet and help it to walk on snow and ice.

Unusual 'Thumb'

Found between about 7000 and 15,700 feet above sea level in forests of deciduous and conifer trees, it needs bamboo around since that is a major part of its diet. Its semi-retractile curved claws help it to feed on bamboo and grasp narrow branches. It has the unusual ability to rotate the ankle for a better grip. The wrist bone extends into a pseudo thumb, helping it get a better grip during climbs. That's one reason that it can even come down a tree, headlong.

The red panda, a solitary creature, looks around for other food around dusk, like birds, insects, and eggs. Since it does not know borders drawn by human beings, you would find it in India, Nepal, parts of Myanmar, Bhutan and in China, where even one scroll that dates back about 700 years, shows the red panda being hunted. Within India, it is found in Sikkim, which has declared it as the state animal. In fact, the red panda found on the two banks of the Brahmaputra are considered to be of two different sub-species or perhaps species that were separated 250,000 years ago.





Good Mother

A mother red panda gives almost all her time to her cubs for the first week of their life. Gradually, she begins to venture out for some hours, returning regularly to take care of them. Rather like cats, she moves them around every few days, perhaps more for the sake of giving her cubs a healthier, more hygienic home. Although the cubs may start eating solid food after about three months, they stay with their mother till the next litter of cubs arrive the next year. While some red pandas live for as long as fifteen years, most barely make it to ten years. That makes it a short life, fraught with danger.

In Danger

I first saw the red panda at the Padmaja Naidu Himalayan Zoological Park in Darjeeling, which has a conservation breeding programme for the shy red panda. However, although scientists like Dr Sunita Pradhan have spent years studying this elusive creature, following its activities becomes more difficult since it is a nocturnal animal. In 2003, this zoo released four red pandas that had been born in captivity, into the wild. An adult

female red panda barely adds one or two cubs in a year and often, several cubs do not survive without help. This makes conservation programmes so important if we are to save the red panda.

India has set aside 20 areas that protect the red panda. China has declared as protected over 40 per cent of its red panda habitat. Even local populations are coming forward to save the animal. A forest in Nepal, managed by the community, has about 15 red pandas. Hopes are that the numbers will keep growing. In Arunachal Pradesh, villagers of five villages have set up the Pangchen Red Panda Conservation Alliance. Some are maintained in zoos around the world.

So, what puts the existence of this cute creature in danger, with whom we have shared planet space for thousands of years? Habitat depletion is a major cause. In some places, they are hunted by poachers. The beautiful, bushy tail has also landed the animal in danger since some people fancy turning it into a hat. In yet other regions where human habitation has grown and encroached on red panda terrain, they are up against livestock owned by the villagers. When human habitation fragments forests, wild

animals in one section have no option but to stay contained within their small part of the forest. People continue to raid their terrain, cutting trees for firewood. If the animals do venture out towards the next forest, they may be hunted. So, virtually trapped within a smaller area, the population weakens with inbreeding.

And oh, just in case you were wondering, in spite of the similar names, it is not related to the Giant Panda, even though it is sometimes called the lesser panda. Although it was once believed to be related to bears—the cuddle factor?—and raccoons—the ringed tail and overall appearance, perhaps?—it is now placed by itself in a family all its own called the *ailuridae*.

With less than 10,000 adults left, we hope that the tide will turn for the adorable red panda. And did we tell you, Panda was an ancient Roman goddess. May the red panda remain safe, too, so its shrill call can reverberate through the mountains. ■

Benita Sen is a journalist and award-winning children's author. She has authored over 20 books for children published by TERI Press. She volunteers to help abandoned and injured urban animals.



Ecosystem Engineers

Preserving the World

There are certain animals who have a huge impact on the environment. Wild boar are the main ecosystem engineers in India, says **Maneka Sanjay Gandhi**. Because of their large size and frequent rooting for food they have a significant effect on the forest floor.

The Kerala government has brought in sharp shooters to kill a tiger in Pathanamthitta. The tiger has allegedly killed one person, a person who tried to stop it from killing the cattle tied up near the human settlement.

By the time this article comes out, the young tiger will probably have been shot dead. For no fault of his! The authorities and forest department have been on a rampage for the past six months killing wild boars in Pathanamthitta

at the behest of farmers. The tiger has nothing left to eat. So now he attacks cattle. In every single place where tigers have supposedly become man-eaters—whether Chandrapur, Yawatmal or Pilibhit—it is because wild boar have been systematically killed for months before that.

The most foolish thing that governments can do is kill wild boar. They are the main ecosystem engineers in India. Not only are wild boar the prey of large cats, they, because of their large size and frequent rooting for food, have a significant effect on the forest floor. They help in creating ideal conditions in the soil for germination of seedlings. They also help to disperse seeds because these often pass intact through their digestive tract and are pushed into the soil. One of their most useful functions, and the reason that we are particularly interested in the species, is that they eat bracken or coarse ferns which no other species can digest. They also dig it up for bedding material. This stops it spreading across the forest floor and prevents the growth of seedlings. Insect larvae, earthworms,



and snails are usually the staple diet of wild boar.

But farmers keep complaining about the increasing population of wild boar. And the reason for this increase is systematic killing of wolves by the government. So, boar have few predators left.

Nature is so convoluted that each thing ties into another. You harm one creature at one of the world and its repercussions are felt at the other end of the world. Let me give you a few pathways that nature takes.

The Bahamas are islands and like all islands they will sink as the oceans rise. So many islands have already quietly slipped into the oceans like Dwarka in the past and two Sundarban islands in the last ten years. The islands need to be protected from high tides, and from being eroded of the bottom and sides. Most of these islands are protected by mangroves, the magical trees that line the coasts and have their roots in the waters. The mangroves prevent the seas from gobbling the land up by holding the soil in place and by protecting the land from storms. You see them in Goa and you used to see them in Gujarat but 87 per cent have been removed because one company needed to earn money by making ports that no one uses. They are being cut in Tamil Nadu and Kerala. At a time when most countries are replanting them, we have not replaced a single mangrove tree. It is amazing that we have not recognized that this is the main keystone species that keeps the world intact. Mangroves are also the nursery for all fish. So no mangroves, then no fish or sea animal. If politicians want to benefit the fishermen community, the first thing they could do is to replant and protect mangroves.

Also, mangroves need fish urine to survive. According to a study done by University of Michigan about the mangroves in the Bahamas, large fish such as snappers roam in the mangroves looking for food. They urinate through their gills and the urine contains nitrogen.

This nitrogen fertilizes the mangrove trees and the algae growing on their roots which they grow lush and feed the fish, crabs, and other animals. These sea creatures are caught to feed people.

But snappers are the most popular victims in spearfishing and for anglers throughout the Caribbean. The biggest fish, the ones with the most beneficial effect on the mangroves, are the ones that are usually caught for the dinner table. The study estimated that if 50 per cent of the snapper species were caught by fishermen, then the amount of nitrogen in the mangroves would decrease by 69 per cent. The mangroves would dwindle and the island will submerge faster. In the meantime all the fish will disappear.

Thousands of other cases exist where one species shapes the surrounding ecosystem. These species are called ecosystem engineers. Ecosystem engineers are 'organisms capable of controlling the availability of resources for other organisms by modifying the physical environment'. For instance, the beaver makes dams in small rivers. Once their dams are built and water pools come into being, the landscape changes and a new ecosystem is born with different amphibians, fish, and birds.

African Savanna elephants are the biggest boon for tree dwelling lizards. When the elephants break twigs and branches, they leave crevices in the trees. These crevices become the homes and breeding places for tree lizards. The tree lizards eat insects like termites and spiders and are in turn eaten by snakes, becoming part of the food web.

The most famous case of ecosystem engineers are the wolves of Yellowstone Park. In the 1930s all the wolves of the park were shot dead. The consequence? The elk populations in the national park increased and they ate all the undergrowth of the area stripping it bare. Riverbeds were the next targets and their juicy grass and saplings disappeared. This desolate landscape did not even provide enough food for the birds so



they left. Next the beavers disappeared as they depend on the tree saplings on the riverbanks. The elk ate all the juicy berries so the bear population, the trademark of the area, dwindled. Without any vegetation to hold them in, the rivers broke their banks and started flooding the area. The park was an utter mess with very few species living in it.

In 1995 wolves caught in Canada were released in Yellowstone Park. The wolves reduced the elk population. Fear of wolves also prevented the elves from coming out freely to the riverside. The willow and poplar saplings grew back and within a few years the river banks became stable again. The beavers returned and created little ponds with their dams. The amphibians returned and so did the birds. The bears are in better health now. Unfortunately, the wolves are again being killed by illegal ranchers who farm their cattle near Yellowstone Park. The ranchers want larger land for the cattle to feed. From 147 wolves, only 100 are left now. And as they diminish, the park will go back to being a mess again.

How long will it take humans to learn a simple lesson—that interfering with a species for no reason and with an astounding lack of knowledge, leads to a problem with every other species as well. ■

Ushering in a Plastic-Free World

Path-breaking Recycling of MLPs

In this article, **Dr Rina Mukherji** highlights the pioneering work done by Deeya Panels in recycling multilayer plastics (MLPs) into Ricron panels, which is of great significance.

Ever since they were first invented, plastics have been extremely popular for packaging, besides a host of other purposes. Durable, easy to handle, and inexpensive to manufacture, besides being easy to combine with other materials, plastics have ended up being used for a variety of purposes.

But, once they reach the end of their lives, plastics pose a severe threat to the environment. Particularly since the very chemicals—such as Biphenol A and phthalates—that make plastics unique, can pose a grave danger to all. Although single layer plastics are also a problem, they are recyclable, and

hence can be disposed of without any harm to the environment. But multilayer plastics (MLPs) that are made up of two layers of plastic with a metallic layer in between, can only be treated through pyrolysis, which is a very expensive process. MLPs too, when used for packing medicines, may be made of



Fine MLP chips before getting compressed



several layers, particularly when used in blister packs. This causes most MLPs to end up in landfills. As far as landfills are concerned, they are a recipe for future disaster; especially since the chemicals in MLPs can leach into the groundwater and cause severe health hazards to humans, flora, and fauna.

Realizing the dangers posed, amendments were notified by the government in the past to the Plastic Waste Management (Amendment) Rules 2018 for MLPs to be phased out. However, MLPs cannot be done away with due to a variety of reasons. This is because MLPs are the only material that can withstand the extreme highs and lows of temperature in a tropical country like India, and prevent spoilage of food and medicine. Besides, no alternative has been developed to MLP packaging as yet.

This is where the path-breaking work done by Deeya Panels in recycling

MLPs into Ricron panels is of great significance. As a long-time manufacturer and entrepreneur of plywood boards, engineer Suhas Khadse came to realize how bad his business was for the environment, especially in view of global warming and climate change. Realizing that 'Wood depletes our forests, and we cannot afford to do this anymore,' Khadse decided to work on an alternative. Plastics were avowedly a known menace to the environment; but MLPs—that went into landfills—were definitely the worst. Thus, after 4–5 years of research, Khadse went on to develop a process to recycle MLPs into a useful product that could replace plywood. His work saw the brand—Ricron panels—took shape in 2013, with commercial production commencing in 2014. Soon after, Khadse saw his investment banker niece—Radhika Chaudhary, and her technocrat-husband, Rahul Chaudhary, join him after

they had moved in to India following some years with multinationals abroad. Health reasons have now had Khadse take a backseat from daily operations at the plant. But he continues as a mentor to his niece and her husband, who handle the company's operations in Ankleshwar, Gujarat.

On any working day, one can see bales of MLPs sourced from scrap dealers, and industrial units in Ahmedabad and various parts of Gujarat being fed to machines to compress them. The MLP bags are then shredded into fine pieces, which are then graded and mixed. The resulting mixture is mechanically heat-compressed into sheets or panels of various thicknesses, ranging from 5 mm to 35 mm. The size of each panel is 8 feet by 4 feet, whether flat, or corrugated. Tough and colourful, the panels give the impression of marble. But unlike marble, these panels are not brittle, and are

MLC packets in bales at the factory



unbreakable. Besides, they can be used like wood, and can be worked on by any carpenter into furniture for residential or office purposes, or used as tiles or partitions or stacking blocks.

Significantly, this is a no-waste industry, wherein the manufacturing waste generated in making the panels can be re-used to make fresh panels several times over. Being recycled plastic, the panels retain some of the qualities that made plastic so indispensable to people. The panels have high compressive strength, low water absorption, are fire-resistant, fungus-resistant, termite-proof, acid-proof, and very durable. This makes them ideal to be used outdoors. Besides, they are light, and hence, easily transported. The surface does not require to be laminated, unlike wood. Commercially, the price of each panel, at ₹30–150 per square feet, depending on the thickness needed, works up on par with the cheapest quality of plywood, and much cheaper than other options in the market. The corrugated variety of Ricron Panels, is particularly in great demand at construction sites, where they are generally used to build temporary sheds, or partitions. Being water-impermeable, one finds them widely used in railway eco-toilets, and mobile public toilets

built by government agencies. However, there is one disadvantage, as Rahul Chaudhary concedes. 'Since the panels are made from waste material, we have no control over the colour /shade of the panels.' Thus, one panel may be on a white background, while another may be a light beige, and still another light green in its shade. Although the shades look attractive enough, some would frown on the difference in colour, if uniformity is desired. The Chaudharys hence advice people to buy entire panels if they are on the look out for a single shade. Of course,

if uniformity of colour is desired, 'any acrylic-based indoor or outdoor paints can be opted for to paint over the panels. Otherwise, the panels can be laminated on as desired,' Rahul Chaudhary says.

Certified as a green product by the CII-Green Products and Services Council, in 2016, Ricron Panels and its manufacturer—Deeya Panels were honoured with the Wildlife Fund for Nature (WWF)'s 2018 Climate Solver Award an year ago. With demand picking up for its products, Deeya Panels has also started looking out for more MLP waste inputs, which is currently mostly obtained from scrap dealers, save for some industrial units in Ahmedabad and Himmatnagar (Gujarat). 'We are now planning to source pre-consumer plastic waste directly from manufacturers like Hindustan Unilever and Nestle, that are into food packaging.'

One hopes for the speedy popularization of a sustainable brand like Ricron Panels, and the consequent disappearance of MLPs from our landfills, so that our forests continue to thrive, and our natural resources remain unpolluted for eons to come. ■

Dr Rina Mukherji is an independent journalist with more than 25 years of experience. She holds a doctorate in African Studies and has several media and academic awards to her credit.

Colourful MLC bags stacked up



Conservation of Biodiversity

For Sustainable Development

‘Failure to conserve and use biological diversity in a sustainable manner would result in degrading environments, new and more rampant illnesses, deepening poverty and a continued pattern of inequitable and untenable growth.’

— Kofi Annan

Humans meet the demand for their daily livelihood from the resources available in the environment.

Nearly 2.6 billion people draw their sustenance either directly or indirectly from agriculture, 1.6 billion from forestry goods, and around 250 million from the aquatic ecosystem. Half of the world's population exploits biodiversity for their benefits and welfare, which becomes a significant factor in the depletion of biological diversity. Trees have been cut for construction, petroleum products have been used for transportation and mineral ores are extracted from the earth for the development of the country and for sustenance of economic activities. However, these activities are also necessary, by using natural resources in an optimized manner. Once these resources are depleted, it will be challenging for the ecosystem to sustain and, therefore, there will be environmental hazards for all of us. 2020 is a critical year for the nations' commitment to preserve and restore biodiversity.

Through the COP15, countries intended to scale up the conservation strategies of the degraded ecosystem to fight climate change and enhance food



security, water supply, and biodiversity in the next decade. The Brundtland Report on conservation strategy states that development activities should meet the demand of the present without compromising future generations' ability to satisfy their individual needs. The Rio framework of the convention on biological diversity stresses on the use of reasonable and equitable sharing of benefits arising from protection. Sustainability is not just about the

environment and ecosystem; it is about achieving a balance between environment, economic, and socio-political sustainability. These three significant sustainability elements must work in a mutual and symbiotic manner to make continued development without degrading the environment.

However, the increased dependence of humans on natural resources leads to the massive destruction of biodiversity. It is estimated that the earth's ecosystem

capacity is reduced by 70 per cent to deliver vital services to the human population. The removal of the forest ecosystem is accountable for the increase in all greenhouse gases (GHGs) by 11 per cent caused by humans. Changes in land-use patterns increased pollution, and rapid climate change destroyed 10 per cent of tropical forest cover in the last 25 years. Biodiversity is an essential character of the world as it ensures the survival of living beings on earth. It supports services that are fundamental to human dignity and well-being. Provision of potable water, food, fertile soil, and clean atmosphere are few of the amenities to name. The earth's biological resources are vital for the economic and social development of humans. There is growing recognition for the biodiversity as a global asset of tremendous value for present and future generations.

Trees and plants store carbon and would stop the release of GHGs into the atmosphere. Mangrove ecosystem is an example of rich biodiversity that stores carbon and provides buffers to extreme flooding due to climate change. This complex mangrove ecosystem works well when all the factors of biodiversity, such as climate, water, and nutrients remain intact. Similarly, the tropical forest cover is responsible for maintaining one-fourth of the total oxygen level in the ecosystem. Biodiversity and ecosystem services are

directly contributing to the development of human well-being and communities. This contribution is essential for the world to embark on the development of the 2030 agenda and its Sustainable Development Goals (SDGs).

Sustainable development encompasses the view of healthy biodiversity, which sooner or later supports the thriving economy. Around 75 per cent of the global food crops rely on animals and insects to pollinate them. With a decline in biodiversity cover, it put more than \$235 million at risk for agricultural products. Economic sustainability adopted a market mechanism to influence the decision-making communities and individuals. It presented biodiversity as an asset rather than a liability on them. For instance, the timber companies have found ways to make profits, ensure increased business status while working sustainably.

Botswana has recognized its natural biodiversity as an incredible source of economic benefit. It banned the killing of lions and other animals for trophy hunting. Instead, they boosted their eco-tourism industry and reinvested the revenue generated to reinforce the economic well-being of the people in the region. Besides this, in several developed countries, authorities are encouraging people to adopt eco-friendly housing and switch to renewable energy sources

by providing subsidies. Similarly, Costa Rica, with an ecosystem services law in place, taxed the use of gasoline and reinvested tax money in restoring their tropical forests cover. As a result, the country expanded its tropical forest cover from 26 per cent to 50 per cent in the last three decades.

Despite having the critical roles in sustainable development, biodiversity, and ecosystem are under constant threat and degraded at unprecedented rates. Several protocols, regulations, and agreements have been framed, but still, the targets have not been achieved. The communities need a long-term process approach to bring a sustainable change desirable for conserving biodiversity. Balancing biodiversity and sustainable development has become a significant concern with policymakers before all is lost and exhausted. Without adequate measures, it will be hard to maintain the crucial balance between these two entities.

It is the time to make serious efforts to conserve biodiversity; otherwise, the consequences will be far impacting and irreversible. We can no longer think of the world in solitude, from the environmental and biodiversity perspectives. The transition to sustainable biodiversity requires a shift in public attitude towards the fair use of resources. This transition can be possible if people have the right information, education, and training to understand and deal with biodiversity issues. Eventually, the ultimate decision-maker for biodiversity is the individual user. It is their personal choice of consumption pattern at a different level that drives the development, which in turn, pollutes or protects nature. The careful and informed selection of products empowers individuals to begin to steer the world towards a new lasting relationship between people and biodiversity for future generations. ■

Article contributed by Mohd Zeeshan, M.Tech Water Science, senior water professional working with international civil society organizations.



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