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COP29

Securing a Climate-resilient Future

IN CONVERSATION

Jaya Vaidhyanathan,
CEO of BCT Digital

SPECIAL HIGHLIGHTS

Decarbonization and the Developed World

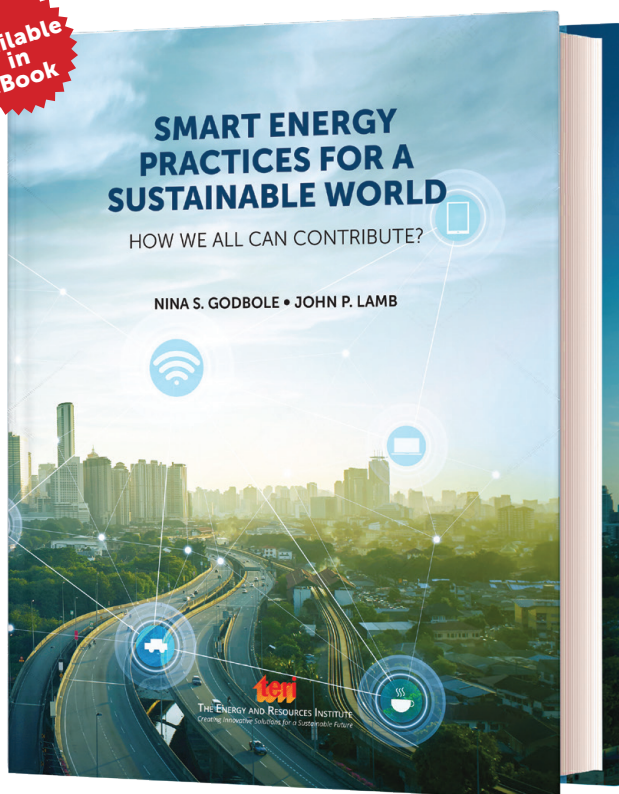
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ISBN: 9789394657113 • Price: ₹1195.00

This book stresses the need for us to judiciously, sustainably, and smartly harness and use energy techniques in order to effectively combat climate change. The book also gives an in-depth discussion on utilization of artificial intelligence and information technology to realize energy efficiency in various sectors of economy including such as transportation, buildings, infrastructure, health care, and other services.

Text is supplemented by case studies that depict ground-level reality to facilitate comprehension of the subject matter. The appendices serve as an extended learning of the concepts discussed in the chapters. The publication would serve as a valuable reference for both scholars and researchers engaged in the domain, in addition to, being a guide to industry and the academic world.

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EDITORIAL



“ During COP29 a significant deal on climate finance was reached, with developed nations agreeing to financially aid the developing counterparts to strengthen their climate action efforts. ”

While the agenda of climate finance dominated the discourse during the recently concluded 29th Conference of the Parties (COP29) to the United Nations Framework Convention on Climate Change (UNFCCC) in Baku, Azerbaijan, other critical issues were also at stake, particularly progress on the Global Goal on Adaptation, the Mitigation Work Programme, market-based approaches under the Article 6, the Loss and Damage Fund, and the UAE Dialogue on Just Transition. A comprehensive agreement on all these issues was necessary for the “full and effective implementation” of the UNFCCC and its Paris Agreement, in particular for the realization of the principle of equity in accordance with the common but differentiated responsibility and respective capabilities (CBDR&RC). However, from a developing country perspective, the COP29 caused disillusionment.

This month’s cover story, “COP29: Securing a Climate-Resilient Future,” highlights that during COP29 a significant deal on climate finance was reached, with developed nations agreeing to channel at least \$300 billion annually into developing countries by 2035 to support their climate action efforts. However, despite being labelled a “Finance COP,” the new climate finance goal has fallen short of the expectations of the developing countries. The COP29 placed significant emphasis on increasing climate finance, especially for the developing nations. The major point of finance negotiations was the New Collective Quantified Goal (NCQG) in addition to implementation of Loss and Damage Fund established at COP27 in Sharm el-Sheikh, Egypt. The conference also deliberated towards ensuring the promised finance delivered effectively and efficiently to those who need it most. Moreover, strategies to attract private sector investment in climate-friendly projects were also deliberated upon at COP29. However, the pledges made for the developing countries caused some degree of dissatisfaction.

On a more positive note, COP29 indeed achieved a historic breakthrough by finalizing the operationalization of Article 6 of the Paris Agreement. This includes both bilateral cooperation (Article 6.2) and an UN-led centralized carbon market mechanism (Article 6.4). The agreement emphasizes the importance of robust registries to ensure transparency and accountability in carbon market activities.

I am confident that the articles in this edition of TerraGreen will deeply resonate with our readers. I encourage one and all to engage in this discourse and share their valuable ideas and reflections.

A handwritten signature in black ink that reads "Vibha Dhawan".

Vibha Dhawan
Director-General, TERI



Apropos the feature article on navigating the urban future published in the September–October 2024 issue of TerraGreen. I believe that IoT and big data are revolutionizing mobility by creating smarter, more efficient transportation systems. IoT connects vehicles, infrastructure, and users, enabling real-time communication and data sharing. This enhances vehicle performance through predictive maintenance and supports autonomous vehicles by processing sensor data for navigation and safety. IoT sensors in traffic lights and roads allow for smart traffic management, reducing congestion and travel times. Mobility-as-a-Service (MaaS) platforms, powered by IoT and big data, integrate various transport modes for seamless, on-demand travel. Fleet management also benefits from real-time tracking and route optimization, reducing operational

costs. Additionally, IoT-enabled electric vehicle charging stations and emissions monitoring promote sustainability. Big data helps tailor personalized travel experiences and improve safety with features like real-time incident alerts. Together, IoT and big data are transforming transportation into a more connected, efficient, and sustainable system.

P Mohan

Bengaluru, Karnataka

I liked reading the article on traditional Indian thali published in the September–October 2024 issue of TerraGreen. Recently, in its latest Living Planet Report, the World Wildlife Fund or World Wide Fund for Nature (WWF) called India’s food consumption pattern as the most climate-friendly among G20 nations and highlighted that India’s diet is the least harmful to the environment. If all countries adopted India’s consumption patterns, the world would require less than one Earth to support food production by 2050, making it a model for sustainability. Cautioning that overconsumption, especially of fats and sugars, is driving a worldwide obesity epidemic, the WWF report revealed that over 2.5 billion adults are overweight, including 890 million living with obesity. It stated, “It’s possible to provide a growing global population with enough nutritious, healthy food—but it will require different dietary shifts depending on current levels of nutrition and consumption.

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RE Capacity Addition Nearly Doubles to 15 GW during Apr.–Nov. 2024

India's renewable energy capacity addition almost doubled to 15 GW during the April–November period of this fiscal compared to the previous year, indicating the country's commitment to the target of 500 GW of non-fossil capacity by 2030, Union Minister for New and Renewable Energy Pralhad Joshi said recently. Highlighting India's remarkable growth in renewable energy, the minister said that the country is not only witnessing an energy revolution but also becoming the renewable energy capital of the world. Addressing the 5th CII International Energy Conference and Exhibition (IECE) in New Delhi, Joshi said that India is one of the world's most promising nations in the clean energy space under the leadership of Prime Minister Narendra Modi.

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

Delhi Mandates Energy-efficient Gadgets in Government Buildings

In a move to cut electricity consumption and save crores of rupees annually, the Delhi government recently mandated the use of energy-efficient appliances, including brushless DC motor (BLDC) fans, 5-star rated air conditioners, and other high-efficiency devices, across all government buildings. Chief Minister Ms Atishi has approved the proposal, which will be sent to the Lieutenant Governor for final clearance. Sharing details about the initiative, she said, "Our government has prioritized energy efficiency by mandating the use of BLDC fans, 5-star rated air conditioners, and other energy-efficient devices in all government buildings."

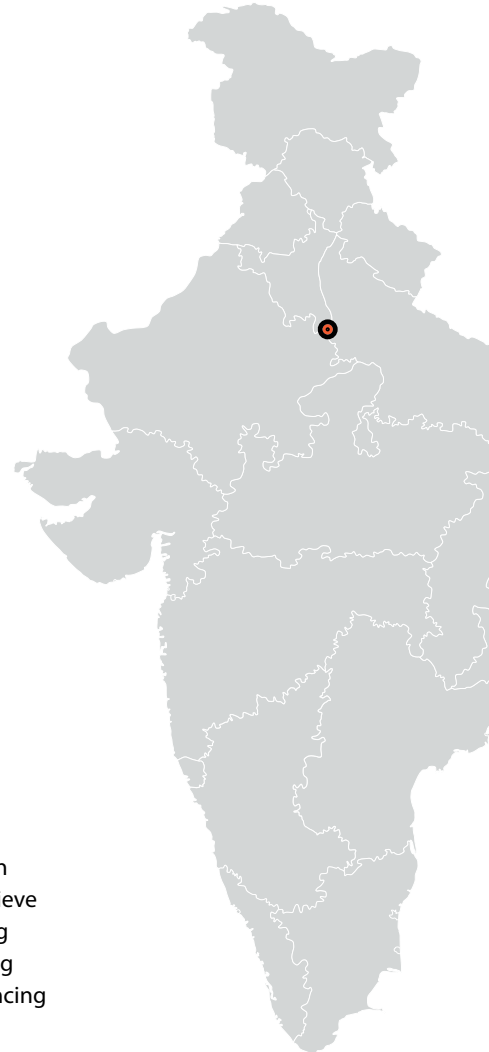
Source: <https://www.dailypioneer.com/>



New Project to Address Sustainable Living in Bengaluru, Gurugram

Vasundhara, a three-year initiative aimed at creating sustainable and resilient communities in Bengaluru and Gurugram, was launched recently. The programme focuses on key areas such as water resource management, biodiversity conservation, and sustainable agriculture, with an emphasis on community empowerment and ecological restoration. The initiative seeks to achieve significant milestones by 2027, including conserving about 710 million litres of water, restoring 24,500 acres of land, and planting 15,000 trees. Notably, an 18-million-litre rainwater harvesting structure near Aivarakhandapura Lake in Bengaluru North has already been completed, enhancing local water availability and reducing dependence on external sources.

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





Only One-third of India's Wastewater is Treated

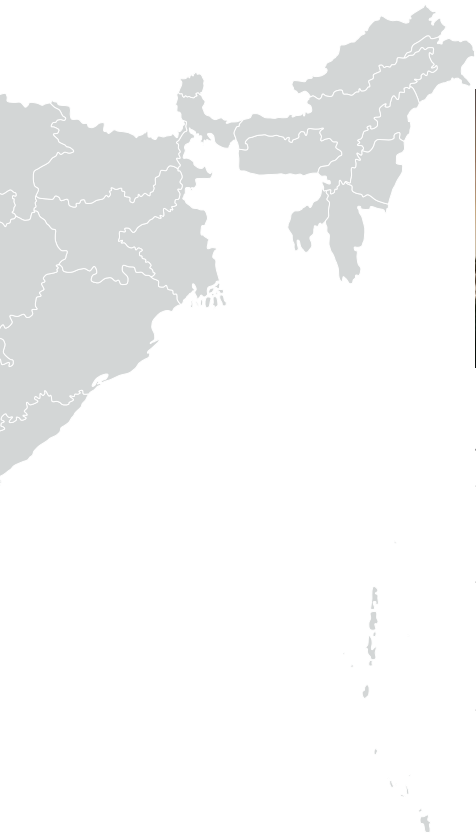
Less than one-third of India's urban wastewater and sewage are treated, leaving over 70 per cent of untreated wastewater flowing into rivers, lakes and land, the Centre for Science and Environment says in a new report. The report that looks at gap areas in the sewage treatment system found that only 28 per cent of the total urban sewage is being treated, implying 72 per cent of the wastewater remains untreated and is disposed of contaminating the environment. Moreover, it notes that 20 per cent of groundwater blocks are in critical condition or overexploited; 55 per cent of the households have either open or no drains and 91 per cent of 302 river stretches are polluted.

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

Half of India's Districts Are Vulnerable to Climate Change, Says ICAR

The government has acknowledged the recommendations of the Indian Council of Agricultural Research (ICAR) to enhance climate resilience in agriculture through the implementation of District Agricultural Contingent Plans (DACPs). Nearly 48 per cent of India's districts are classified as vulnerable to the impacts of climate change, necessitating urgent measures to mitigate risks and ensure sustainable agricultural practices. ICAR is spearheading the National Innovations in Climate Resilient Agriculture (NICRA) project, which assesses the effects of climate change on crops, livestock, horticulture, and fisheries. The initiative focuses on developing and promoting climate-resilient technologies to help regions prone to extreme weather events, such as droughts, floods, frost, and heat waves, adapt effectively to these challenges.

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



Dangerous Air Pollution Kills 15 Lakh Indians Each Year

The all-pervasive super-fine polluting particles that travel to the bloodstream and penetrate the lungs are associated with an estimated 15 lakh deaths in India every year, public health researchers said recently, after comparing the mortality with WHO safe limit for such particles known as PM_{2.5}. A comparison with more relaxed Indian air quality norms brings down the figure to more conservative 300,000 plus individuals, according to the researchers who singled out the impact of long-term exposure of PM_{2.5} while separating other probable causes of death. On both counts the toll estimates are very high, underlining the risks posed by dirty air. An international team comprising researchers from India, the USA, Europe and Israel for the first time applied statistical tools and sophisticated modelling techniques on district level official death data to identify mortalities caused by air pollution after eliminating other possible causes like socio-economical or nutritional factors.

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



ILO's World Social Protection Report 2024–26

Climate change disproportionately affects the world's poorest and most vulnerable communities. The International Labour Organization's (ILO) World Social Protection Report 2024–26, titled 'Universal Social Protection for Climate Action and a Just Transition', highlights the intersection of structural inequalities and climate vulnerability. It reveals that over 90 per cent of people in the 20 countries most affected by the climate crisis lack access to social protection, such as child or unemployment benefits. Similarly, in the 50 most climate-vulnerable nations, 75 per cent of the population—2.1 billion people—remains unprotected. These gaps leave millions exposed to the worsening impacts of climate change.

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



World's Oldest-Known Wild Bird Lays Egg in Hawaii at Age 74

Wisdom, the world's oldest documented wild bird at 74 years old, has laid what experts estimate to be her 60th egg, according to US wildlife officials. The Laysan albatross, a long-winged seabird, has returned to the Midway Atoll National Wildlife Refuge, located near the northwestern boundary of the Hawaiian Archipelago. It was her first in four years, in the Pacific Region of the US Fish & Wildlife Service said in a post on Facebook recently. Since 2006, Wisdom and her partner Akeakamai had regularly visited the atoll in the Pacific Ocean for egg-laying and hatching. Laysan albatrosses, known for mating for life, typically lay one egg annually.

Source: <https://economictimes.indiatimes.com/>

Chile's Giant 'Living Fossil' Frog Faces Threat from Climate Change and Humans

A giant frog species that hopped alongside dinosaurs and is considered a "living fossil" is now losing ground in its native Chile as climate change and human intervention damage its habitat. The *Calyptocephallela gayi*, or Helmeted Water Toad, is one of the largest frogs in the world, growing up to over 30 cm (1 foot) in length and weighing up to 1 kg (2.2 lbs). The amphibian has seen little genetic variation for millions of years, but now its future is at risk, scientists say. "It's sad that a species that managed to coexist with dinosaurs, that managed to resist a mass extinction, is now threatened by human beings," said Melissa Cancino, Founder of Proyecto Anfibia, a group dedicated to amphibian research and education in Chile.

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





Major Report Joins Dots between World's Nature Challenges

Climate change, nature loss and food insecurity are all inextricably linked and dealing with them as separate issues won't work, a major report has warned. The review of scientific evidence by the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) found governments are underestimating or ignoring the links between five key areas—biodiversity, water, food, health, and climate change. This “siloes” approach has unintended consequences, such as damaging biodiversity through tree-planting schemes, or polluting rivers while ramping up food production, the report said. The latest assessment was approved by almost 150 countries meeting in Windhoek, Namibia.

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



Global Coal Demand Is Set to Plateau Through 2027

Coal 2024—the new edition of the IEA's annual coal market report, which analyses the latest trends and updates medium-term forecasts—shows that global coal use has rebounded strongly after plummeting at the height of the pandemic. It is poised to rise to 8.77 billion tonnes in 2024, a record. According to the report, demand is set to stay close to this level through 2027 as renewable energy sources play a greater role in generating power and coal consumption levels off in China.

Source: <https://www.iea.org/>

Japan's Draft Climate Strategy Spurs Calls for Bolder Cuts in Carbon Emissions

Japan's draft proposal for a carbon emission reduction target sparked calls for deeper cuts from experts as well as from within the ruling coalition, as the world's fifth-biggest carbon emitter struggles to reduce its dependence on fossil fuels. The government last month presented a draft plan to aim for a 60 per cent cut in greenhouse gas emissions by 2035 from 2013 levels, a commitment that would align with Japan's future energy mix currently under consideration and other energy policies. As Japan is the world's second-largest importer of liquefied natural gas and a major consumer of Middle Eastern oil, its energy strategies are closely followed by oil, gas and coal producers.

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



Indoor Air Quality Challenges in India during Winters

In this article, **Prabhat Sharma** highlights India's indoor air quality (IAQ) challenges during the winter season, the pollution impacts on health, and solutions to improve IAQ for a healthier environment.

India's winter season, combined with the Diwali celebrations, often leads to a noticeable spike in air pollution, which impacts both the air outside and indoors. During this time, cities experience higher pollution levels due to factors such as emissions from factories, vehicle exhaust, dust emission, crop burning, and additional emission load during Diwali fireworks. These activities release large amounts of harmful particles and gases into the air, such as particulate matter (PM₁₀ and PM_{2.5}), nitrogen oxides (NO_x), sulphur oxides (SO₂), ozone (O₃), carbon monoxide (CO), and volatile organic compounds

(VOCs). This pollution doesn't just stay outdoors; it seeps into homes, offices, and other buildings, making indoor air quality a major health concern. Doors, windows, and ventilation systems allow outdoor pollutants to enter, often creating indoor pollution levels that are as high as those outside, especially in urban areas. Both ambient and indoor air pollution reveals a complex relationship that places residents at risk of exposure to harmful pollutants, leading to respiratory issues such as inflammation, asthma exacerbation, chronic lung disease, and increased infections, as well as cardiovascular risks

including hypertension, atherosclerosis, heart arrhythmias, and heightened risk of heart attacks and strokes. People with pre-existing conditions are at even higher risk.

Hidden Health Hazards of Indoor Air Pollution in Urban Areas

Indoor air pollution causes unique health challenges, especially in urban areas during winter. Fine particles from outdoor sources can easily enter indoor spaces, making ambient air pollution primarily responsible for poor indoor air quality. Although urban buildings often have controlled ventilation and Heating, Ventilation, and Air Conditioning (HVAC) systems, research by TERI has found that even well-maintained corporate offices can have PM₁₀ and PM_{2.5} levels that exceed WHO's safe limits. Small particles like PM_{2.5} are especially dangerous because they can reach deep into the lungs and even the bloodstream, worsening respiratory conditions like asthma and raising the risk of heart disease. The WHO advises that PM_{2.5} levels stay below 10µg/m³ annually and 25µg/m³ over 24 hours, while PM₁₀ should not exceed 20µg/m³ annually and 50µg/m³ in 24 hours. However, during winter months, indoor particulate levels in urban areas often surpass these



limits due to the infiltration of outdoor pollution. According to monitoring stations data (CPCB), gaseous pollutants in ambient air generally remain below National Ambient Air Quality Standards (NAAQS), and TERI studies have shown that indoor levels of these pollutants often fall below detectable limits. As a result, in urban areas where buildings have good HVAC systems, gaseous pollutants are not a significant concern.

Rural IAQ Challenges Owing to Biomass Fuels and Improper Ventilation

In contrast, rural areas face an even more challenging indoor air quality (IAQ) situation due to traditional cooking and heating practices. Many rural households rely on biomass fuels such as firewood and crop residue for cooking, which releases fine particulate matter and gases like CO, SO₂, and NO_x. These pollutants accumulate in the air due to limited ventilation, creating hazardous indoor environments that regularly surpass recommended air quality limits. Women and children, who typically spend the most time in cooking areas, are especially vulnerable to the effects of this indoor pollution. TERI's studies indicate that biomass combustion in rural households can lead to PM_{2.5} and PM₁₀ levels far above WHO standards, presenting significant health risks. Moreover, gaseous pollutants like CO, SO₂ and NO_x can reach dangerously high concentrations, particularly in poorly ventilated



homes, exacerbating respiratory issues and increasing the likelihood of cardiovascular conditions. This complex contrast in IAQ between urban and rural areas illustrates the varied sources and types of pollution that challenge health and well-being across India.

Divergent Indoor Air Quality Challenges in Urban and Rural India

Efforts to improve IAQ in both urban and rural settings require a combination of technological advancements and behavioural shifts. Enhancing ventilation systems in urban buildings, particularly through high-quality HVAC systems,

can prevent the infiltration of outdoor particulate matters. During high pollution periods, such as Diwali and winter, advanced air filtration systems can play a vital role in reducing the impact of ambient pollution indoors, maintaining healthier indoor spaces. In rural areas, a shift towards cleaner cooking practices is crucial for reducing indoor pollution levels. Switching from biomass fuels to cleaner alternatives, such as liquefied petroleum gas (LPG) or improved biomass stoves with ventilation can significantly decrease indoor pollution and its associated health risks. Additionally, increasing public awareness about the importance of IAQ can empower people to make healthier choices, such as cleaner cooking practices and improving home ventilation. As outdoor pollution seeps into indoor spaces and rural homes continue to face indoor pollution sources, effective solutions require teamwork across technology, policy, and public awareness to create healthier indoor environments for both city and rural communities. ■

Prabhat Sharma works as Associate Fellow, Centre for Air Quality Research, TERI, New Delhi.



The Great Ripple

How a Tsunami Can Disrupt Global Trade

Tsunamis can inflict significant physical damage on ports, but the economic impact extends far beyond that. The disruption of shipping routes leads to daily losses amounting to billions of dollars, as demonstrated by the 2011 tsunami in the Tohoku Region. To better understand the ripple effects a tsunami could have on shipping lanes in the South China Sea, an international team of researchers conducted 104 tsunami simulations.

Tsunamis can cause immense physical damage to ports, but the economic cost does not stop there. The resultant disruptions of shipping lanes result in billions of dollars in losses every day, as was seen in the 2011 tsunami that hit the Tohoku Region. To better assess the ripple effect a tsunami could cause to shipping lanes in the

South China Sea, a group of international researchers carried out 104 tsunami simulations. Port disruptions are actually very costly. While the 2011 Tohoku tsunami caused around \$12 billion in damages to port facilities and vessels, the ensuing port disruptions resulted in a loss in seaborne trade that cost approximately \$3.4 billion per day.

Shipping facilitates more than 80 per cent of global trade, meaning disruptions to the global port network can have severe consequences for global commerce. Despite these risks, tsunamis are rarely considered in port capital planning or structural design. This oversight is partly due to the infrequent occurrence of tsunamis and the lack of





robust methods to quantify potential risks.

In response, a group of researchers has proposed a framework to evaluate tsunami risk to seaports and the global port network. The framework estimates potential economic losses in trade caused by port disruptions while also analysing the ripple effect it would have on the global port network, including the ramifications for shipping routes and ports not directly affected by physical damage.

Constance Chua, a postdoctoral researcher at Tohoku University's International Research Institute of Disaster Science (IRIDeS), led the study, with the support of Professor Fumihiko Imamura, Associate Professor Anawat Suppasri, and Professor Adam Switzer from Nanyang Technological University.

"We applied our framework to the South China Sea, focusing on a potential tsunami scenario triggered by a rupture along the Manila Trench," says Chua. "We also incorporated tsunami conditions under future sea-level rises."

In total, Chua and her colleagues evaluated 104 scenarios, thanks to the help of international experts from various fields. These included Dr Tanghua Li, a geophysicist at the Earth Observatory of Singapore who specializes in sea-level rise modelling in Asia; Research Professor Qiang Qiu, a tectonic geodesy expert on the Manila Trench based at the Chinese Academy of Sciences; and Professor Linlin Li, a tsunami modeling expert from Sun Yat-sen University. Each expert contributed the latest knowledge and models on different hazard components, ensuring a broad base of factors was

considered, thereby creating scenarios that mirrored reality as closely as possible.

The study found that a Manila Trench tsunami could damage up to 11 international seaports under present-day sea-level conditions and up to 15 ports by 2100. In the most severely damaged locations, port closures could last over 200 days. However, the length of closure did not always translate into the greatest economic loss. Ports with higher annual cargo were more susceptible to economic damage. The ports of Hong Kong, Manila, and Kaohsiung experienced the highest trade losses across all scenarios.

Chua says that a Manila Trench tsunami could have greater repercussions for global trade than past events, such as the 2004 Indian Ocean tsunami and the costly 2011 Tohoku tsunami. "Since South China hosts some of the busiest ports and sea lanes, the number of disrupted shipping routes would far exceed previous tsunami events. Given the lack of consideration towards tsunami impacts, our study could help stakeholders prepare for such events." ■

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



Environmental Impacts of Tourism Industry in J&K

Need for a Sustainable Tourism Model

In this article, **Adv. Aqib Ul Ahad Wani** examines the negative impacts of the tourism industry on the natural environment of Jammu & Kashmir. He argues that as the population and urbanization increase, the number of tourists grows each year, causing physical damage to the environment. There is a growing imbalance between the demand of tourists and the physical carrying capacity of the areas where tourism activities take place. In such cases, the expected positive relationship between tourism and sustainability is disrupted, leading to an environmental crisis. To protect Kashmir, a sustainable tourism model is essential. This model should include promoting eco-friendly practices such as waste reduction, water conservation, and involving local communities in tourism-related decision-making.







Tourism is primarily a service industry, relying almost entirely on natural resources such as mountains, hills, lakes, reservoirs, dense canopies, flora, fauna, and the aesthetic beauty of pleasant climates. However, tourism is not a low-pollution industry; it is increasingly recognized as one of the most polluting sectors.

One of the ugly faces of tourism is environmental damage. Tourism is constantly damaging the natural environment of popular tourist destinations. Tourism can dramatically

increase transportation services and deforestation, resulting in air and water pollution. In addition, infrastructure services around tourist destinations in hotels, restaurants, shops, stores and other related industries are constantly growing. This growing infrastructure ultimately destroys the natural environment of the tourist destination if it is not regulated by regulations like the Environmental Protection Act, 1986.

Many negative effects on tourists occur when the number of tourists exceeds the capacity of the environment

which can compete with the quantity of tourists. Some of the consequences of going beyond ecological potential include pressure on scarce resources such as water, energy, food, and natural habitat. In addition, the development of uncontrolled tourism can lead to soil erosion, increased pressure on endangered species of animals and plants, increased risk of deforestation and loss of biodiversity. It also increases emissions from traffic, garbage, sewage production, and noise pollution.

Damage to the Natural Environment

With the increase in population and urbanization, tourists increase year by year. It is causing physical damage to the environment. There is an imbalance between the demand of tourists and the physical carrying capacity of the tourist activity area. The expected symbolic relationship between tourism and security is broken in such cases, resulting in an environmental crisis.

Jammu & Kashmir Union Territory (J&K UT) has tremendous potential to attract tourists and promote sustainable tourism in the Kashmir Valley. However, the findings suggest that, to enhance



human well-being, we must prioritize the environment and limit tourism to the region's capacity in order to ensure sustainability. Many tourist destinations in India, especially religious shrines, have already exceeded their capacity. A notable example is the Amarnath Yatra. Muhammad Sultan Bhatt, head of the Department of Geography and Regional Development at the University of Kashmir, said an environmental impact assessment of Lidder Valley found that the area could carry only 4300 pilgrims daily. But on average, more than 12,000 pilgrims visit the cave daily in the first months of the Amarnath Yatra. Global warming is already affecting the glaciers around the shrine, and human pressure increases the effect. Due to overcrowding, the image of Lord Shiva, in the form of a 'lingam' or 'Shiva linga' (naturally formed stalagmite) is steadily declining in size each year and is melting entirely before the end of the Yatra season in the valley. If this limit of carrying capacity is not overcome in a few decades, we may not have the lingam to go and pray. Therefore, there is an urgent need to limit the number of tourists and improve the management of the place. We can learn some lessons from our neighbour Bhutan in doing



so. Bhutan has controlled the number of tourists by promoting high-value tourism.

Snowfall Imbalance

Climate change is wreaking havoc on the Kashmir Valley's snowfall equilibrium. Kashmir attracts a vast number of tourists due to its snow-covered adventure activities. The recent increase in temperature, lack of snowfall throughout the winter season, and excessive rains are all apparent evidence of climate change in the valley. According to a study done by the National Institute of Hydrology, glacier volumes in Jammu and Kashmir's Zaskar Adgator Himalayan mountains have fallen by 3.6 per cent and 97 per cent in the last three decades in Roorkee, Ladakh. The majority of glaciers are represented and reduced by 17 per cent to 25 per cent. The lack of snowfall is impacting the UT's freshwater supplies and its industry. That is why long-term development is required. The uneven pattern of rainfall is another consequence of climate change. As a result, natural disasters such as droughts and floods have grown increasingly common. The devastating floods of September 2014 were caused by recent extreme climate change.

Change in Climate

Tourism, as a sector sensitive to climate, is directly impacted by adverse climate events in the region, such as climate change, storms, floods, snowfall, and heavy rainfall. Global tourism cannot be excluded as a contributor to climate change, as it involves the movement of people and the development of infrastructure for travellers, making it a secondary source of environmental impact. It is estimated that the activity of people from one destination to other alone accounts for 50 per cent of the total traffic (road, railway, and air), thus contributing to the emission of greenhouse gases and other primary pollutants. The average temperature rise in Kashmir Valley over the last two decades, as reported by the Indian Meteorological Department (IMD), the Ministry of Earth Sciences, Government of India, was 1.45 degrees Celsius against 2.32 degrees Celsius in the Jammu region.

Pollution of Water Bodies

Natural water resources can be severely damaged due to hotels, restaurants, and accommodation services if proper

sewerage disposal systems for hotels, resorts, and other tourist facilities are not installed. Sewage can contaminate groundwater if the sewage discharge is made in a nearby river, lake, or coastal seawater area. This situation is common in areas of beach resorts, where hotels form an outfall in the adjacent water area, which can be used by tourists for swimming or even for fishing by the locals. In surface water, recreational and tourist transport motorboats pollute rivers, lakes, and seawater due to the spread of oil and gas and the clearing of their bulges in the water.

The UT of Jammu & Kashmir, especially the Kashmir Valley, is characterized by some beautiful lakes. However, the ecosystem of these lakes is rapidly deteriorating due to tourism. Dal Lake in Srinagar, famous for its geography and stunning beauty, is pathetic. Its crystal clear water has become highly polluted with foul odour. It has suffered from eutrophication, siltation, encroachment, growing vegetables in floating fields, and wastewater discharge. Not only is its water-covered area shrinking, but



the lake itself is also shrinking. Its water quality is the worst in the Himalayan region. Wrappers, plastic bags, tins, cans, rags, vegetable peels, empty cigarette butts, rubbish, and countless bushes can be seen floating in its water, affecting the lake's shape. The area of Dal Lake, which was 22 sq. km in 1931, has shrunk to only 15 sq. km in 1999. Out of the current size

of Dal Lake, only 11 sq. km has water. About 5000 people were found living permanently on houseboats.

Air Pollution

Tourism is generally considered a "smoke-free industry." But it can also cause air pollution in a particular





area by tourist vehicles, especially in significant attractions that are only accessible by road. This is due to improper maintenance of the vehicle exhaust system. In addition, in the case of dust or dirt in the air, pollution can arise from open, vegetated areas if tourism development is not adequately planned, developed, landscaped, or built. In Jammu & Kashmir, heavy vehicles and all kinds of two-wheelers, four-wheelers, trucks, buses, carriage vehicles,

passenger vehicles, yatri load carriers, tourist season vehicles, construction equipment vehicles, transport vehicles, etc., are disturbing the ecological balance of the place.

Impacts on Wildlife

Wildlife can be negatively impacted by the construction and maintenance of tourist infrastructure and activities. These impacts can be direct, such as when development in lower elevations

of mountain resorts limits the migratory range of certain species, or indirect, such as when automobile headlights and resort lighting disorient marine turtles. The two primary ways tourist activities disturb the wildlife are by altering their eating habits and feeding patterns and altering their habitat. Feeding patterns are changed directly by tourists feeding animals and indirectly by littering, which encourages wildlife to scrounge for food. Wildlife habitat is altered by tourists' trampling and by the use of off-road vehicles (ORVs).

What Should be Done?

To protect Kashmir, a sustainable tourism model is needed. This includes promoting, eco-friendly practices like reducing waste, conserving water, and involving local communities in tourism decisions. Infrastructure should be built to withstand extreme weather, and tourism offerings should be diversified to avoid the overcrowding during peak tourist seasons. ■

Aqib Ul Ahad Wani is an advocate currently practicing in Jammu Kashmir and Ladakh High Court and holds Master's Degree in Environmental Laws. Views expressed are exclusively his own and he can be reached at advocateaqib08@gmail.com





ESG and Climate Change-related Risks

BCT Digital helping corporates manage climate risks

ESG frameworks help businesses integrate climate risk into risk management by identifying environmental, social, and governance factors impacting operations. **Jaya Vaidhyathan, CEO of BCT Digital**, believes that with robust data analytics, ESG frameworks can help analyse vast amounts of environmental and social data to identify patterns related to climate risk. BCT Digital is assisting corporates and financial institutions in managing ESG and climate change-related risks through its rt360 ESG and Climate Risk Monitoring platform. Here, she is in an exclusive email conversation with *TerraGreen* editorial team.



How ESG (Environmental, Social, and Governance) frameworks help businesses integrate climate risk into their overall risk management?

ESG frameworks help organizations to understand climate risk as interconnected with various business dimensions, enabling the identification of growing risks. For example, regulatory changes in climate policy can impact supply chain stability and consumer behaviour. This systems-thinking approach allows for more comprehensive risk assessments, ensuring businesses are prepared for potential challenges arising from climate-related issues.

With robust data analytics, ESG frameworks can help analyse vast amounts of environmental and social data to identify patterns related to climate risk. Predictive analytics can signal disruptions in resource availability or shifts in regulations, enabling organizations to anticipate challenges and develop proactive strategies.

Advanced scenario planning is integral, as it allows organizations simulate diverse climate scenarios—like extreme weather or market shifts develop tailored resilience strategies. This preparation fosters a culture of agility and innovation among organizations.

The emphasis on stakeholder capitalism in ESG frameworks enhances accountability to a broader range of stakeholders, including employees, communities, and the planet. This encourages businesses to embed climate considerations deeply into their operations and cultivate a commitment to sustainability. Additionally, ESG factors drive innovation, leading to new products and services that address climate challenges and enhance competitive advantage. Finally, implementing ESG frameworks can catalyse cultural transformation, embedding sustainability into corporate values and motivating employees. These frameworks drive governance structures that prioritize climate insights, embedding them within core decision-making practices.

Please shed light on the growing vulnerability of India's corporates/ financial institutions to climate-related risks.

India's corporates/financial institutions are increasingly vulnerable to climate-related risks, a concern highlighted by the Reserve Bank of India's (RBI) latest financial stability report. While it notes a multiyear low in non-performing loans, the report reveals that climate change has emerged as the foremost systemic risk to the Indian financial



system. This acknowledgment, voiced by market participants for the first time, underscores the urgent need to reassess the risk management strategies.

As the climate change impacts intensify, sectors such as agriculture, infrastructure, and energy—critical to India's economy—are becoming increasingly exposed. Scheduled commercial banks, which play a pivotal role in financing agriculture, are particularly affected. Climate variability directly impacts farmers' incomes and food security, leading to greater credit risks for banks that provide this financing. Therefore, climate-risk management is no longer optional; it is imperative for banks to factor climate risks into their credit assessments and tailor financial products that enhance agricultural resilience.

Beyond physical risks, financial institutions face significant transition risks as the global economy moves towards low-carbon practices. These risks include regulatory changes, technological advancements, and evolving consumer preferences, all of which can negatively affect the sustainability of investments. The RBI's recent draft disclosure framework reflects an acknowledgment of the importance of integrating climate considerations into financial planning, signalling a step towards strengthening the climate resilience of Indian banks.



Please share your views on the transformative power of technology—AI, machine learning, and blockchain—in tracking, managing, and mitigating climate risks.

The transformative power of technology, particularly through AI, machine learning, and blockchain is crucial in tracking, managing, and mitigating climate risks within the ESG landscape. Advanced technologies enable precise data collection, in-depth analysis, and efficient reporting, enhancing the accuracy and efficiency of ESG assessments.

Blockchain technology can provide a secure and transparent system for recording environmental data, enabling traceability of emissions and resource use, and ensuring accountability in carbon credits and sustainability initiatives across supply chains.

By analysing vast datasets from sources like satellite imagery and weather patterns, AI and machine learning facilitate the development of sophisticated predictive models that can forecast climate impacts more accurately. This capability allows organizations to prepare for extreme weather events and make informed decisions about risk management.

AI tools further enhance risk assessments by integrating climate variables into financial models, enabling businesses to understand their exposure to risks such as floods or droughts. This informed decision-making is essential

for managing credit risks, particularly in sectors heavily reliant on climate-sensitive resources. Additionally, technology enables companies to conduct comprehensive climate-related stress tests and scenario analyses, providing valuable insights that influence strategic decision-making.

Real-time monitoring of environmental conditions and greenhouse gas emissions is another critical application of AI, promoting compliance with regulatory requirements and fostering corporate accountability. Furthermore, AI can identify investment opportunities in sustainable projects, guiding capital towards initiatives that promote climate resilience. AI-powered platforms enhance community engagement by providing accessible information about climate risks, empowering local populations to take informed actions.

Overall, the integration of AI, machine learning, and blockchain represents a paradigm shift in climate risk management, driving innovative solutions that can reshape industries and foster sustainability.

How is BCT Digital helping corporates and financial institutions manage ESG and climate change-related risks?

BCT Digital is assisting corporates and financial institutions in managing ESG and climate change-related risks through its rt360 ESG and Climate Risk Monitoring

platform. As banks and financial institutions increasingly confront the complexities of climate-related risks, BCT Digital provides a comprehensive, strategic solution designed to address these challenges effectively.

The platform facilitates governance and risk assessment by streamlining the assignment of roles and responsibilities across business units. This enables institutions to proactively manage climate risks by identifying and assessing various risk categories and their drivers, thereby integrating climate risk into their enterprise risk management (ERM) frameworks. This integration fosters informed, data-driven decision-making by allowing organizations to analyse material exposures vulnerable to climate impacts in depth.

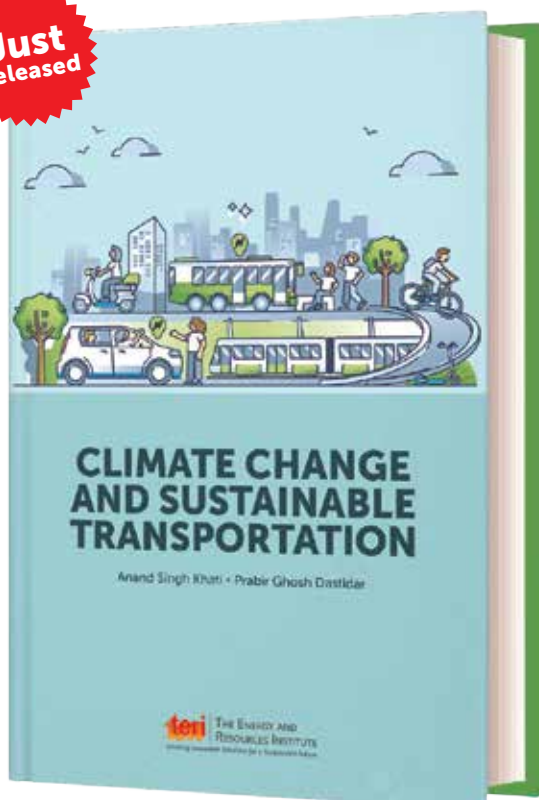
In terms of portfolio monitoring, rt360 ensures that financial portfolios maintain resilience against climate-related challenges. It establishes an early warning system and employs dynamic tools for tracking concentrations and limits, enabling institutions to identify vulnerabilities and gain real-time insights. This capability is essential for protecting portfolios and financial assets in a volatile climate landscape.

BCT Digital also supports stress testing and scenario analysis, evaluating the potential impacts of physical and transition risks on strategies and portfolios. With pre-built libraries for scenario analysis based on global frameworks, organizations can plan strategically, considering a wide range of possible future scenarios.

Additionally, the platform enhances internal reporting processes by incorporating climate risk seamlessly into reporting frameworks. This alignment with global reporting standards ensures transparency and assists institutions in meeting regulatory requirements. Overall, BCT Digital's rt360 platform equips corporates and financial institutions with the necessary tools to navigate the complexities of ESG and climate change-related risks effectively. ■

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29

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COP29

Securing a Climate-resilient Future

Expectations for the 29th Conference of the Parties (COP29) to the UNFCCC, held in Baku, Azerbaijan, were high. While climate finance dominated the discourse—and rightly so—other critical issues were also at stake. These included progress on the Global Goal on Adaptation, the Mitigation Work Programme, market-based approaches under Article 6, the Loss and Damage Fund, and the UAE Dialogue on Just Transition. In this article, **Dr Anil Pratap Singh** highlights some of the key deliberations and breakthroughs during COP29. Despite being labelled a “Finance COP,” he argues that the new climate finance goal has fallen short of the expectations of developing countries. India and other Global South nations have criticized the inadequacy of the New Collective Quantified Goal (NCQG). Keep reading to learn more!



The annual round of climate talks, COP29, that is, the 29th Conference of the Parties to the United Nations Framework Convention on Climate Change concluded in November 2024 in Baku, Azerbaijan, after two weeks of intense deliberations. A significant deal on climate finance was reached, with developed nations agreeing to channel at least \$300 billion annually into developing countries by 2035 to support their climate action efforts. This breakthrough agreement not only tripled finance commitment, from the previous goal of \$100 billion annually to \$300 billion, but will also secure efforts of all actors to work together to scale up finance to developing countries, from public and private sources, to the amount of \$1.3 trillion per year by 2035. However, despite being labelled a “Finance COP”, the new climate finance goal has fallen short of the expectations of developing countries. Moreover, the selection of petro-states to

host the third climate COP has also raised concerns about potential biases due to their economic reliance on fossil fuels.

Financing a Sustainable Future

The COP29 placed significant emphasis on increasing climate finance, especially for developing countries. The major point of finance negotiations was the New Collective Quantified Goal (NCQG) in addition to implementation of Loss and Damage Fund established at COP27 in Sharm el-Sheikh, Egypt. The conference also deliberated towards ensuring the promised finance delivered effectively and efficiently to those who need it most. Moreover, strategies to attract private sector investment in climate-friendly projects were also discussed at COP29. However, despite the focus on climate finance at COP29, the pledges made for developing countries fell short of expectations. Trillions are required for climate solutions, for instance, according to one of the latest estimates by International Energy Agency (IEA), \$4.5 trillion required annually, only for the energy transition by the early 2030s against current investment of just \$1 trillion per year being a tiny fraction of what’s needed.

While India and other Global South countries criticized the inadequacy of the NCQG, COP29 President Mukhtar Babayev, in his opening address, urged countries to deliver an ambitious NCQG. This new annual financial target, starting from 2025, is critical to accelerate the transition to clean energy, protect vulnerable communities, and build a climate-resilient



future. India demanded at least \$1.3 trillion annually in climate finance, with \$600 billion in grants, to address the growing climate crisis in developing countries. Mr Babayev highlighted the potential of operationalizing carbon markets under Article 6 of the Paris Agreement to reduce the costs of implementing national climate plans.

Small Island Developing States (SIDS), also expressed their pressing need for financial support in order to implement their ambitious climate plans and to adapt to climate change and to reduce the debt burdens as well. SIDS are already suffering from the impacts of extreme weather, sea-level rise, and ocean acidification, despite their commitment to net-zero emissions and climate resilience. Papua New Guinea, a SIDS, already boycotted COP29, citing broken climate promises. The Alliance of Small Island States (AOSIS) urged for increased financial support to address loss and damage and emphasized the importance of ambitious national climate plans. Meanwhile, the Independent Alliance of Latin America and the Caribbean (AILAC), the Umbrella Group, the European Union (EU), and the Environmental Integrity Group expressed disappointment with the lack of progress on the Global Stocktake. It is also worthwhile to mention that the Paris Agreement requires countries to submit Nationally Determined Contributions (NDCs), at the intervals of five years, outlining their climate action plans, including mitigation and adaptation measures. The third round of NDC is due to be submitted to the UNFCCC secretariat by early 2025. The second round of NDCs reveals that current efforts and climate plans are not ambitious enough to meet the Paris Agreement's temperature goals and magnitude of challenges are alarming. Also, countries are expected to submit their first biennial transparency reports by the end of 2024.

In his closing remarks, UN Secretary-General Antonio Guterres said that new plans must cover all



emissions and the whole economy, accelerate fossil fuel phase out, and contribute to the energy transition goals agreed at COP28—seizing the benefits of cheap, clean renewables. The end of the fossil fuel age is an economic inevitability. New national plans must accelerate the shift, and help to ensure it comes with justice.

Imperative of Carbon Reduction

The record-breaking carbon emissions in 2024 underscore the urgency of immediate climate action. Each passing year increases the likelihood of more and more catastrophic climate impacts and makes it harder to limit warming to 1.5°C. This will bring us closer to irreversible climate change and makes it increasingly difficult to meet the climate goal.

The United Nations Environment Programme (UNEP) brought out *The Emissions Gap Report 2024: No more hot air ... please!* which also cautioned that nations must deliver dramatically stronger ambition and action in the next round of NDCs or the Paris Agreement's 1.5°C goal will be gone within a few years. Executive Director of UNEP, Ms Inger Andersen, at COP29, emphasized the growing importance of climate litigation and the need for strong environmental laws.

The Paris Agreement sets the goal of limiting global warming to well below 2°C above pre-industrial levels, with an aspiration to limit warming to 1.5°C. To achieve this ambitious target, countries must drastically reduce greenhouse gas emissions and shift towards low-carbon development pathways. However, the global energy crisis and post-pandemic economic recovery led to a record \$7 trillion in fossil fuel subsidies, according to an IMF report. Several countries at COP29 expressed deep concern that as extreme weather events intensify across Asia, Europe, and the United States, continued investment in fossil fuels through subsidies undermines global efforts to limit warming to 1.5°C. Fiji demanded



a shift from fossil fuel subsidies to renewable energy and commented on current situation and said, 'the money is there but misallocated'. The Netherlands called for a global coalition to phase out fossil fuels. The EU announced ambitious plans for renewable energy in Africa, while Singapore pledged to mobilize private capital for green initiatives.

A Milestone for Market-based Climate Solutions

Article 6 of the Paris Agreement provides a framework for international cooperation on climate action, including carbon markets. However, parties discussed that delays in operationalizing these market-based approaches has impacted the overall implementation of the Paris Agreement. Eventually, one of the most significant outcomes of COP29 was the adoption of decisions on Article 6.2 and 6.4 of the Paris Agreement, which will facilitate international cooperation on climate action through market-based approaches. Due to the success of COP29 on these new rules for trading carbon credits, it is expected to reduce global emissions faster and make easier and cheaper for countries to meet climate goals. COP29 President Mukhtar Babayev explained that this agreement would enable countries to achieve their climate targets more cost-effectively, ending a decade of negotiations and delays.

The discussions held at COP29 also pinpointed on the development and implementation of a mitigation work programme to reduce greenhouse gas emissions. However, regarding adaptation, the focus was on the global goal on adaptation (GGA). As a final point, for Paris Agreement Articles 6.2, i.e., cooperative approaches to climate change mitigation and 6.4 being carbon market mechanism, the discussions aligned on the development of registries. The development of registries under Article 6 of the Paris Agreement is

crucial for establishing a transparent and accountable system to track, verify, and record carbon credits and other climate mitigation activities.

Mitigating Methane

Another noteworthy accomplishment of COP29 was 'Reducing Methane from Organic Waste Declaration' to which more than 30 countries were initial signatories. However, India did not sign the deal. This declaration was developed with the UNEP-convened Climate and Clean Air Coalition (CCAC). Contextualizing this declaration, it is worth to mention that at COP26, the Global Methane Pledge (GMP) was also launched which aimed to reduce methane emissions, a potent greenhouse gas, by at least 30 per cent by 2030. It is believed that by reducing methane emissions this pledge can aid to slow the rate of global warming in the short term and buy the valuable time to transition to a low-carbon economy. Martina Otto, the head of CCAC Secretariat called for immediate action to reduce methane emissions from organic waste, warning that failure to do so could jeopardize the Paris Agreement goals and threaten global food security. She said, "Given over 50 per cent of municipal solid waste is organic waste that emits methane, and nearly one-third of all food produced is lost or wasted each year, this declaration will help to increase ambition in the prevention, separate collection, and improved management of organic waste, including through targets in the next round of countries' climate plans, cooperation across all levels of government, and finance, helping us keep food out of landfills."



A Watery Path to Climate Action: Ocean and Water

UN Secretary-General's Special Envoy for the Ocean, Peter Thomson, welcomed the increased attention given to ocean-based solutions at COP29, signalling a significant step forward in global climate action. He stressed the critical need for de-carbonization, emphasizing the devastating impacts of emissions on the oceans, including the destruction of coral reefs that support 24 per cent of marine life. Also, a recent UN Department of Economic and Social Affairs' Division for Sustainable Development Goals (UN DESA), published ahead of COP29, aligns with the broader goals of the 2025 UN Ocean Conference. A contribution to the report by the author of this article highlighted the need to prioritize the capacities and capabilities of SIDS and Least Developed Countries (LDCs) within the framework of the Ocean Action Panel on Conservation, Sustainable Management, and Restoration. This report synthesizes the diverse perspectives and insights provided by a wide range of stakeholders.

On the sidelines of COP29, the Eighth South and South-West Asia Sub-regional Sustainable Development Forum, also held in New Delhi, from November 12–14, 2024, emphasized the importance of data and knowledge sharing for effective ocean management. Participants, including the author who penned this article, expressed concern over the current data gaps and called for greater efforts in this area. Besides, the 5+5 Ocean Decade Conference 2025, led by the author, marks the midpoint of the UN Decade of Ocean Science, also shared with UN officials and other participants at the Forum. Such initiatives can strengthen climate action by providing crucial insights and innovative solutions.

The High-Level COP29 Presidency event launched the Baku Dialogue on Water for Climate Action, a significant initiative to address the role of water in climate mitigation and adaptation. The Declaration emphasized the need for international cooperation on water-related climate action and the continuity of the Baku Dialogue between COPs. However, a significant outcome of the event was the endorsement of the Water Declaration, which calls for integrated approaches to address the impacts of climate change on water resources and

ecosystems. Recognizing the vital role of water in climate action, a UN-Water Analytical Brief called for the integration of water resources management into climate mitigation and adaptation strategies.

The World Meteorological Organization's (WMO) report, 'State of Global Water Resources 2023,' reveals a concerning global water crisis, characterized by declining river flows and unprecedented loss of glaciers, which threaten water security for millions worldwide. The devastating impacts of climate change, including record-breaking heatwaves and floods, were evident in 2023. The WMO report offers a global assessment of water resources, drawing on data from meteorological and hydrological services to inform decision-makers in water-sensitive sectors and disaster risk management.

Sharing the report at COP29, the WMO revealed alarming trends: 2023 was the driest year for global rivers in 33 years, and glaciers experienced their largest mass loss in 50 years. The report emphasized that climate change is making hydrological cycles more erratic. To address these challenges, the WMO called for improved early warning systems to mitigate water-related hazards and better data sharing for informed decision-making. The WMO used World Water Day at COP29 to highlight these critical issues and role of water in climate action, called for integrated approaches to address water security and climate resilience. Now, The Baku Dialogue aimed to ensure continuity and coherence in water-related climate action between COPs.





Additionally, the 'Baku Adaptation Roadmap' and the 'Baku High-Level Dialogue on Adaptation' were also launched, demonstrating the continued commitment to transformative adaptation. At COP29, for the first time, a special space was created to ensure meaningful participation of children in a youth-led climate forum. Four children, including one aged just ten years, played an important role as moderators and speakers on the stage, communicating directly with country representatives and observer organizations. The participation of young people at COP29 was a powerful demonstration of the next generation's commitment to climate action. Their involvement fosters intergenerational cooperation and ensures that the voices of future generations are heard.

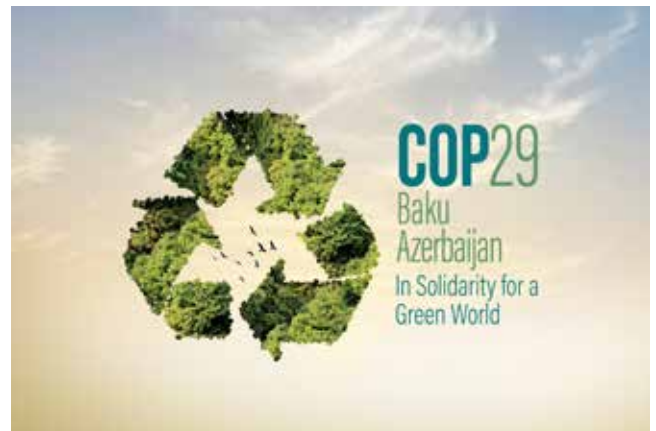
In his final remarks, Simon Stiell, UN Climate Change Executive Secretary, called the new climate finance goal an insurance policy for humanity. He acknowledged that while significant progress was made, more work is needed to address the increasing climate impacts and to ensure a just transition to a low-carbon future. ■

COP29 Breakthroughs

- COP29 in its breakthrough accomplishments, aimed to triple annual climate finance to \$300 billion by 2035, with developed countries taking the lead. It also reached the agreement that will secure efforts of all actors to work together to scale up finance to developing countries, from public and private sources, to the amount of \$1.3 trillion per year by 2035 in order to mitigate and adapt to the impacts of climate change.
- COP29 achieved a historic breakthrough by finalizing the operationalization of Article 6 of the Paris Agreement. This includes both

bilateral cooperation (Article 6.2) and an UN-led centralized carbon market mechanism (Article 6.4). The agreement emphasizes the importance of robust registries to ensure transparency and accountability in carbon market activities.

- More than 30 countries endorsed the declaration on reducing methane from organic waste, while India did not sign the agreement.
- The COP29 Presidency, in collaboration with the Food and Agriculture Organization (FAO), launched the Baku Harmoniya Climate Initiative, a platform designed to recognize and support farmers as key actors in climate action. This initiative aims to consolidate existing climate initiatives in the food and agriculture sector and identify opportunities for future policy interventions. This would support farmers to find and facilitate access to finance at their ease.
- COP29 adopted the Baku Work Plan and extended the mandate of the Facilitative Working Group under the Local Communities and Indigenous Peoples Platform. This will enable continued work on implementing the plan in a collaborative and gender-responsive manner. The plan is due to be reviewed in 2027 as was established at COP24.
- COP29 extended the Lima Work Programme on Gender, which was established in 2014, for another decade. This decision reaffirms the importance of gender equality in climate action and calls for the development of a new gender action plan to be adopted at COP30.



Dr Anil Pratap Singh, General Secretary & Founder Director, Global Science Academy (GSA), Basti, Uttar Pradesh; Website: www.gsaindia.org

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Purpose of the book is to develop, contribute, and disseminate scientific knowledge pertaining to the issues related to sustainable development. The chapters are developed so that the contents can facilitate comprehension of the major constraints in achieving sustainability including but not limited to environmental, social, economic, and governance-related issues from local, regional, to national level. Resource management, climate change, agriculture, population, education, women, poverty, infrastructure, crime, corruption, governance, are the other relevant topics that have been both identified and suitably discussed. *Constraints in Achieving Sustainability of India* can be utilized as a guiding tool for realizing sustainability in development, especially, in the Indian context.

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Decarbonization and the Developed World

Accelerating India's Sustainable Building Sector for a Better Future

In this article, **Mahesh Ramanujam** discusses the complexities of tackling Scope 3 emissions and why they are critical to achieving true net-zero targets. He also explores India-specific net-zero building standards and how they account for regional diversity, as well as the latest trends and technologies driving sustainable real estate and infrastructure development. Additionally, he highlights the role of GNFZ in accelerating the decarbonization of buildings and helping businesses achieve their net-zero goals, with a particular focus on Scope 3 emissions.

At COP26 in November 2021, India announced its ambition to become net zero by 2070. I believe that accelerating our national race to net zero can play a crucial part in realizing Prime Minister Modi's goal of becoming the world's third largest economy and

Viksit Bharat 2047 – or a developed nation by 2047.

The reality is that a truly developed nation must be a wholly decarbonized nation. Given India's ranking as the frontrunner in net-zero building progress, there is no better time to capitalize on

our current position and empower our real estate leaders to drive accelerated decarbonization.

I've spent two decades advising companies—from multinationals to small and medium enterprises (SMEs)—on how to build green and transition to net zero.



I've seen firsthand the barriers real estate leaders face in decarbonizing. Globally, the real estate market is grappling with many uncertainties: high interest rates, reduced office demand and hybrid work, declining property values, rising maturity defaults, capex issues, tight profit margins, labour shortages, maintaining sufficient inventory and more. And when it comes to decarbonizing existing buildings, global real estate leaders face financing and cost issues, lack of accurate ROI data to make the business case, lack of credible net-zero transition plans for buildings and portfolios, and slow implementation progress.

But more than any other challenge facing the real estate market, it's the hurdle of Scope 3 emissions¹ that presents both the biggest obstacle and greatest opportunity to achieving India's Viksit Bharat 2047 vision by the centennial of our nation's independence. That's because addressing Scope 3 emissions—those that occur outside a company's direct control but within its supply chain (such as employee travel to and from a building, consumer and waste stream emissions for products and services, etc.)—can make up to 70 per cent of a company's emissions, and in buildings, it can be as high as 80–90 per cent of total emissions. In India, where industries are rapidly growing and supply chains are vast and intricate, and where sectors such as manufacturing, agriculture, and logistics contribute significantly to Scope 3 emissions, finding a solution is pivotal to any credible net-zero movement, and as such, the national movement towards becoming the world's third largest economy and a fully developed nation.

This is precisely why my organization, the Global Network for Zero (GNFZ), has introduced the world's only Scope-3 centric solution for accelerating decarbonization at scale. We must face



the reality of both the international and national frontiers.

According to ABI Research, net-zero buildings make up only 0.023 per cent of the world's buildings—and most of those only account for Scope 1 and 2 emissions. Consider that while India's current net-zero goal is outlined for 2070, its goal for becoming a 30 trillion-dollar economy and hitting developed nation targets for economic expansion, social progress, and sustainable industrialization, is significantly earlier at 2047.

Simply put, there is no accelerated decarbonization without tackling Scope 3 emissions head on. Entities in India must implement a Scope-3 focused framework or methodology to have the greatest prognosis for accelerating emissions reduction and elimination across sectors.

With 40 per cent of the world's carbon emissions coming from buildings, Indian companies must do their part and begin with the lack of data and transparency across their value chains—and specifically what's missing in building operations management. There are many key trends and technologies emerging within the sector that will enable a greater transformation of the situation on the ground. For example, Smart Building Management Systems integrate Internet

of Things (IoT) devices to monitor and control energy usage, lighting, heating, ventilation, and air conditioning systems. These systems optimize energy consumption, reducing waste and improving the building's overall energy efficiency. Building Information Modeling technology allows for efficient planning, design, and management of buildings. It integrates data related to materials, energy usage, water consumption, and lifecycle costs, helping developers and architects optimize resource efficiency and minimize environmental impacts. Digital twinning technology, on the other hand, creates a virtual replica of physical buildings, enabling real-time monitoring, simulation, and optimization of performance. By simulating various energy scenarios, digital twins help optimize energy consumption, and they can predict when building systems need maintenance, preventing breakdowns and extending system lifecycles.

Of course, greater access to resources and collaborative efforts improves Scope 3 data collection. This is where organizations like GNFZ step in by supporting organizations in utilizing performance data to develop strategies for reducing Scope 3 emissions—in buildings, portfolios, and businesses. Our approach includes conducting life

¹ Scope 3 emissions are greenhouse gas (GHG) emissions that occur from activities that are not directly owned or controlled by a company, but that the company indirectly impacts.

cycle assessments, enhancing energy efficiency, promoting circular economy principles, adopting green standards, using low-carbon materials, and fostering sustainable procurement practices. In the realm of buildings, our net-zero certification for existing structures focuses primarily on operational emissions. For Scope 3, we evaluate 15 categories, including: transportation, processing of sold products, use of sold products, end-of-life treatment of sold products, leased assets, franchises, and investments.

These are all tactics currently deployed in regional GNZ projects including at Shree Ramkrishna Exports Pvt. Ltd, Mindspace Airoli West, Chalet Hotel's Westin Mumbai Powai Lake, Duflon Industries, Hindustan Unilever's Assam plant, and more.

We are also offering training, capacity-building tools, and technology platforms that enable even SMEs to quantify their

emissions and contribute to global net-zero efforts. Moreover, GNZ encourages collaboration across sectors, urging large corporations to engage with suppliers and logistics partners, offering them support to adopt greener practices. This approach ensures that companies aren't working in isolation to decarbonize India's economy.

Our certification is tailored to align with international and national frameworks and standards and to consider region-specific factors like local climate, energy needs, and infrastructure. From arid regions to coastal areas, we customize net-zero implementation strategies per the specific project and their regional conditions—and we adapt benchmarks for emissions, renewable energy, and efficiency to ensure they are both realistic and impactful across India's varied environments. This approach also ensures that businesses can balance Scope 3 progress with cost-efficiency,

making it easier for them to implement and scale these solutions without a massive financial burden. By addressing both regional challenges and net-zero ambitions, our clients can create buildings that are truly built to last.

Furthermore, the GNZ approach enables organizations to capitalize on national incentives including India's National Solar Mission under the National Action Plan on Climate Change, which aims to increase solar power capacity to 280 GW by 2030, providing businesses with the motivation and subsidies to adopt solar energy solutions, or even the Production-Linked Incentive scheme for solar PV manufacturing, which offers financial support to boost domestic production of solar panels, and encourages companies to invest in renewable energy and reduce dependence on imports.

While Scope 3 may seem like the most frustrating part of the decarbonization



process, the truth is that emphasizing their reduction will yield the most progress in the least amount of time, deliver change at scale, and serve as a driving force of India's path to becoming a developed nation. As industries and businesses across the country evolve, and as support from organizations like GNFZ expands, the focus must shift from merely addressing direct emissions to this more holistic decarbonization of the entire value chain.

Progress doesn't have to come at the expense of preservation, and that development must not undermine the urgent need for decarbonization either. Adopting net-zero frameworks can provide substantial economic benefits for businesses—by improving energy efficiency and switching to renewable energy, businesses can significantly lower their operational costs over time, boosting profitability. A clear net-zero strategy is becoming a major attractor of capital investment. Businesses with strong net-zero goals can access capital more easily, whether through ESG funds, green bonds, or even favourable loan terms from banks prioritizing sustainable investments. Consumers are also opting for more eco-friendly, future-ready buildings, making the real



estate market ripe for net-zero adoption. The Indian government is actively supporting net-zero initiatives through policies like the Energy Conservation Building Code, which sets standards for energy efficiency in buildings. Additionally, the SEBI ESG mandate requires large companies to report on their sustainability efforts, which pushes businesses to focus on reducing their carbon footprints. Initiatives such as the Smart Cities Mission and Housing for All emphasize sustainable urban development, creating a favourable

environment for net-zero projects to thrive. Developers are incorporating green-certified homes and office spaces into their portfolios, responding to consumer demand for better energy efficiency and reduced carbon footprints. The push for sustainable infrastructure is especially prominent in metropolitan areas such as Mumbai, Bengaluru, and Delhi.

Significantly, India's progress in sustainability and net-zero projects makes it a key market for GNFZ's expansion plans. With government policies supporting sustainability, consumer awareness rising, regulatory support and developer-led initiatives, and the promise of agency and independence pushed by the Hon'ble Prime Minister Shri Narendra Modi, the Indian market is ripe for transformation. GNFZ's certifications can become a cornerstone of the country's sustainability efforts; but more importantly, they can support a new age of Indian leadership—one where we can, at last, redefine the standards of a developed world in terms of our collective commitment to the decarbonization efforts designed to enrich it. ■

Mahesh Ramanujam, President and CEO of Global Network for Zero.



Pollution in the Yamuna River

Unveiling the Crisis and the Path to Restoration

In this article, **Rishabh Mishra** discusses how rivers are considered sacred and revered in Indian civilization. However, much of the water flowing through these rivers is now toxic and polluted. He highlights the issue of water pollution in the Yamuna River and the path to its restoration, emphasizing that we are running out of time to tackle this challenge.

Rivers played a very significant role for the growth of human civilization since ancient times. All the major civilizations of the world like Indus Valley or Mesopotamia had been nurtured by rivers such as Indus, Euphrates, and Tigris. Moreover, rivers had helped in emergence and flourishing of the cities from medieval to modern times. Apart from historical significance, rivers also have geographical and ecological significance. They had been providing various ecosystem services within their catchment areas. They provide provisioning services such as

water for drinking, industrial uses, and irrigation. They also provide with food and fibre. Also, they help to regulate the water quality through natural filtration. Moreover, they support a variety of flora and fauna and their habitat—thus maintaining the biodiversity within its vicinity.

India has also witnessed the cultural significance of rivers since time immemorial. These rivers have been worshipped and revered as Mother Nature. The titles like 'Ganga Maiyya' or 'Maa Ganga,' highlight the status that citizens provide to these rivers. Moreover,

rivers are also associated with religious practices like disposing of human ashes in rivers, taking holy bath during Kumbh Mela, submerging the Hindu god idols into rivers and so on.

However, in the recent decades, there has been a rising phenomenon of increasing poor health of Indian rivers. According to the Central Pollution Control Board (CPCB), in 2022, out of 603 rivers, 311 stretches on 279 rivers have been identified as polluted. There have been overexploitation and mistreatment of rivers by various anthropogenic means. Some of these factors are dumping of waste in the river, effluent discharge from industries, overextraction of water or groundwater for irrigation and industrial use, excessive use of fertilizers ultimately leading to polluted river waters, riverbed sand mining, and illegal construction in the catchment areas. Moreover, there has been a lack of political will and citizenship engagement to resolve the issue of river pollution. This has led to deteriorating health of rivers and unfortunately, our rivers are gradually migrating to the status of polluted from being pristine.

One such river is the Yamuna River. It has been a major part of Indo-Gangetic plains and supports the local population due to its fertile lands and Indo-Gangetic doab between Ganga and Yamuna.





A majority of population depends on it for agriculture, household water consumption, and industrial water usage. Major metropolitan regions and other city areas such as Delhi NCR, Mathura, Agra, Prayagraj fulfill their water needs from Yamuna River. Moreover, it has been associated with the spiritual centres of Vrindavan and Mathura.

The Yamuna River has been a lifeline for the National Capital Territory of Delhi (NCT), supplying 70 per cent of the region's water. According to the CPCB, while the river spans only 2 per cent of its total stretch in Delhi, it receives 80 per cent of the region's entire pollution load. According to the Ministry of Jal Shakti, Yamuna River receives no freshwater downstream of Wazirabad

barrage in Delhi and there is a critical path of 22 km in Delhi where 18 major drains discharge pollutants into the river. Moreover, there have been challenges due to lack of installed capacity of sewage treatment plants and operational and maintenance issues of existing treatment plants to treat the discharge load. As per the Ministry of Jal Shakti, around 940 MLD of sewage is discharged untreated into the river. Moreover, the common effluent treatment plants (CETPs) installed in the industrial cluster in Delhi also have non-compliance issues as per the report.

These factors have impacted the purity of Yamuna River's water in the region. The physicochemical parameters of river water are beyond the permissible

limits. There are high levels of bacterial coliforms in the water and the biological oxygen demand (BoD) and chemical oxygen demand (CoD) levels are also above the permissible limits. It means that the water is not fit for both drinking and bathing purpose. Moreover, the recent year activity of froth formation in the NCT region during Chhath Puja is a case in point about the existing issue of water pollution in the region. This is another example of rampage of the river ecosystem beyond its carrying capacity.

The recent formation of a thick layer of white froth is mainly due to high levels of water pollution in the river. The froth forms when organic matter from decaying plants and pollutants such as phosphates and surfactants mix with



the turbulent water. It creates a layer of foam which is highly concentrated with harmful chemicals. This foam consists of heavy metals and volatile organic compounds. It can harm aquatic life as well as people who are in contact with this water for mundane usage. It can cause skin irritation, allergy, and rashes and may impact nose, throat, and lungs. Moreover, the pollutants can also bio-accumulate in aquatic life and human bodies and impact in the long term causing neurological disorders or kidney diseases.

The “Waterman of India,” Rajendra Singh, pointed out that a major cause of the problems in the Yamuna River is the lack of coordination amongst government agencies. There are multiple agencies which are working in silos and lack a comprehensive collective approach to resolve the challenges of water quality in Yamuna River. There have been three phases of Yamuna action plans but more needs to be done for bringing back the purity of Yamuna waters.

To bring back life to Yamuna River in NCT region, we need to act fast. Firstly, the principles of watershed management and groundwater recharge shall be considered on a serious note

for the catchment area of Yamuna River. Moreover, there shall be steps for dense afforestation and greenery with native species along the banks of Yamuna River. These two steps will help to improve the water quality and quantity in an environment-friendly manner. Also, we can organize Yamuna water councils to enhance awareness about river conservation and rejuvenation amongst the citizens and local government bodies.

Secondly, operation and maintenance of effluent treatment plants (ETPs) and sewage treatment plants (STPs) shall be made functional as a preventive measure to water pollution. Moreover, we can seek to establish best-in-class STPs and ETPs to enhance the operational capacity of water load handling. Also, the water can be circulated and used in public spaces like parks and gardens with aeration methodologies such as fountains, running streams, and so on. It will help to dilute the pollutant load in the water.

Also, there is a need to establish a graded action plan based on continuous water pollution monitoring just like we have Graded Response Action Plan (GRAP) for air quality in the NCR region. It shall be drafted by collaborative work of stakeholders which may

include municipal bodies like Delhi Jal Board, DSISD, Municipal Corporation responsible for sanitation. Moreover, in the long term, Delhi NCR region needs to adopt a robust waste management model by learning from Indore or Bhopal waste management models. It will reduce the waste dumping in Yamuna River over a period of time. Finally, amending the Water (Prevention and Control of Pollution) Act in lines with Clean Water Act of the United States and Water Framework Directive on European Union can help to provide regulatory push to clean the rivers.

Rivers are considered sacred and revered in Indian civilization. However, much of the water flowing through our rivers is now toxic and polluted. We are running out of time to address this challenge. There must be harmony amongst citizens, institutions, and the government to restore the purity of our rivers. As the saying goes, “Rivers never flow backward.” Let’s collectively strive to live like a river—leaving the past behind and focusing on the present to shape the future of our rivers. ■

Rishabh Mishra works as Sustainability Consultant at Accenture.



Terra Youth

Joining Hands
for a Greener
Tomorrow

Global Warming and Public Health

Understanding the links between rising temperatures and disease outbreaks

In this article, **Alexia Cheenath** discusses the issue of global warming and its impact on public health. Fossil fuel-driven climate change has altered weather patterns, and one of the most concerning health consequences is its role in the emergence and spread of diseases. Warmer climates allow pathogens, particularly those transmitted by insects, to expand into areas that were previously too cold for them. As a result, environmental issues are not the only consideration in the fight against climate change; the health of people today and in the future is also at stake. Every step taken to reduce the Earth's temperature is a step towards better health for future generations.

Have you sensed that the heat of the sun during the summer season has become more punishing than it used to be a few years back? If so, you are not the only one. We hear the term 'global warming' thrown around, it is not a marketing gimmick but rather a phenomenon that is affecting the world as we know it and to make

matters worse, it is affecting the health of the populations in the world. Global warming always brings to mind a few iceberg-capped regions or tropical storms, but there are some other facets to the story— and they are not looking good. Rising temperatures bring about a range of threats to human life, including diseases, health issues, and instability.

These challenges can manifest in various forms, from respiratory illnesses to food scarcity, leaving many people unable to meet their basic needs.

Global warming, in simple terms, is the rise in the average temperature of the Earth, mainly caused due to greenhouse gas emissions from human activities such as industrialization, deforestation, and fossil fuel combustion among many others. Picture the Earth trapped beneath a cover of gases that hold in the heat. While this naturally occurring "greenhouse effect" serves the important purpose of ensuring our planet's warmth, an excess of it results in disastrous overheating. As of late, it seems that the global temperature record is broken not only seasonally, but also yearly which subjects humanity to a variety of health-related issues. Higher temperatures endanger not only the weather but the disease incidence and pattern as well, harm the respiratory system, and threaten the availability of food resources. For example, rising temperatures contribute to droughts that damage crops, decreasing food



availability and raising prices, threatening global food security and nutrition.

Fossil fuel driven climate change has affected our weather patterns, and among the most disturbing health impacts of climate change is its influence on the emergence and spread of diseases. Warmer climates permit pathogens, particularly those carried by insects, to spread into new areas that had hitherto been too cool. Malaria and dengue fever, classified as tropical diseases, are now being reported in many regions where it was previously impossible to spread because of the absence of these insects. Apart from infectious disease, global warming is also aggravating adverse effects on non-communicable diseases—air pollution. Ozone and smog are exacerbated with the increase in temperatures which affects lung diseases such as asthma. As well as this, pollen seasons have become longer, which are more bulging, causing allergies and asthma to worsen affecting millions of people. We can connect these types of temperatures to heat exhaustion, heatstroke, excessive strain on cardiovascular functions, and, ultimately, increased fatalities caused directly or indirectly by high-temperature



situations. Water sources also are of concern. Warmer water can trigger toxic cyanobacteria blooms which would contaminate drinking water. Even mental health can be harmed which comes because of claustrophobic climate changes, desperation, and tension from the constantly hot weather leading to various mental illnesses creating a distinct impact of global warming on human health.

What can be done, then? To begin, it is crucial to understand that global warming has adverse health impacts. From planting trees and controlling

pollution at the community level to regulating emissions on a larger scale, individuals and communities are vital in implementing such initiatives. Creating urban green spaces is an example of a type of green infrastructure that could lessen urban heat and improve the quality of the atmosphere. Using public transport, saving energy, and adhering to environmentally friendly policies are among the simple things that can be done to resolve the problem. On a national level, it is essential to promote and endorse measures to increase the sources of renewable energy, reduce the production of carbon, and impose restrictions on pollutants. Preparing for climate-related healthcare challenges, for instance, improving access to air-conditioning and installing heatwave warning systems can also enhance community resilience to the impact of global warming. Environmental issues are not the only consideration in the fight against climate change; it is also about the health of all people today and in the future. Every move made towards reducing the Earth's temperature is a motivated step towards better health in the future. As a result, this is an important battle that we must win. ■

Alexia Cheenath is a final year student at Vellore Institute of Technology, Chennai, pursuing Computer Science Engineering in AI and Robotics.



Bizarre Facts

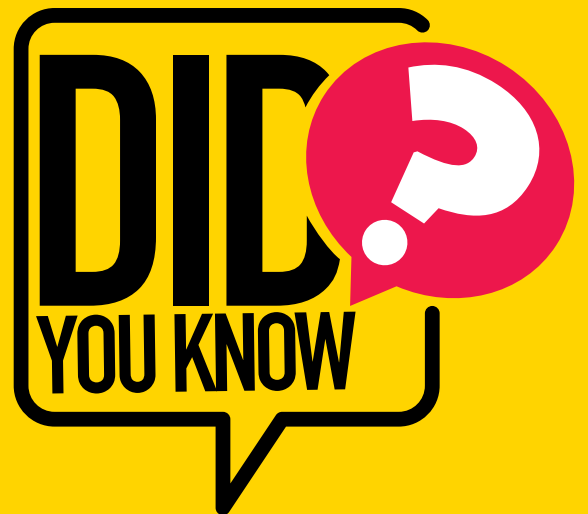


1. Some frogs can freeze without dying.
2. Blue whales eat half a million calories in one mouthful.
3. Koalas have fingerprints.
4. Some fish can walk on land.
5. Salamanders can regenerate body parts.
6. The gray parrot can live up to 60 years in captivity.
7. The falcon is the fastest bird, capable of diving at 240 mph.
8. The albatross can fly for thousands of miles without landing.
9. Flamingos are born with gray feathers, which gradually turn pink.
10. Some species of birds can fly for weeks without stopping.



Did You Know?

- A group of flamingos is called a 'flamboyance.'
- Polar bears have black skin.
- A jiffy is an actual unit of time.
- A tree's rings reveal its age, but they can also tell when natural disasters have occurred.
- There are trees in California that are 5,000 years old!
- A group of frogs is called an army.
- The kiwi lays the largest egg in relation to its body.
- The wandering albatross has the largest wingspan of any living bird.
- A group of parrots is called a pandemonium.
- The cassowary is considered one of the most dangerous birds in the world due to its powerful kick.



Source: <https://www.weareteachers.com/weird-fun-facts/>

‘BSG Plastic Collection Drive’

To Combat Plastic Pollution

In a proactive response to the escalating crisis of plastic pollution, Bharat Soka Gakkai (BSG) has launched the ‘BSG Plastic Collection Drive’ in Mumbai as part of its ongoing ‘Say No to Plastic’ initiative. This impactful campaign, aimed at reducing plastic waste and encouraging sustainable human behaviour, ran from October 14–20, 2024. During this period, BSG members across Mumbai deposited plastic waste at designated local hubs, where recycling vans collected it for proper processing and recycling. By promoting responsible consumption and recycling, the campaign seeks to both reduce plastic waste and raise awareness of sustainable practices.

The ambitious goal is to collect and recycle 10,000 kg of plastic waste, inspiring widespread awareness and meaningful action. The drive aims to galvanize individuals to adopt ‘Sustainable Human Behaviour’ by reducing their plastic use, making environmentally conscious choices, and contributing to the fight against plastic pollution in their daily lives.

At the launch event on October 14,



2024, held in Mumbai, renowned Climate Innovator Ms Prachi Shevgaonkar, Founder of the Cool the Globe app, delivered the keynote address. She highlighted the pressing issue of plastic pollution and climate change, stating, “At Cool The Globe, we are on a mission to make climate action easy and measurable for citizens and organizations. We believe that when people unite for climate action, miracles can happen!”

Mr Vishesh Gupta, Chairperson of BSG, expressed his commitment to sustainability, urging everyone to actively participate in this campaign. “We are not just collecting plastic; we are creating a movement that inspires long-lasting change. Every effort counts, and together, we can build a future where our planet thrives.” Mr Gupta remarked.

Bharat Soka Gakkai (BSG) is an organization dedicated to promoting peace, happiness, and sustainability through its initiatives in peace, culture, education, and sustainability. With more than 280,000 members across 600 towns and cities in India, BSG envisions a ‘New Age in India’ where the dignity of life is deeply respected. BSG’s ‘BSG for SDG’ initiative, launched in 2021, focuses on achieving the Sustainable Development Goals (SDGs) through fostering sustainable human behaviour. BSG’s mission is to inspire individuals to contribute positively to environmental preservation, peacebuilding, and social equity through grassroots activism. ■

For further information and media inquiries, please check: www.bharatsogakkai.org



Pioneering Efforts of Startups

Leading the Charge for a Greener, More Sustainable Future

Sustainability is key to creating a greener, thriving world. Several startups are addressing climate change with innovative products and services focused on sustainability. From advanced EV charging networks to energy storage solutions, these five startups are leading the way towards a more eco-friendly future.

Sustainability has become a cornerstone in the quest to make the world a greener and more thriving place. Several startups are tackling climate change directly, offering groundbreaking products, services, and resources centred on sustainability. From cutting-edge electric vehicle charging networks to innovative energy storage solutions, these five startups are at the forefront of sustainable practices. Their pioneering efforts and visionary leadership are setting the stage for a brighter, more eco-friendly future.

Vidyuta

Vidyuta is leading the charge in sustainable energy storage with its groundbreaking battery materials for various uses, including energy storage systems, electric vehicles, and portable electronics. Focusing on cathode active materials (CAM) for lithium-ion cells, Vidyuta is committed to both environmental responsibility and technological advancement. Founded in 2023, the company's mission extends beyond India, aiming to revolutionize the global energy storage industry

by establishing a closed-loop battery ecosystem. Under the guidance of Ankit Sharma, Co-Founder & Director, Vidyuta's emphasis on reducing battery waste addresses a significant environmental challenge posed by the rapid growth of the EV industry, positioning the company as a crucial player in the sustainable energy sector.

CEF Group

CEF Group stands out as a premier provider of clean energy solutions, dedicated to practical and sustainable approaches to waste processing and environmental conservation. Recently, CEF launched a waste processing facility in Srinagar, collaborating with the JK Lake and Waterways Authority and NAFED, where the company acts as both a technical and financial partner. With extensive experience in establishing large-scale power and steel plants, CEF has been pivotal in bringing innovative technologies to the forefront nationwide. The company, under the leadership of Maninder Singh, Founder & CEO, is renowned for its contributions to renewable energy, organic manure, Ayurveda, and capacity building. CEF Group's mission is to harness natural resources to create sustainable solutions, promoting a greener planet.





Statiq

As India's leading EV charging network provider, Statiq is rapidly expanding its infrastructure across the country, offering easy access to over 7000 chargers in more than 65 cities. With strategic partnerships with government bodies, automakers, and major hospitality groups, Statiq plans to install 20,000 charging points by 2025 to cater to the rising demand for EV charging services. Operated by

Gurugram-based Sharify Services, Statiq supports electric cars, buses, trucks, and three-wheelers through its app, allowing users to locate, prebook, and control charges remotely. To further sustainable mobility, Statiq has recently installed over 20 new EV chargers across 14 cities in 11 states, including Haryana, Rajasthan, Bihar, and Kerala. Co-founders Akshit Bansal and Raghav Arora are spearheading these initiatives, ensuring a seamless charging experience that

facilitates the widespread adoption of electric vehicles in India.

Neemli Naturals

Naturals, a homegrown skincare brand, offers environmentally friendly products made in small batches and packaged in recyclable and reusable materials. All ingredients used are plant-based, vegan, and cruelty-free, ensuring that their products are both sustainable and ethical. The startup's commitment to clean, conscious beauty is reflected in its entire product line, which caters to consumers seeking high-quality skincare without compromising on environmental responsibility.

Capital A

Capital A, established by Ankit Kedia, is at the forefront of a genuine Greentech revolution. With initiatives like 'Evolve,' a specialized fund for startups in the electric mobility space, Capital A is backing companies focused on environmental conservation and social impact. By rethinking ESG frameworks, these startups are driving significant change and speeding up the shift towards a more sustainable future. ■





Scientists Predict How Climate Change Alters Plant Growth Cycles

A new study published in the journal *Communications Earth & Environment* is set to make seasonal forecasting a little less onerous and a lot more reliable. The authors enhanced existing approaches used to predict phenology and added a measurement of how fast an area warms in spring. This improvement allowed the authors to predict how the timing of leaf and flower production would change over a period spanning more than 150 years. Plant species in the US are flowering three to four weeks earlier than they did 150 years ago. The breakthrough was sparked by the rediscovery of an old 19th-century report containing thousands of detailed phenological observations for plants and animals throughout the eastern United States. The observations represent the earliest effort organized under the Smithsonian Institution to monitor biological cycles in the US with volunteer collections, making it the first phenology-based citizen science project in the country.

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

Sustainable Material Uses Sunlight to Decontaminate the Air

The Chemical Institute for Energy and the Environment (IQUEMA) has designed a new compound to remove nitrogen oxides, which constitutes a step towards the development of a system to purify the air under real conditions. Nitrogen oxides (NO_x) are a group of gases formed by nitric oxide and nitrogen dioxide. They are produced, above all, by the burning of fossil fuels. Due to their harmful effects on human health and the environment, in recent years they have been in the scientific community's crosshairs. A research team at the Chemical Institute for Energy and the Environment (IQUEMA), attached to the University of Cordoba, has developed a photocatalytic material capable of effectively reducing these gases, achieving results similar to others developed to date, but through a more economical and sustainable process.

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



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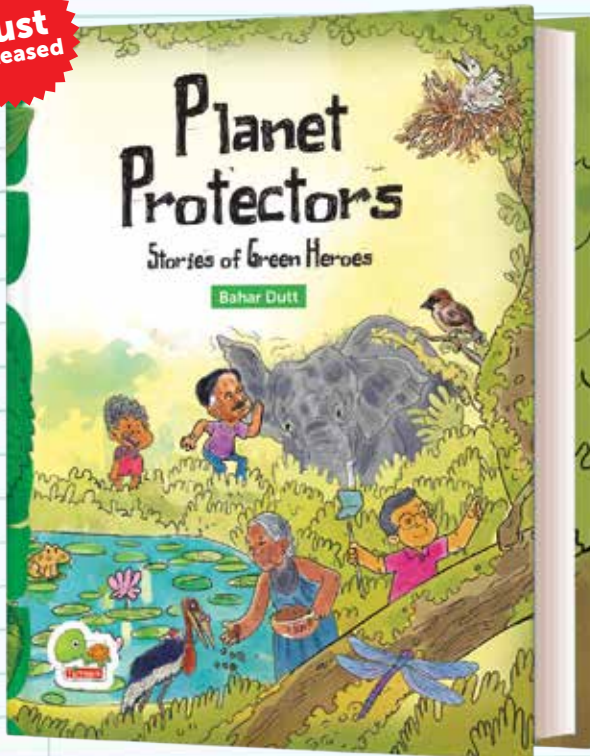
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Alarming Levels of Air Pollution in Delhi

The Current Scenario and Way Forward

In this article, **Stuti Upadhyay** discusses about the deteriorating air quality in the national capital that has been a strong topic of debate and discussion both nationally and internationally. Despite numerous government programmes and initiatives launched in response to the city's concerns, these schemes have largely failed to garner political empathy. While the media—both social and print—continues to highlight the harsh reality of Delhi's poor air and water quality, little progress has been made. November 2024 marked the most alarming month in recent years, with the air quality index (AQI) soaring to a dangerously high level of 494—26 times the healthy limit set by WHO standards. The key to addressing this crisis lies in a sustainable approach that focuses on incorporating green spaces into the urban landscape.

Our capital city Delhi is breathing poison at an alarming rate right now. The city's population struggles to face the battle against vicious particle pollution every year. Gaseous miasma is targeting the lives of all age groups despite the financial barrier, targeting indigenous flora and fauna. The deteriorating quality of air in Delhi has been a strong topic of

debate and discussion both nationally and internationally. Despite numerous government programmes and initiatives launched in response to the city's concerns, these schemes have largely failed to garner political empathy. While the media—both social and print—continues to highlight the harsh reality of Delhi's poor air and water quality, little progress has been made. November

2024 marked the most alarming month in recent years, with the air quality index (AQI) soaring to a dangerously high level of 494—26 times the healthy limit set by WHO standards. The key to addressing this crisis lies in a sustainable approach that focuses on incorporating green spaces into the urban landscape. Green spaces are ecologically designed vegetation in areas with constructed buildings and industrial zones. According to the WHO, green spaces include street trees, garden parks, and natural landscapes. The establishment of green spaces in the urban sphere has resulted in improving the health of both the natural environment and the ecological community. It also helps in mediating the heat released from buildings and cemented structures. According to a report by the Delhi Forest Department in November 2024, there has been a steep expansion in the green belt of Delhi-NCR region from 20.08 per cent to 20.22 per cent. However, this increase has not been significant enough to resist the environmental vulnerability.

Prolonged exposure to such surroundings is a known cause of





contagious health problems such as asthma, bronchitis, and emphysema. With a huge population, Delhi-NCR is the nation's highest polluted and second most populated area becoming a serious victim of human-made calamities with a rising morbidity and mortality rate of 11.5 per cent. We are sacrificing 1200 lives every year due to chronic health problems arising from thick and toxic smog. Major factors destroying air purity include nitrogen dioxide, sulphur dioxide (SO₂), ozone, and densely formed particulate matter of sizes varying from PM_{2.5} (particles that are 2.5 µm or less in diameter) to PM₁₀ (particles that are 10 µm or less in diameter). A recent study by the Centre for Science and Environment (CSE) reveals the reason behind the repeated occurrence of severe winter air pollution in New Delhi and its subordinates. With the arrival of winter, air quality seems to worsen due to decrease in wind speed and temperature

inversion. As a result, an umbrella of cool and condensed air forms near the earth which reduces the dispersion of pollutants and particulate matter, gradually leading to its ground trapping and creating 13 gas chambers across the region. Moreover, stubble burning conundrum post-Diwali celebrations in Haryana and Punjab regions significantly contribute to about 34.9 per cent of the city's poor air quality preceding predominant vehicular emissions contribution by 51.5 per cent. Another vivid perspective blames the 11 active thermal power plants within a 300-km radius of the Delhi region emitting 281 kilotonnes of SO₂ annually, which is 16 times more than the 17.8 kilotonnes emissions produced by seasonal farm fires. It's a surreal government defiance to accept the truth that, despite the government's regular announcement of adopting flue gas technology (FGT) these power plants don't even bother

to prioritize the mandate. There have been remarkable discussions on religious insights highlighting Diwali crackers and fireworks. However, the Chief Justice of the Supreme Court of India, Abhay S Oka, has denied the addressal of supporting religious practices that claim for environmental contamination and degradation. Graded Response Action Plan (GRAP) stage III has been implemented in the city to combat the critical condition underlying the temporary prohibition of small goods vehicles, non-essential goods vehicles, and light commercial vehicles. Earlier years including 2022 and 2023 have also witnessed the enforcement of GRAP I and GRAP II action plans all over Delhi-NCR regions.

It is significant that Delhi has the largest forest cover, covering 194.24 sq. km, among the seven major cities in India. However, this substantial green cover requires significant expansion



due to the growing urban sprawl. Not only in India, but many other cities across the globe also serve as beautiful examples of the concept of green spaces in urban areas. Copenhagen, the capital of Denmark, implies the two-fold strategy of introducing green parks and rooftops in municipal and non-municipal lands. Japan's capital city, Tokyo, has also designed the green corridor incorporation idea between buildings to maintain an ecological dynamic balance. Similar steps have been applied to enhance the garden system in Singapore. Ministerial programmes have recently announced the utilization of stubble as a potential source of biogas and bioenergy. However, practical implementations of such policies in the Delhi region are somewhat challenging and troublesome. This is because of unplanned and uncontrolled constructional colonization of industrial as well as residential zones in and around the outskirts of Delhi,

including Ghaziabad, Faridabad, and Gautam Buddha Nagar. Poor responsible authority and weak legal enforcement should be accountable for the severity.

New Delhi is located at the central point of both the geographical and political framework of India. Political parties often campaign against this crisis to advance their diplomatic agendas. Recently, the current ruling party, that is, AAP (Aam Aadmi Party) was criticized for using ineffective methods to reduce dust density, such as spreading large amounts of water on roads and constructing 80-ft high air purification smog towers, each costing \$2 million. The Scientific Advisory Board of India has also questioned the efficacy of these strategies on an economic and commercial scale. Internationally acclaimed efforts by the United Nations Framework Convention on Climate Change (UNFCCC) and World Resources Institute (WRI) have taken the current critical scenario of

Delhi under scrutiny. Consequently, the Central Government of India along with the Delhi Municipal Corporation, and Delhi Developmental Authority have collaborated with The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, involving stakeholders from various sectors. Thus, it is believed that this dynamic, diverse, and demanding participation would surely help in the successful restoration of Delhi's lost biodiversity and wildlife into existence. ■

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How a Village Learned to Catch Water

The Untold Story of National Award-winning Film *Paani*

The 2019 Marathi film *Paani* is a fictionalized account of Nagdarwadi, a drought-stricken village in Maharashtra, grappling with extreme water scarcity. Inspired by real events, the film follows a young community mobilizer who leads the efforts to tackle the village's water crisis. This article by **WOTR Communications team** explores how collective action transformed Nagdarwadi from a struggling village into a model for watershed development.

A Village on the Edge

In the late 1990s, Nagdarwadi—a village in Maharashtra's drought-prone Nanded district—stood as a stark

symbol of the harsh realities across Marathwada. The area, marked by **erratic monsoons** and blistering summers, faced a recurring specter of water scarcity. Each morning, village residents set off

before dawn, trekking long distances to fill containers with barely enough water to meet their daily needs. Agriculture faltered under the dry conditions, and young men felt compelled to leave in search of better prospects in distant cities. Moreover, the village was rife with conflicts among its inhabitants, leaving little hope for progress. As Harish Daware, Deputy Director at WOTR (Watershed Organisation Trust) puts it: "This was a village where NGOs found it difficult to work because of the social complexities and conflicts. People couldn't imagine a sustainable life here, and families wouldn't send their daughters for marriage due to the constant water shortage."

WOTR, during this time, had been working in the Marathwada region, focusing on transforming drought-prone villages through sustainable land and water management under the Indo-German Watershed Development Programme (IGWDP). Balaji Kendre, one of WOTR's social officers and trainers, was a native of Nagdarwadi. During an informal visit to his village, Balaji's colleagues urged him to consider initiating the watershed project there. But Balaji was hesitant. He knew the deep-rooted social issues and daunting physical terrain, and the thought of



tackling them was intimidating—especially since these projects relied on *shramdaan*, voluntary labour by the community. In Nagdarwadi, where cooperation was hard-won, rallying the village to take on such a demanding initiative seemed almost impossible.

The regional team at WOTR, led by Dr Venkatesh Tagat (on deputation to WOTR from NABARD) however, was not deterred. “Dr Tagat told Balaji, ‘If you take up this work in your village, you can inspire other villages to follow your example,’” Harish recalled. Inspired by his team’s persistence, Balaji resolved to give it a try. He was not alone. His younger brother, Hanumant Kendre, soon became an essential partner in the effort as a community mobilizer ultimately becoming a linchpin of the project.

With Balaji’s commitment secured, WOTR teamed up with Sanskriti Samvardhan Mandal (SSM), a partner NGO experienced in implementing watershed projects across challenging terrains. SSM’s established rapport and proven ability to navigate complex environmental and social conditions made them an ideal ally for the ambitious work ahead in Nagdarwadi. SSM’s chairman, Pramod Deshmukh, remembers the villagers’ skepticism.



“Convincing people to dig trenches on hillsides wasn’t easy,” he said. “Nagdarwadi was the kind of place where people had a bald spot on their head from carrying water over long distances each day,” Deshmukh recalled. “To them, bringing water closer to home seemed unimaginable.”

Breaking Ground, Building Trust

As the project’s community mobilizer, Hanumant began connecting with villagers and forming Self-Help Groups (SHGs) with local women, turning

the watershed effort into a collective mission. The men of the village opposed but he persevered. Midway, his marriage proposal fell through when his prospective in-laws insisted he leave Nagdarwadi for a “better” future in Nanded. Hoping to prove himself and win back the girl, Hanumant stayed, encouraged by his brother’s words: “Those who stay and make a difference are remembered. Escaping is the easier choice.” With slow but steady progress, Hanumant and his team gained the community’s trust, fighting against those who fuelled conflicts.

Guided by WOTR and the German Agency for Technical Cooperation (GTZ), and with NABARD and KfW’s (a German state-owned investment and development bank) funding support, the village embarked on an intensive watershed development process. “We started by selecting the NGO and mobilizing the community, then conducted training sessions, organized *shramdaans* (voluntary labour days), and formed village committees,” Harish explained. The vision was to build a sustainable water management model owned by the villagers themselves.

The first few steps of the project were carefully structured:

1. Community Mobilization and Voluntary Labour (*Shramdaan*):

Four initial *shramdaans* were





conducted, engaging the residents of Nagdarwadi in voluntary work to build a sense of collective ownership.

- 2. Project Planning:** WOTR supported SSM and the village in developing a detailed project plan (DPR), refining it through regular feedback.
- 3. Capacity Building and Training Programmes:** Committees were trained in water conservation, agriculture, and entrepreneurship, directly linking water security to new livelihood options.
- 4. Exposure Visits:** WOTR organized visits to successful watershed projects in places like Mendhwan and Darewadi, showing Nagdarwadi's villagers what could be achieved through dedication and teamwork.

As trenches took shape, bunding structures were constructed, and new plantations were introduced, visible signs of progress emerged. "At first, people doubted that working on the hillsides would actually bring water," Pramod shared. "But as water levels rose in the wells, hope began to grow."

"Frequent visits from WOTR leaders, including Crispino Lobo, Marcella

D'Souza, and Venkatesh Tagat for monitoring and training, reassured the villagers that they were partners in this transformation," Pramod recalled. "We made mistakes, but they encouraged us to keep going, reminding us, 'Those who work make mistakes, and that's okay.'"

A Transformation Rooted in Community

Within five years, Nagdarwadi had shifted from a drought-stricken area to a self-reliant village. Water was now accessible year-round, lifting a heavy burden from families and reducing the need for migration. Hanumant's commitment to the village strengthened community bonds, earning him respect and a new sense of purpose.

Beyond securing water, WOTR's approach tied water management to agricultural and dairy development, making this project a socio-economic milestone. As Pramod highlighted, "The aim wasn't just water conservation. WOTR's strategy was to connect water to agriculture and dairy, making this a **technical and socio-economic success.**"

A Story Retold through *Paani*

Nagdarwadi's story gained both national and international recognition through *Paani*, the 2019 Marathi film directed by Adinath M Kothare and produced by Priyanka Chopra Jonas. Inspired by Nagdarwadi's journey—one of the 200 villages participating in the Indo-German Watershed Programme—the film captures the struggle for water in rural India. *Paani* went on to win the National Film Award for Best Film on Environment Conservation, highlighting the resilience of communities like Nagdarwadi in the face of scarcity.

Today, Nagdarwadi is a testament to what a committed community, guided by focused intervention, can accomplish despite overwhelming adversity. It stands as a symbol of resilience, a reminder that even the most challenging realities can be transformed with unity, hope, and sustained effort. ■

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The Time is Now

FMCG brands called to action on reuse models ahead of 2025 targets

The reuse model for plastic packaging presents untapped potential for environmental, commercial, and social benefits. With India's Plastic Waste Management Rules mandating reuse targets for brand owners starting in 2025–26, it is imperative for FMCG players to demonstrate stronger commitment by piloting and scaling adoption of reuse solutions, setting a benchmark for sustainable innovation in the industry.

Upstream Interventions Must Complement Recycling to Address Plastic Pollution Effectively

The United Nations is negotiating a legally binding international agreement aimed at transforming the entire lifecycle of plastics, from production and design to disposal. Global Plastics treaty is expected to take effect in 2025, incorporating measures to prevent, eliminate, and reuse plastic.

In India, trends in plastic consumption and recycling clearly indicate that focusing solely on downstream solutions will not be sufficient to end plastic pollution. Reuse is increasingly recognized as a key area of opportunity, offering the potential to significantly reduce plastic waste while encouraging

businesses and consumers to participate in systems that promote the return and repurposing of products.

Under India's Plastic Waste Management Rules, FMCG brands will be required to achieve defined reuse targets for plastic packaging, ensuring a specific percentage of their packaging is reusable within their supply chains. For rigid plastics, this target starts at 10 per cent for the year 2025–26, with progressive increases in subsequent years to drive a wider adoption of reusable packaging across the industry. Many FMCG brands might be strategizing to navigate compliance requirements by adjusting packaging sizes to fall outside the regulated 900 ml to 5-litre range. However, brands have an opportunity to demonstrate leadership by piloting reuse models, setting a benchmark for sustainable innovation, and signalling a stronger commitment to circular practices.

From Concept to Consumer: Defining Plastic Reuse Models for Retail Transformation in India

The Ellen MacArthur report outlines four business-to-consumer reuse models, each varying in its impact on consumer convenience: 1) refill at home, 2) refill on the go, 3) return from home, and 4) return on the go. 'At-home' reuse models could be implemented with minimal behaviour change, making them easier for consumers to adopt. In contrast, 'on-the-go' models may require more significant adjustments to established consumption habits.

While refills are somewhat familiar to consumers, return models would demand consistent participation and a significant shift in habits. Return models may be capital-intensive initially, as they require investment in durable, reusable packaging, logistics, and washing infrastructure. In the price-sensitive Indian market, the cost of implementing such a system may need to be absorbed either by the brand or through subsidies, partnerships, or incentives to avoid passing it onto the end consumer.

We must also note that refill plastic packaging solutions often bypass the informal sector—waste collectors, recyclers, and workers, which forms the backbone of waste management across the country. These refill models



focus primarily on reducing single-use plastic by promoting the idea of consumers bringing containers for refill at designated points, typically in formal retail environments.

In contrast, return models provide more opportunities to integrate the informal plastic sector. These models, which involve the repeated use of the same packaging (e.g., containers that are recovered, reconditioned, and refilled), can create new roles for informal workers. The collection, sorting, and cleaning of reusable containers can offer employment opportunities and integrate informal workers into formal systems. For example, informal workers can be part of the reverse logistics chain, ensuring that used packaging is returned and processed efficiently.

Unlocking Value: Scaling Reuse Models across the Retail Value Chain for Economic Impact

Significant economic value stands to be unlocked as reuse business models scale across the value chain, driving both cost efficiencies and reduction in plastic waste. Broadly speaking, reuse would shift value from the early stages of the plastic production cycle (materials extraction, manufacturing) towards later stages (sales, marketing, reverse



logistics, cleaning or reconditioning, refilling). It's important to recognize that manufacturers stand to benefit substantially from the shift towards reuse, particularly through opportunities such as "manufacturing as a service."

In recent years, government agencies, multinational bodies, and NGOs in leading EU countries have piloted models aimed at advancing a reuse-based system. However, with diverse stakeholders advocating for varying levels of ambition within these highly complex frameworks, alignment on a unified ambition level for reuse remains a challenge.

The Next Step for Indian Retail

In India, refill models—both refill at home and refill on the go—have been trialled, piloting scalable reuse systems for plastic packaging remains largely uncharted. The time is ripe for pilot programmes to test reuse models with different product categories and in urban centres where consumer awareness is high. In India's dynamic FMCG space, brands fall broadly into four key categories—food, beverages, personal care, and home care products. Each segment is distinct, shaped by consumer preferences, purchasing behaviour, and distribution models that respond to India's diverse demographic and economic landscape.

The food segment covers everything from packaged snacks, ready-to-eat meals, and staples to dairy and processed foods. Beverages category includes soft drinks, juices, bottled water, tea, and coffee. For the food and beverage sector combined, regulatory requirements for hygiene and food safety are stringent, as reused packaging must prevent contamination and ensure product integrity. Meeting these standards requires advanced cleaning and sterilization processes, which are both



costly and logistically demanding. On the other hand, personal care products such as haircare, bath and shower products, and general home care cleaning items—laundry detergents, floor cleaners, are indeed strong candidates for testing reuse models in India. This suitability stems from factors such as consumer willingness to adopt refillable formats and lower regulatory barriers compared to food products. For brands, reuse is likely to generate value through a deeper sense of connection with consumers, particularly those associated with admired principles of sustainability.

Gauging the tailwinds from Plastic Management Rules, it is only a matter of time before reuse models are established, supported, and scaled across major urban centres in India. To pilot the Reuse model, plastic packaging could be sourced from waste picker networks, scrap dealers, and reverse logistics systems in gated communities and retail outlets. Once collected, the packaging would undergo a thorough assessment to confirm its suitability for reconditioning, with non-viable materials directed to recycling. The reconditioning process would include decontamination, de-labelling, sanitization, and stringent quality checks, following SOPs co-developed with FMCG partners.

As previously noted, building new reuse business models may require establishing a comprehensive system for transportation, reverse logistics,

returns, refilling, and cleaning or reconditioning. According to the World Economic Forum's Platform for Shaping the Future of Consumption, the scalable implementation of reuse models necessitates a systems-change approach across the following dimensions:

Delivery model efficiency: Implementing shared reuse systems and optimizing short-distance logistics loops can facilitate scalable economics across a wide range of categories. A centralized infrastructure for shared resources effectively enables the large-scale distribution of reusable products.

Consumer experience: Consumers have access to a variety of reusables that compete with disposables on convenience and other measures of customer satisfaction. Consumers are provided with superior user experiences over disposables.

Technological advancement: Implementation of tracking solutions (QR codes, RFID, unique ID, etc.) enables life cycle tracking of the packaging and value-added services, extends the lifespan of containers, standardizes backend processes, and facilitates scalability.

Regulation: The establishment of mandatory quantitative reuse targets within the Plastic Waste Management Rules have provided a substantial policy impetus. The current Extended Producer Responsibility (EPR) certificate based model in India has faced ongoing

criticism for failing to encompass the full costs of plastic waste management. For reuse regulations to be effective, robust enforcement and monitoring mechanisms have to be implemented.

Cultural shift: A widespread cultural shift moves consumers and institutions towards reusables products while reducing reliance on disposables.

Demonstration of impact: Reusables demonstrate improvements on all prime economic, environmental and social impact metrics relative to disposables. Common reporting standards and definitions are established for reuse accounting.

Transforming Tomorrow: A Call to Action for FMCG Brands to Pioneer Reuse Solutions

A unified approach could enable reuse plastic packaging to reach a level of value that smaller-scale initiatives cannot achieve. In case of siloed circularity initiatives, consumers often face compromises on convenience or incur higher costs for innovative models, which renders such solutions unviable. However, at a larger scale, consumers are not forced to sacrifice convenience or quality; instead, they experience tangible benefits that extend beyond the intrinsic satisfaction of participating in a reuse initiative. Achieving large-scale reuse systems can be challenging, yet the benefits in terms of consumer acceptance, delivery efficiency, and overall impact would justify the added complexity.

For the successful implementation of reuse models in India, role of FMCG brands is critical. FMCG brands must seize the moment by actively imagining the reuse business opportunities and usher in a new age of consumer access to reuse models of consumption. ■

Article contributed by Devanshu Ralhan, Principal-CAIF, Intellectap.



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