

## Earth System Science Panorama

(The News, Events, Discoveries Awareness and Researches  
on Earth, Climate, and Environmental Sciences)

### Prologue

The Earth System Science Panorama section focuses on compiling and revitalizing recent research, news, and advancements in Earth, climate and environmental sciences. It is a platform to disseminate advanced knowledge and insights for students, educators, and the general public interested in these fields. Inspired by the objectives in the Patron's message, it seeks to foster an engaging space that promotes critical analysis and community-driven solutions to challenges in these disciplines. As the global environment faces unprecedented threats, the pressing question is whether humanity will adapt and survive or succumb to the impacts of global warming and climate change. The inclusion of remedial measures in this section reflects a commitment to not only spotlighting problems but also exploring potential solutions. The content is designed to encourage readers to think critically and holistically about these issues. By promoting dialogue, offering actionable solutions, and providing a platform for feedback, this initiative aspires to build a community-driven approach to tackling pressing environmental challenges. Themes and examples addressing these areas are woven throughout, encouraging a collaborative understanding and response to the crises affecting our planet.

### The New Chemistry of CO<sub>2</sub> turning pollution to profit

New findings in CO<sub>2</sub> conversion processes spotlight the molecular dynamics on copper sites, advancing our ability to produce valuable chemicals like ethylene and ethanol more sustainably. Researchers have made significant advancements in CO<sub>2</sub> electroreduction technology, identifying specific catalyst sites and mechanisms for converting CO<sub>2</sub> into ethylene and ethanol, crucial for sustainable fuel and plastic production. *A groundbreaking study takes advantage of advanced spectroscopic methods and theory to shed light on the intricate processes involved in converting carbon dioxide (CO<sub>2</sub>)*

*into valuable chemicals. This research could significantly enhance sustainable practices in the chemical industry by advancing the development of efficient and sustainable catalysts.* The electrochemical reduction of CO<sub>2</sub> (CO<sub>2</sub>RR) is a promising technology that uses renewable electricity to convert CO<sub>2</sub> into high-value chemicals, effectively closing the carbon cycle. Ethylene and ethanol, the focus of this study, are crucial for producing environmentally friendly plastics and fuels, respectively. However, the exact mechanisms and intermediate steps involved in this conversion have remained elusive until now. The mechanistic understanding is crucial to rationally designing the active sites, which we show here are not only present in the synthesized pre-catalyst. Still, it can also be formed and evolve in the course of the reaction through the interaction with reactants and reaction intermediates. The research team led by group leader Dr Arno Bergmann, Prof. Dr. Beatriz Roldán Cuenya, and Prof. Dr. Núria López employed in-situ surface-enhanced Raman spectroscopy (SERS) and density functional theory (DFT) to investigate the molecular species on copper (Cu) electrocatalysts and thereby, gain insights into the reaction mechanism. Their findings reveal that the formation of ethylene occurs when specific intermediates, known as OC-CO(H) dimers, form on undercoordinated Cu sites. Conversely, the production of ethanol requires a highly compressed and distorted coordination environment of the Cu sites, with the key intermediate OCHCH<sub>2</sub>. One of the critical discoveries is the role of surface morphology in the reaction process. **The team found that the undercoordinated Cu sites strengthen the binding of CO, a crucial step in the reduction process.** These Cu sites, characterized by atomic-level irregularities, likely form under reaction conditions and make the catalytic surface more effective, leading to better performance in producing ethylene and ethanol. These findings can have significant implications for the chemical industry, particularly in the production of plastics and fuels. **By understanding the specific conditions and interme-**

**diates required for the selective production of ethylene and ethanol, researchers can design more efficient and sustainable catalysts. This could lead to more effective ways to utilize CO<sub>2</sub>, reducing the carbon footprint of chemical manufacturing processes.**

The study was a collaborative effort, with theoretical support from a research group in Spain. This partnership allowed for a comprehensive investigation, combining experimental and theoretical approaches to provide a detailed understanding of the CO<sub>2</sub> reduction process. The research conducted by the Interface Science Department at the Fritz Haber Institute and Institute of Chemical Research of Catalonia represents a significant step forward in the field of CO<sub>2</sub> reduction. By unveiling the key intermediates and active sites involved in the production of ethylene and ethanol, this study provides a foundation for developing more efficient and sustainable catalytic processes. **The findings not only advance scientific knowledge but also offer practical solutions for reducing CO<sub>2</sub> emissions and promoting sustainable chemical production.** *Reference: “Key intermediates and Cu active sites for CO<sub>2</sub> electroreduction to ethylene and ethanol” by Chao Zhan, Federico Dattila, Clara Rettenmaier, Antonia Herzog, Matias Herran, Timon Wagner, Fabian Scholten, Arno Bergmann, Núria López and Beatriz Roldan Cuenya, 11 September 2024, Nature. Courtesy: Fritz Haber Institute of The Max Planck Society September 14, 2024*

### **More than 127 dead in Vietnam Super typhoon Yagi**

Typhoon Yagi is the most powerful storm to hit Vietnam in 30 years on 9<sup>th</sup> Sept 2024. At least 127 people have died and 54 others are missing in northern Vietnam bringing heavy rainfall, landslides and flooding. Thousands of people were seen stranded on rooftops in some northern provinces, while others needed for help on social media. This typhoon has wreaked havoc across the north of the country, leaving 1.5 million people without power. The Dashcam footage showed the moment the Phong Chau bridge in Phu Tho province gave way, plunging several vehicles into the water below. Yagi brought winds of nearly 150km/h (92 mph) to northern Vietnam. Later, it was weakened into a tropical depression, however, authorities have warned Yagi will create more disruption as it moves westwards.

The typhoon which brought winds of nearly 150km/h (92mph) - has damaged bridges, torn roofs of the buildings, damaged factories and triggered widespread flooding and landslides, leaving 64 people missing. Authorities had issued flood and landslide warnings for 401 communes across 18 northern provinces. Single-storey homes in parts of Thai Nguyen and Yen Bai provinces were almost completely submerged in the early hours of 10<sup>th</sup> September, with residents waiting on the roofs for help. The flooding and landslides have also injured at least 752 people according to the Ministry of Agriculture. Before hitting Vietnam, Yagi had caused death toll across southern China and the Philippines. Meteorologists say that as the world warms typhoons can bring higher wind speeds and more intense rainfall, although the influence of climate change on individual storms is complicated.

Courtesy: [bbc.com/news/articles/cql3qvg3vk9o](https://www.bbc.com/news/articles/cql3qvg3vk9o)

*India’s first ‘teal carbon’ study bets on wetlands to address the challenges of climate adaptation and resilience*

**Teal carbon refers to carbon stored in non-tidal freshwater wetlands, encompassing carbon sequestered in vegetation, microbial biomass, and dissolved and dissolved organic matter.**

**India’s first study on ‘teal carbon’, undertaken at Keoladeo National Park (KNP) in Rajasthan’s Bharatpur district, has highlighted the significance of wetland conservation to address the challenges of climate adaptation and resilience. The pilot project sought to develop holistic nature-based solutions to address climate change. The concept of teal carbon is a recent addition to the environmental science about organic carbon in inland fresh wetlands.** The study carried out in the form of the KNP’s global review, has depicted the potential of teal carbon as a tool to mitigate climate change if the anthropogenic pollution in the wetlands can be controlled. Teal carbon refers to carbon stored in non-tidal freshwater wetlands, encompassing carbon sequestered in vegetation, microbial biomass, and dissolved and particulate organic matter. Though these wetlands play a crucial role in regulating greenhouse gases, they are vulnerable to degradation from pollution, land use changes, water extraction, and landscape modifica-

tions. Laxmi Kant Sharma, professor and head of the Department of Environmental Science at the Central University of Rajasthan, who led the review, told *The Hindu* that wetlands, when degraded, could release methane and carbon dioxide into the atmosphere. “Given the fragility of these ecosystems, we need urgent conservation and management efforts across the country,” Dr. Sharma said. Special Arrangement. ‘Teal carbon’ being a colour-based terminology reflects the classification of the organic carbon based on its functions and location rather than its physical properties. As opposed to teal carbon, black and brown carbon are primarily produced by incomplete combustion of organic matter from sources such as wildfires, fossil fuel combustion, and industrial activities. They contribute to global warming. The comprehensive review at KNP was conducted by researchers from the Central University of Rajasthan, led by Dr. Sharma, in collaboration with Amanda Nahlik of the U.S. Environmental Protection Agency (EPA) and Siobhan Fennessy from Kenyon College, Ohio, U.S. The review focused on four major teal carbon ecosystems to assess the status and potential role of teal carbon in mitigating climate change. **Preliminary results from the research conducted at KNP revealed elevated levels of methane emissions, necessitating the reduction of these discharges through the use of a specialised type of biochar, which is a form of charcoal. Dr. Sharma said developing this specific biochar – a lightweight black residue comprising carbon and ashes – and its research would require sophisticated instruments, such as the LI-COR device for real-time ground-based greenhouse gas measurements. Ensuring availability of water and selecting suitable vegetation will ensure effective conservation of wetlands in the national park, which in turn will sustain the teal carbon pools. Dr. Sharma said the teal carbon ecosystem would also contribute to an increase in the ground water level, flood mitigation and heat island reduction, supporting a sustainable urban adaptation.** At the global level, the storage of teal carbon across the ecosystems is estimated to be 500.21 pentagrams of carbon (PgC), which is a unit to measure carbon. Peatlands, freshwater swamps, and natural freshwater marshes account for a significant amount of this storage. Dr. Sharma presented the findings of his study recently at the International Union of Forest Research Organisa-

tions (IUFRO) World Conference in Stockholm, Sweden. **While he laid emphasis on the conservation and restoration strategies to enhance natural carbon storage efficacy and reduce emissions from teal carbon ecosystems, scientists from other countries exchanged ideas on climate change, loss of biodiversity and environmental pollution. (EOM)**

Courtesy: Mohammed Iqbal, the Hindu, September 09, 2024.

### **Ethanol push turns India into corn importer, shaking up the global market**

*India usually exports 2 million to 4 million metric tons of corn, but in 2024, exports are expected to drop to 450,000 tons*

“Sugarcane can start contributing more from the next season, but it cannot contribute more than 5 billion litres of ethanol. Ethanol, also known as ethyl alcohol, is a chemical compound with many uses, including Ethanol is a high-octane fuel used in vehicles. It has lower evaporative emissions and is less flammable than gasoline. **A push by India to make more corn-based ethanol has turned Asia’s top corn exporter into a net importer for the first time in decades, squeezing local poultry producers and scrambling global supply chains.** The jump in import demand comes after India in January 2024 hiked the procurement price of ethanol made from corn to drive a shift away from sugarcane-based ethanol for blending in gasoline. With the government promoting ethanol in gasoline to reduce carbon emissions and trying to ensure ample supply of cheap sugar in the world’s biggest market for sweeteners, India appears set to become a permanent net importer of corn.

The prospect of India ramping up corn imports is likely to support global prices which are trading near four-year lows. India usually exports 2 million to 4 million metric tons of corn, but in 2024, exports are expected to drop to 450,000 tons while the country is set to import a record 1 million tons, mainly from Myanmar and Ukraine, which grow non-GM corn (Non-GM corn is corn that has not been genetically modified, or altered in a lab to produce a specific trait). Traditionally, the poultry and starch industries absorbed most of India’s corn production of around 36 million tons. Looking to curb carbon emissions, India aims to increase the share of ethanol

in gasoline (petroleum product) to 20% by 2025-26, from 13% now. To achieve its 20% blending target, India will need more than 10 billion litres of ethanol, government estimates show, which is double the volume the country produced in the marketing year ended October 2023. This year, around 3.5 million tons of corn has been used to make 1.35 billion litres of ethanol, about four times more than a year earlier, government data shows. An increase in corn-based ethanol production to 3 billion litres, requiring nearly 8 million tons of corn, said the official, declining to be named as he was not authorised to speak with media.

Courtesy: Reuters, Sep 04 2024

[https://www.business-standard.com/economy/news/ethanol-push-turns-india-into-corn-importer-shaking-up-global-mkt-124090400327\\_1.html](https://www.business-standard.com/economy/news/ethanol-push-turns-india-into-corn-importer-shaking-up-global-mkt-124090400327_1.html)

### **Microplastics reach the human brain: Which contains 10-20 times more of it than any other organ.**

Microplastics are tiny pieces of plastics, smaller than five millimetres (0.2 inches), which form as larger plastics break down, either by chemically degrading or physically wearing down into smaller pieces. Microplastics in the brain were found to be much more than any other human organ. **Scientists have raised alarm after discovering microplastics in critical human organs like lungs, placentas, livers, kidneys, reproductive organs, knee and elbow joints, blood vessels and bone marrow including the brain. They are calling for more stringent measures to control plastic pollution. A new study has found that a lot more microplastics are present in the human brain than in any other organ. The researchers described the brain as “one of the most plastic-polluted tissues yet sampled”.**

Scientists in Brazil found microplastics in the brain tissue of cadavers. Mounting research over the last few years has found microplastics in nearly every organ in the body, as well as in the bloodstream and in plaque that clogs arteries. The latest research looked at a part of the brain called the olfactory bulb, which processes information about smell. Humans have two olfactory bulbs, one above each nasal cavity. Connecting the olfactory bulb and the nasal cavity is the olfactory nerve. Some researchers worry the olfactory pathway may also be an entry

point for microplastics getting into the brain according to Dr. Thais Mauad, an associate professor of pathology at the University of São Paulo Medical School in Brazil. Mauad and her team took samples of olfactory bulb tissue from 15 cadavers of people who died between the ages of 33 and 100. Samples from eight of the cadavers contained microplastics — tiny bits of plastic that ranged from 5.5 micrometres to 26.4 micrometres in size.

In total, the researchers found 16 plastic fibres and particles in the tissues. The smallest were slimmer than the diameter of a human red blood cell, which measures about 8 micrometres. The most common type of plastic they found was polypropylene, followed by polyamide, nylon and polyethylene vinyl acetate. “Propylene is everywhere, in furniture, rugs, clothes,” Mauad said. “We know the place we are most exposed to particles is indoors because all of our homes are full of plastic.” Matthew Campen, a toxicologist at the University of New Mexico believes the samples likely also contained many nanoplastics, which range in size from 1 to 1,000 nanometers. A strand of human DNA is about 2.5 nanometers thick. (One micrometre is 1,000 times larger than a nanometer). The presence of microplastics in the olfactory bulb doesn’t automatically mean there are microplastics elsewhere in the brain, such as regions related to cognition. Whether these particles can reach these parts of the brain through the olfactory bulb is still not clear. “There is evidence that very small airborne particles can move to the brain via the olfactory bulb, but this is not known to be a major route of trafficking material to the brain,” Campen said. The olfactory system is the pathway between the nose and the brain. The system detects smell by processing the tiny odor molecules that waft off of various objects, such as baking bread or a bouquet. Those molecules stimulate olfactory nerves, and the signals are processed in the brain as smell. Other particles can travel these same routes. Although rare, amoebas such as *Naegleria fowleri* — larger than the size of the microplastics found in the study — can get into the brain through the olfactory nerve. “We thought that if bacteria can pass through this pathway, microplastics might be able to, too,” Mauad said. Campen said it’s more likely that nanoplastics enter the brain through the bloodstream, which picks up plastic bits from the lungs or digestive tract, rather than the olfactory bulb. However, it’s extremely difficult for particles, even those in pharmaceuticals, to enter the

brain through the blood. That's because the brain is surrounded by a semipermeable membrane called the blood-brain barrier. Research on microplastics in the body is still new, and whether these microscopic bits of plastic can pass through the blood-brain barrier in humans is still a big question. Most of what scientists understand about how the 4,000 chemicals are used to make plastic, and how the pieces themselves, may harm health has been limited to animal studies. One recent study showed that exposure to microplastics through drinking water over three weeks caused cognitive changes in mouse brains. The particles were also able to cross the blood-brain barrier. Earlier this year, a study was the first to link the presence of microplastics to higher rates of mortality in people who had higher levels of microplastics in arterial plaque. "We know there is an inflammatory reaction when cells are exposed to microplastics in the lab," said Dr. Mary Johnson, an environmental health research scientist at Harvard T.H. Chan School of Public Health, who was not involved in the research. Johnson noted that neurological diseases including dementia have been linked to exposure to air pollution. "The thought is, could microplastics, could that be a part of the puzzle?" she said. "Part of the concern is not just the particle itself, it's the fact that those plastics have additives in them, some of them we know are potentially toxic."

Courtesy: NBC News.com Kaitlin Sullivan is a contributor for NBCNews.com who has worked with NBC News Investigations. She reports on health, science and the environment and is a graduate of the Craig Newmark Graduate School of Journalism at City University of New York. Edited By: Anamica Singh, Updated: Aug 23, 2024

***The state-of-the-art facility at Cacora adopts an integrated approach to tackle South Goa's waste challenges.***

***Goa's path to sustainable waste solutions: Innovations and progress***

**The Cacora Integrated Solid Waste Management Plant represents a significant step forward in sustainable waste management for South Goa.**

The Goa Waste Management Corporation (GWMC) has reached a significant milestone with the establishment of a 100 tonnes per day (TPD) Integrated Solid Waste Management Plant in Cacora, South

Goa. The facility is designed to manage municipal solid waste from both municipalities and panchayats in the region. **The plant is located on a site that was previously an open dumping ground, which has since been remediated and transformed into a modern waste management facility. The state-of-the-art facility was inaugurated by Prime Minister Narendra Modi on February 6, 2024. The Cacora plant is a brownfield project, meaning it was developed on a previously used site. The legacy waste at this location was remediated to recover the land for the new facility.**

The Goa Waste Management Corporation (GWMC), established on October 2, 2016, has been pivotal in revolutionizing waste management in Goa. This Special Purpose Vehicle (SPV) under the Department of Science, Technology and Waste Management and also of Village Panchayat is tasked with the scientific collection, segregation, treatment, and disposal of solid and other waste. With a mission to address waste issues comprehensively, GWMC has launched several centralized and de-centralized facilities that have been set up under 14th/15th FC Grants and SBM-G Funds at Village Panchayat/Block level to manage various waste types, including municipal, biomedical, hazardous, construction and demolition, and e-waste. Centralized Waste Management Facilities GWMC has set up integrated waste management facilities through a Public-Private Partnership (PPP) model, ensuring efficient and sustainable waste treatment. Key facilities include: • Saligao, North Goa: Integrated 250 TPD + 20% Solid Waste Management Facility • Cacora, South Goa: Integrated 100 TPD + 25% Solid Waste Management Facility • Kundaim IDC, Ponda Goa: Common Biomedical Waste Treatment Facility • Pissurlem, Goa: Common Hazardous Waste Treatment Storage Disposal Facility • Bainguinim, Goa: Proposed Integrated 100 TPD Solid Waste Management Facility • Verna IDC, Goa: Proposed Integrated 250 TPD Solid Waste Management Facility and 250 TPD Waste to Energy Facility • Pissurlem, Goa: Proposed E-waste Management Facility • Proposed: Construction and Demolition Waste Management Facility Common Biomedical Waste Treatment Facility (CBWTF), Kundaim In October 2021, the GWMC commenced operations at the state-of-the-art CBWTF in

Kundaim. Managed by M/s Biotic Waste Solutions Pvt Ltd, this facility operates under a PPP model on a 10,000 sq.m. plot provided by GWMC. It is designed to collect, transport, treat, and dispose of biomedical waste for 20 years. **The CBWTF has a total treatment capacity of 28 tonnes per day and is equipped with cutting-edge technology, including a Rotary Incinerator, Autoclave, Boiler, Shredder, Effluent Treatment Plant (ETP), and a Plastic Recycling plant. This facility has treated 3,500 tonnes of biomedical waste since its inception, serving over 1,500 healthcare facilities across Goa. The facility's Rotary Incinerator, a first in West India, processes 300 kg of waste per hour, featuring a 6-Step Dry Air Pollution Control Device. This ensures smokeless emissions and captures all particulate matter. The installed 15 KLD ETP guarantees the complete treatment of wastewater, adhering to international safety standards. GWMC's collaboration with SINTEF, a Norwegian scientific research organization, aims to establish a modern Construction & Demolition (C&D) Waste Management Facility in Curchirem Village, Bicholim Taluka. This facility will recycle C&D waste through wet and dry processes, leveraging SINTEF's expertise and insights from international visits. The GWMC has acquired 44,478 sq.m. of land for the facility, which will be developed through a PPP model. Meanwhile, a temporary provision for C&D waste disposal is in place at Tuem, identified by the District Magistrate of North Goa. Common E-Waste Management Facility at Pissurlem To tackle the rising challenge of electronic waste, the GWMC is setting up an E-Waste Management Facility at Pissurlem Industrial Estate. The facility, which spans 4,000 sq.m., is currently under construction. It will focus on dismantling e-waste for downstream recycling, supported by robust collection and transportation mechanisms as per relevant guidelines. The operator has already begun collecting e-waste from urban and rural local bodies, ensuring scientific disposal to authorized recyclers. This initiative aims to create awareness among stakeholders and promote sustainable e-waste management practices. The GWMC's initiatives reflect a significant step towards sustainable waste management in Goa. By setting up**

**advanced facilities and leveraging international collaborations, the GWMC is not only addressing current waste management challenges but also paving the way for a cleaner, greener future.** These efforts underscore the importance of scientific and efficient waste treatment and disposal, ensuring environmental sustainability for generations to come. It is based on a public-private partnership model, with the state providing 75 per cent of the funding, supported by a National Bank for Agriculture and Rural Development loan under the Rural Infrastructure Development Fund and the concessionaire providing the remaining through equity. The GWMC has also provided essential infrastructure, including land, access roads, electricity and water connections. The plant is the second of its kind established by the corporation in Goa, after a solid waste management facility in Saligao, said Ankit Yadav, managing director of GWMC. "The Cacora facility incorporates similar technology and builds on the operational experience of the Saligao plant. The facility adheres to the Solid Waste Management Rules, 2016 and employs a comprehensive approach, including recycling and sorting lines, segregation, bio methanation and composting," he added. The operations of the facility are overseen by an expert committee led by Padmashree Sharad Kale, a former Bhabha Atomic Research Centre scientist, with contributions from the National Environmental Engineering Research Institute, Indian Institute of Technology Bombay, Birla Institute of Technology and Science, Pilani and other waste management experts from Goa. Shri Prasiddh P. Naik, Dy Director of Panchayat, Govt of Goa/State Coordinator SBM-G Goa state, M.No-9923274585. Email- dydir-panc.goa@nic.in • Shri Shashank Dessai, Dy. Manager Goa Waste Management Corporation M.No- 9923326872 Email Shashank.dessai@zerowastegoa.com.

Courtesy: [Kaifee Jawed](#)

<https://www.downtoearth.org.in>

### *Turning garbage into value for future fuels*

Union Minister Nitin Gadkari emphasized the importance of monetizing waste for both safe disposal and generation of revenue, suggesting that garbage should become so valuable that people vie for the right to acquire it. Speaking at an event organized by Akhil Bharatiya Sthanik Swarajya Sanstha, **Gadkari**

highlighted the role of waste monetization in enhancing civic body revenue. Gadkari shared, “In north India recently, we used a total of 80 lakh tonnes of garbage for the construction of highways. This helped to fill in the road base and also get rid of the huge garbage problem. “He elaborated on the value of segregating waste, which increases the end product’s value. Gadkari provided examples such as plastic, metal, glass, and organic waste. He explained that plastic could be converted into crude petrol, which is then mixed with diesel up to 50 per cent, reducing the cost to around Rs 50 per litre and making it economically viable for use in tractors. Discussing Nagpur’s initiatives in monetizing waste, Gadkari said, “In Nagpur, the civic body is earning Rs 300 crores annually by treating sewage and selling it to industries in the vicinity.” Gadkari also focused on organic waste, noting its potential to create high-value products. He mentioned a project in Nagpur where organic waste is processed in a bio-digester to produce methane, which is then used to create biofuels. The minister emphasized changing perspectives towards resources to generate wealth, concluding with, “Garbage should become valuable...so valuable that people clamour for the right to acquire it.” Gadkari’s insights present a model for municipalities to consider, demonstrating the economic and environmental benefits of rethinking waste management strategies. By adopting these methods, self-governing bodies can turn a potential problem into a profitable solution, as exemplified by the initiatives in Nagpur and northern India.

*Typhoon Yagi is the most powerful storm to hit Vietnam in 30 years*

Super Typhoon Yagi, one of the strongest storms to hit Vietnam in three decades, has left a trail of destruction and continues to threaten the lives of millions across northern and central parts of the country.

At least 127 people have died and 54 others are missing in northern Vietnam, according to officials, as a super typhoon which hit on 7<sup>th</sup> Sept.2024 continues to bring heavy rainfall, landslides and flooding. Thousands of people were seen stranded on rooftops in some north-

ern provinces, while others posted desperate pleas for help on social media. **Typhoon Yagi - Vietnam’s most powerful storm in 30 years - has wreaked havoc across the north of the country, leaving 1.5 million people without power.** On 9<sup>th</sup> Sept. dashcam footage showed the moment the Phong Chau bridge in Phu Tho province gave away plunging several vehicles into the water below the river bridge. Yagi brought winds of nearly 150km/h (92 mph) to northern Vietnam. Although it has now weakened into a tropical depression, authorities have warned Yagi will create more disruption as it moves westwards. “The storm - which brought winds of nearly 150km/h (92mph) - has damaged bridges, torn roofs off buildings, damaged factories and triggered widespread flooding and landslides, leaving 64 people still missing. Authorities have now issued flood and landslide warnings for 401 communes across 18 northern provinces. One-storey homes in parts of Thai Nguyen and Yen Bai provinces were almost completely submerged in the early hours of Tuesday, with residents waiting on the roofs for help. As well as the dead and missing, flooding and landslides have also injured at least 752 people, officials at the Ministry of Agriculture said on 10<sup>th</sup> Sept. Before hitting Vietnam, According to authorities, nearly 190,000 homes have been flooded, damaged or destroyed, with at least 325 people reported dead or missing, and an estimated 1.6 million people affected overall. These numbers are expected to rise as damage assessment continues, while the risk of further flooding and landslides remains high throughout the affected regions. Immediately after the initial impact of the typhoon, the Vietnam Red Cross Society organised the mobilisation of relief items, such as food, medicine, and cash distribution worth up to VND 5.5 billion (190,000 CHF) to support affected communities. Red Cross staff and volunteers have been deployed to assist with debris cleanup and to provide psychological first aid, and disaster response teams are also continuing to collaborate closely with the authorities to conduct damage and need assessments in the affected areas. Local Red Cross branches are implementing measures such as early warning communication, supporting the reinforcement of houses, providing assistance at temporary evacuation and shelter points, and closely monitoring storm updates so they’re on standby for emergency response. “*This extreme and prolonged weather event is continuing to have a widespread impact on many local communities, including in areas where*

*we have rarely seen this kind of disaster occur previously. People's resilience is being stretched, and there is an urgent need to provide both immediate relief and recovery support to the affected populations. "IFRC is working closely with the Vietnam Red Cross Society to mobilise international support to address the growing and evolving needs of the affected populations, especially with health services, water and sanitation as well as restoration of shelter and livelihoods. "Yagi left 24 people dead across southern China and the Philippines. Meteorologists say that as the world warms typhoons can bring higher wind speeds and more intense rainfall, although the influence of climate change on individual storms is complicated.*

*Courtesy: BBC News, 10 Sept. 2024*

***Yagi, the 11th typhoon of this year, made two landfalls in China on 6<sup>th</sup> Sept 2024, first striking Hainan and later the Guangdong province.*** Typhoon Yagi pounded south China's island province of Hainan with heavy rain and gusty winds, forcing thousands of people to be relocated for safety, local authorities said on 7<sup>th</sup> Sept 2024. Yagi, the 11th typhoon of this year, made two landfalls in China on 6<sup>th</sup> Sept 2024, first striking Hainan and later the Guangdong province. Super Typhoon Yagi has pounded south China with heavy rain and gusty winds, leaving four people dead and 95 injured, the state-run Xinhua news agency reported, citing authorities. Chinese President Xi Jinping has urged beefed-up disaster relief efforts after the typhoon struck the country's southern region. In Hainan, a popular tourist destination, the storm uprooted trees, caused power outages and flooded roads. Over 2,200 workers have been mobilised to restore power to more than 1.6 million affected households, Xinhua reported. High-speed rail services circling the island are expected to resume on 8<sup>th</sup> Sept afternoon, while ferry services across the Qiongzhou Strait are anticipated to restart by 9<sup>th</sup> Sept. evening. Rescue teams are racing to restore communication networks after more than 12,500 base stations were damaged across Hainan, official media reported. In Guangdong province, Yagi had forced the relocation of 729,954 people by noon on 7<sup>th</sup> Sept, according to the provincial flood, drought and typhoon control authorities. Since 5<sup>th</sup> Sept night, heavy rainfall has battered western Guangdong, with Xiaqiao township recording the highest accumulated precipitation at 415.6 millimetres, according to the Guangdong Meteorological Service.

More than 34,400 rescue personnel have been devoted to disaster relief work in Zhanjiang, Yangjiang, Jiangmen and Maoming cities, Xinhua reported. Yagi has also wreaked havoc in the Guangxi Zhuang Autonomous Region, forcing the evacuation of about 60,000 residents. As of 11 am on 7<sup>th</sup> Sept, over 107,000 households remained without power. Heavy rains lashed over 30 townships and strong gales affected more than 110 townships in the region. Authorities have issued flood alerts as water levels in several rivers continue to rise.

Courtesy: Business Standard, bbc.com, 7<sup>th</sup> Sept 2024.

***Scientists reviewed 7,000 studies on microplastics. Their alarming conclusion puts humanity on notice.***

The comprehensive study on microplastics, synthesized from over 7,000 studies, reveals a pervasive and potentially harmful environmental crisis. Microplastics—tiny particles of plastic 5mm or smaller—have infiltrated ecosystems globally, appearing in oceans, soil, and even the most remote regions of the planet. **Microplastics have been identified in the water we drink, the air we breathe and the food we eat** – including seafood, table salt, honey, sugar, beer and tea. These particles come from diverse sources, including synthetic clothing, cosmetic cleansers, and plastic waste breakdown. Alarmingly, their effects ripple throughout food chains, impacting both wildlife and human health. Microplastics have been detected in over 1,300 species, with evidence of blocked digestive tracts, chemical leaching, and organ damage, especially in animals that mistake microplastics for food. For humans, microplastics have been found in essential organs and fluids, from blood to lungs. Though our bodies can expel some microplastics, others persist, potentially leading to inflammation, oxidative stress, immune issues, and even genetic mutations that may raise cancer risks. The accumulation of microplastics continues to escalate, with projections suggesting that by 2040, releases could be more than double. This pollution, already nearly impossible to reverse, demands immediate, unified action. The UN's Global Plastics Treaty aims to reduce global production of plastics. But the deal must also include measures to reduce microplastics specifically. **Ultimately, plastics must be redesigned to pre-**

**vent microplastics from being released and individuals and communities must be brought on board, to drive support for government policies.** After 20 years of microplastics research, there is more work to be done. But we have more than enough evidence to act from now. In brief, to reduce exposure, laws must target sources of microplastics directly, while also encouraging community involvement to sustain support for environmental policies. Courtesy: Karen Raubenheimer, Senior Lecturer, University of Wollongong published in the conservation, UK. 19 September 2024.

**Changing climate means Wayanad-like disasters to increase in frequency & intensity: Expert.**

*Vulnerable and marginalised sections of society remain the most at risk from landslides.*

**On July 30, 2024, Wayanad in Kerala witnessed India's worst-ever landslide, devastating the villages of Punchirimattam, Chooralmala and Mundakkai.**

The scale of destruction was unimaginable, with over 420 people confirmed dead, while 397 people were injured. The **2024 Wayanad landslides** were a series of landslides that occurred in Punjirimattom, Mundakkai, Chooralmala, and Vellarimalavillages in Meppadi panchayat, Vythiri taluk in Wayanad district, Kerala. The landslides were caused by heavy rains that caused hillsides to collapse, destroying the areas below. The disaster was one of the deadliest in Kerala's history, with reports of over 420 fatalities, 397 injuries, and 118 people missing. **Deforestation, seismic sensitivity, poor building construction, and global warming have been identified as possible causes of the landslides and fatalities.** **A changing climate means that disasters like the landslides in Kerala's Wayanad on July 30 will increase in frequency and intensity, an expert has told *Down To Earth (DTE)*.** Also, **the poorest and most marginalised sections of society are and will be most affected by such disasters, said Associate Professor Pierre Rognon in the School of Civil Engineering, University of Sydney, Australia.** "The scientific consensus is that climate change will induce even more of such extreme rain events in the future. As extreme rainfalls are a mechanical trigger of

landslides, and a direct cause of mud flows like in Wayanad, we should, unfortunately, expect an increase in frequency and intensity of such landslides globally shortly," Rognon, whose area of expertise encompasses landslides and their triggers; social consequences; recovery and rescue; aftermath analysis, added. More than 1,555 houses and other buildings including schools, a dispensary, the panchayat bhawan, the electricity board office, and 136 community buildings were damaged. Additionally, 290 shops, 124 km (77 mi) of electricity infrastructure, two transformers, 1.5 km (0.93 mi) of rural roads, and three bridges were affected. The landslides also devastated a total of 600 ha (1,500 acres) of land, including 310 ha (770 acres) of farmland. After the landslides, business institutions including hundreds of shops in Chooralmala and Mundakkai were shut down by officials, citing the danger of additional landslides. According to Kerala Vyapari Vyavasayi Ekopana Samithi, these restrictions cost more than 25 crore (US\$3.0 million) to the business community in the impacted areas. Harrisons Malayalam lost 10 ha (25 acres) of tea estate, which cultivates an estimated 230 tonnes of tea produce worth 3.5 crore (US\$420,000); forty-one estate employees and forty-eight of their family members were either missing or dead. Prof. Pierre Rognon observed that the two major triggers of landslides are rainfall and earthquakes. The landslide that hit Wayanad was most likely triggered and fed by unusual rainfall on the day before the event, and during the week before the event. Rognon classified the Wayanad landslide as a 'mud flow'. "It (mudflow) is made of a lot of rainwater flowing fast and transporting earth particles, rocks, trees and anything in its path," he said. The occurrence of mudflows is directly related to extreme rain events. What happened in Wayanad is a typical scenario, said Rognon. "Over a few days, significant rainfall fully saturates the porous ground "filling up the ground water tank"; the next heavy rain cannot be stored underground, it then runs off fast on top of the ground and collects in gullies and canyons, where it suddenly forms very powerful streams," he explained. These streams, in turn, erode the ground including fine soil particles, boulders and trees. "This mixture has the devastating consequences that we know on people, buildings and infrastructures that are in its path," said Rognon. *Courtesy: Rajat Gandhi, Down to Earth.org, 2 August 2024 and Wikipedia.org.*

## Epilogue

The CEHESH TRUST OF INDIA is an organization committed to addressing some of the most critical environmental challenges facing our planet today. The trust focuses on the interconnected themes of climate change, global warming, pollution, and loss of biodiversity, advocating for sustainable development and ecological balance. Key themes and objectives are:

- CEHESH TRUST aims to educate communities and policymakers about the urgent need to reduce greenhouse gas emissions.
- advocates renewable energy adoption, afforestation, and sustainable practices to minimize the impact of rising global temperatures. The trust emphasizes the consequences of global warming, such as rising sea levels, melting glaciers, and extreme weather patterns. It works on strategies to enhance carbon sequestration and reduce reliance on fossil fuels. It conducts seminars on air, water, and soil pollution through advocacy for stricter environmental regulations. We encourage waste management initiatives, including recycling and reducing single-use plastics. We focus on protecting endangered species and restoring degraded habi-

tats We collaborate with local communities to promote the coexistence of human development and ecological conservation. The school initiatives are taken to spread awareness about environmental sustainability. Local stakeholders are involved in projects such as tree plantation drives, clean-up campaigns, and wildlife conservation. The CEHESH TRUST OF INDIA strives to inspire a collective effort to safeguard the planet for future generations, emphasizing the urgent need to balance development with ecological stewardship.

By adopting sustainable practices and fostering awareness, we can restore ecosystems, improve environmental health, and secure a sustainable future for all.

**Every climate action, no matter how small, contributes to the larger goal.**

Compilation and revamping

**Dr. B. Mishra,**

Patron

JOURNAL OF GEOINTERFACE