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Change in rainfall pattern a concern

Rajesh Tiwari
Publisher
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As India readies for the 2024 Union Budget, it will be crucial to focus on future-proofing the economy against increasingly erratic rainfall patterns. The monsoons impact the food we eat, the water we drink and also our energy transition.

Over the last 40 years during the southwest monsoon, India as a whole experienced 29 'normal', 9 'above-normal', and 3 'below-normal' monsoon years, according to a study conducted by Council on Energy, Environment, and Water (CEEW), an independent, not-for-profit policy research institution.

However, analysis at the district level showed that approximately 30 per cent of India's districts witnessed a high number of deficient rainfall years and 38 per cent witnessed a high number of excessive rainfall years.

Of this, 23 per cent of districts such as New Delhi, Bengaluru, Nilgiris, Jaipur, Kachchh, and Indore, witnessed both a high number of deficient as well as excessive rainfall years.

Decoding these trends at an even more granular level, the study found that 55 per cent of tehsils witnessed an increase in southwest monsoon rainfall in the past decade (2012-2022), by more than 10 per cent compared to the climatic baseline (1982–2011).

While the decreasing trends in southwest monsoon were not statistically significant continuously over forty years, we found that nearly 11 per cent of the Indian tehsils witnessed a decrease particularly in the past decade (2012-2022), by more than 10 per cent compared to the climatic baseline (1982–2011).

CEEW's recent study -Decoding India's Changing Monsoon Patterns: A Tehsil-level Assessment - has been conducted by Shravan Prabhu and Vishwas Chitale.

These are in the Indo-Gangetic plains, which contribute to more than half of India's agricultural production, northeastern India, and the Indian Himalayan region. These regions also host fragile but highly diverse ecosystems. Of these tehsils, approximately 68 per cent experienced reduced rainfall in all months from June to September, while 87 per cent showed a decline during the initial monsoon months of June and July, which are crucial for the sowing phase of kharif crops.

The rainfall associated with the northeast monsoon (OND), which primarily impacts peninsular India, has increased by more than 10 per cent in the past decade (2012-2022) in approximately 80 per cent of tehsils in Tamil Nadu, 44 per cent in Telangana, and 39 per cent in Andhra Pradesh, respectively.

While the remaining Indian states are usually dry during this period, we found a statistically significant increasing trend in the OND rainfall along the tehsils of Maharashtra and Goa on the west coast and Odisha and West Bengal on the east coast.

Further, the analysis of monthly variability indicated that nearly 48 per cent of tehsils in India saw an increased rainfall in October by more than 10 per cent, which could be due to the delayed withdrawal of the southwest monsoon from the subcontinent.

The monsoons are crucial for the Indian economy and are often regarded as the backbone of the agricultural sector, which employs over half of India's population.

Dr Vishwas Chitale, Senior Programme Lead, CEEW, said, "As India readies for the 2024 Union Budget, it will be crucial to focus on future-proofing the economy against increasingly erratic rainfall patterns. The monsoons impact the food we eat, the water we drink and also our energy transition. CEEW's study not only maps monsoon variability—both southwest and northeast—over the past 40 years across India, but also provides openly-accessible tehsil-level rainfall information for decision-makers to assess risks at the local level. With increasing extreme weather events, hyper-local climate risk assessments and action plans are the way to go for India to keep leading in climate action and disaster risk reduction. This will help save lives, livelihoods and infrastructure."

Further, the CEEW study finds that the increase in rainfall is not well distributed throughout the seasons and months.

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Editor: Rajesh Tiwari

ACC sets up a flour mill in Maharashtra's Yavatmal District, offering big solace to people in the region

ACC, the cement and building material company of the diversified Adani Group, continues to exemplify its commitment to community well-being. In a demonstration of its values, ACC has successfully enhanced the economic prosperity of over 300 residents in a small village in Maharashtra by establishing an exclusive flour mill for the local community.

Until recently, members of the 80-odd households in Chincholi village located in Wani taluka of Yavatmal district were forced to travel more than 15-kms, had to navigate challenging terrains to accomplish a simple task of grinding everyday cereals into flour for daily use. What might seem to be a simple task for us in the city, was a huge challenge for villagers.

Until the new flour mill was set up by ACC and Adani Foundation, the locals had to travel more than 15 kms just to make flour for daily use.

This initiative reaffirms ACC's belief that no endeavor is too modest when it comes to improving the lives and livelihoods of its stakeholders.

In December 2020, ACC started working closely with Jivandhara Self Help Group (SHG) under the Integrated Chanda Area Development Program (ICADP) to set up a brand new flour mill in Chincholi village that today not only provides easy access to a grinding machine, but has also created a new stream of livelihood for members of the local self-help group. The flour mill grinds locally grown cereals like Wheat, Bazra, Jawari and Toor for as till as Rs. 4 per kg with a capacity to handle 250 kgs every day. Furthermore, this intervention is also generating a monthly income of Rs 12,000 for the members of the local SHG.

Ajay Kapur, CEO, Cement Business, said, "This initiative underscores our belief that every positive step, no matter how seemingly small, contributes to the greater good. By addressing the basic needs of the Chincholi community, we are not just providing a service but promoting sustainable change and creating opportunities for economic well-being. This aligns with our broader vision of promoting self-reliance, community empowerment, and a more resilient and prosperous future for all."

The flour mill has also won the hearts of the 300-odd residents in Chincholi village, who are now able to direct their energies and scarce resources to more productive use by saving on travel and more expensive grinding services in the main market situation some 15 km away.

ACC and the Adani Foundation are involved in specific initiatives addressing various themes like social inclusion, community development, and the empowerment of rural communities. Their dedication extends to supporting and uplifting rural communities, contributing to positive change and sustainable development across these crucial areas.

Royal Enfield's partnership with social enterprise Surf Turf in Kovalam enhances beach safety by building watchtowers and equipping lifeguards with training and equipment

Royal Enfield in partnership with Surf Turf has constructed two solar powered lifeguard watchtowers and is providing lifeguard services in Kovalam, a popular surfing destination along the East Coast Road, 40 km from Chennai. The twin towers and the lifeguards help safeguard over a kilometre of coastline in Kovalam, which sees a footfall of over 50,000 tourists each weekend.

Under the partnership, Local fishermen were trained by Surf Turf over immersive workshops to double up as surfing lifeguards and prevent incidents of drowning – known to be the third leading cause of unnatural deaths globally. The lifeguards surf on rescue boards to speed their response time during a calamity. They are also trained in performing CPR and using first aid. This provides village youth a means of livelihood, who are employed under the programmes for their services. Royal Enfield provided customised rescue boards as well as other equipment to support Surf Turf's operations. The support has been a lifesaver to the locals and tourists. The lifeguards have saved over 30 lives from incidents of drowning since May 2023, when the towers were constructed.

The intervention has helped save over 30 lives from drowning incidents.

Watchtowers are dismountable, solar powered and equipped with first aid, binoculars and walkie-talkies

"Tamil Nadu is home to Royal Enfield. This critical intervention is part of the coastline conservation work under our social mission.The presence of these watchtowers is crucial to beach safety and helps the lifeguards do their job," said Bidisha Dey, Executive Director at Eicher Group Foundation, the CSR arm of Royal Enfield.

"This project is beautiful and satisfying as it saves lives and also creates jobs for the fishing community. We plan to expand this association with Royal Enfield to many more beaches in Tamil Nadu," says Arun Vasu, founder of Surf Turf.

The tower stands at an elevated height of 15 ft and is built using recyclable material. While lights and charging points are solar powered, the tower is equipped with walkie-talkies, binoculars and first aid kits. The structure is both ergonomic and dismountable in order to be able to adapt with agility in a constantly shifting coastline. Royal Enfield has built similar towers in Goa.

"I love being a lifeguard, especially since the lifeguard tower was installed in my village. Before the tower, there were accidents, but now, we've had zero deaths. I'm proud to contribute to the safety of Kovalam beach and grateful for this opportunity after my fishing days. Lifeguarding is a respectable and fulfilling job today," says 36-year-old Kannan, a Kovalam-based lifeguard who was trained under the initiative.

Apart from keeping Kovalam safe the initiative has brought about a transformation among the fishing community who now see being a lifeguard as an aspirational job that makes an invaluable difference to public safety.

From Vocational Training to Vibrant Communities: Godrej & Boyce's CSR impact felt by lacs in India

Godrej & Boyce (G&B), the flagship company of the Godrej Group, announced its CSR achievements in 2023.

Anchored in its steadfast commitment and significant milestones in nation-building, its initiatives are built on ensuring employability and community development. In line with its strategic emphasis on promising regions and trades, the company has INR 18 crore in its skilling initiative over the past decade. This investment has yielded social returns six times the initial amount.

DISHA, the skill development initiative of G&B is committed to advancing vocational training aligned with the company's business needs, encompassing areas from sales through technical aspects. Partnering with 88 Vocational Training Institutes (VTIs) and 24 Govt. VTIs across 22 states in India, the key features of DISHA include specialized training sessions which delve into sales, service, interiors, building construction, manufacturing, technical training, and digital skills. By March 2023, the DISHA program had trained 1.79 lac youth in target states.

The Digital Skills program encompasses a wide spectrum of courses, ranging from Robotics and Automation, Business Analytics and Dashboarding, to Digital Marketing and E-Commerce. While the technical courses cater to engineering students, the latter ones are accessible to all fresh graduates. An essential feature of this program is its on-site training, enabling trainees to practically apply their theoretical knowledge, ensuring a comprehensive understanding of their chosen field.

Ashwini Deodeshmukh, Head, CSR, Godrej & Boyce, spoke about the CSR approach of Godrej & Boyce, "At Godrej & Boyce, we deeply believe in the philosophy of 'shared value', seamlessly intertwining business success with societal advancement. Central to this ethos are our flagship CSR programs, DISHA and our commitment to fostering sustainable communities, particularly around our manufacturing hubs. Through DISHA, we've joined hands with dedicated non-profit organizations and social enterprises to bring forth vocational training to create a future-ready and employable workforce. By empowering communities and fostering institution-building, we not only provide opportunities but also instil a sense of ownership in community members. It's this spirit of co-evolution and mutual progress that truly embodies our approach."

DISHA, the skill development initiative of G&B is committed to advancing vocational training aligned with the company's business needs, encompassing areas from sales through technical aspects.

The company has implemented several programs for the holistic development of underserved, rural communities in 8 locations in 24 villages across 6 states. The key thematic areas include improving education and health infrastructure, strengthening rural livelihoods and women-led enterprises, and enhancing water access.

G&B's commitment to education is evident through its transformative efforts in improving infrastructure across 46 schools. In Maharashtra, 18 schools have been digitalized and transitioned to solar-powered electricity. Further, specialized learning programs, STEM learning and the Karadi Path English curriculum were introduced to create well-rounded curricula. Moreover, by expanding school infrastructure, a more focused teacher-student interaction through improved classroom ratio.

Central to its community initiatives is the empowerment of women. So far over 5000 women have benefitted through its community development initiatives. By forming and nurturing 160+ self-help groups, G&B has carved pathways for women's active participation in the rural economy enabling them to significantly enhance its incomes.

The company has also underscored its dedication to community well-being, providing medical equipment and infrastructure upgradation support for 4 primary health centres in the Khalapur and Shirwal areas of Maharashtra. These centres have been integrated with TB detection capabilities and dedicated operation theatres for family planning.

GD Goenka University and Fortis National Mental Health Program host India's Largest Counselor's Summit on Exams, Performance & Skills

GD Goenka University in partnership with Fortis National Mental Health Program brought together school Counselors from across India for the 'VARTAH 2.0: National School Counselors' Winter Edition Summit on Exams, Performance & Skills.

Led by Dr. Samir Parikh; Chairperson, Fortis National Mental Health and Dr. Anjali Midha Sharan; Dean- Research & Development & Dean - School of Liberal Arts at GD Goenka University, this pioneering initiative aims to enhance mental health awareness in educational institutions.

The summit provided a dynamic platform where participants engaged in crucial discussions that impact students' well-being. Themes included raising awareness about mental health issues, advocating for necessary educational policy changes, and emphasizing practical measures for fostering a healthy and inclusive mental health culture in schools.

GD Goenka University demonstrated its commitment to social well-being, emphasizing a positive approach to sports and academics. Renowned experts engaged in discussions on 'Counselling in Schools: Challenges and Solutions,' highlighting the importance of personal and professional relationships. The conversation underscored the role of technology and the transformative impact of NEP 2020 on traditional examination systems.

A focused session highlighting 'Suicide Prevention and Crisis Intervention,' emphasizing the ongoing efforts of counselors was also included. The summit concluded with discussions on 'Examinations: A Collaborative Approach Between Stakeholders,' emphasizing the necessity for collaboration and recognizing schools as spaces for holistic student development.

Mr. Nipun Goenka, Managing Director, GD Goenka Group remarked: " I'm delighted to see our partnership with Fortis Healthcare strengthen each year and to witness the high school community participating with such zeal. This goes to show that our collective efforts will certainly bring more focus on mental health and well-being for the youth, and that school communities and parents today are consciously driving this change. We commit ourselves entirely to this cause going forward as well."

Dr. Samir Parikh, Chairperson, Fortis National Mental Health Program quoted: "It's important to focus on skills building, performance and instill the zeal for success in students. Counselors have an important role to play in this. It's

our collective responsibility to make exams a skill for life. Vartah is a unique initiative which brings together multiple stakeholders for the school mental health."

Prof. (Dr.) Anjali Midha Sharan, Dean - Research & Development and Dean - School of Liberal Arts,GD Goenka University said: "Vartah has provided a platform for collaboration, dialogue and meaningful engagements amongst School counselors and mental health professionals. With several competitive and board exams being just around the corner, this winter Vartah was appropriately themed and with participation from schools across the length and breadth of the country, the impact will be far-reaching and we hope several students benefit."

About GD Goenka University

Established in 2013 and located in Gurugram, Delhi NCR, GD Goenka University is a leading multi-disciplinary institution of higher education. Established with a vision to redefine education and empower the next generation of thought leaders, the university rooted in a rich heritage of culture and armed with a forward-looking approach, offers undergraduate, postgraduate and doctoral programmes that transcend traditional boundaries and equip our students with the skills and knowledge to thrive in an ever-evolving global economy. Committed to academic rigor, research and innovation, and holistic development, the university is dedicated to nurturing intellectual curiosity, fostering creativity, and producing socially responsible global citizens.

A forerunner in implementing best practices of the NEP 2020, the university operates 8 schools and hosts a diverse body of 6000+ students and 11000+ alumni from over 45 countries. It is recognised by UGC and BCI, and is a member of prestigious national and international organizations including association of Indian Universities (AIU), Association of Commonwealth Universities (ACU) and International Association of Universities (IAU). It is recognized by QS IGUAGE as a "Diamond" rated University for teaching and learning.

The university is located on a 60-acre sustainable campus and features state-of-the-art facilities including smart classrooms, research and design labs, experience centers, sports facilities of international scale including a shooting range and a half-Olympic size swimming pool and world-class airconditioned hostels.

mPokket Partners with Swapnopuron Welfare Society: Empowers school children with quality education

mPokket – India's fastest-growing loan app – has undertaken a meaningful collaboration with Swapnopuron Welfare Society (SWS), an NGO dedicated to providing quality education to underprivileged children in the remote islands of the Sundarbans. This partnership reflects mPokket's commitment to its core values of creating an empowered community where every child has an equal chance to realize their full potential.

In the spirit of giving, mPokket employees came together to contribute various stationery items such as chess boards and bags. These items were donated to support the children associated with the NGO. Aimed at easing educational challenges, this effort resonates with mPokket's vision of enabling a brighter future for India's youth.

Through Swapnopuron Sikhsha Niketan Schools, SWS adopts a holistic approach to education. The schools provide a unique blend of multi-sectoral teaching, incorporating music, dance, drama, and storytelling to enrich learning experiences. The mission of SWS revolves around promoting socio-economic empowerment and ensuring increased access to entitlements for the community in the Sundarbans.

mPokket welcomed six children from Swapnopuron Sikhsha Niketan Schools, the English medium school run by SWS, to its office on Christmas. The children had the opportunity to engage with the senior leadership team of mPokket, including the Founder & CEO, Gaurav Jalan. The interaction focused on fostering creativity and a personal connection with these children.

Gaurav Jalan, Founder & CEO of mPokket, stated, "We are delighted to collaborate with Swapnopuron Welfare Society in our joint mission to empower underprivileged children with quality education. It is heartening to see the positive impact such initiatives have on the lives of underprivileged children. We remain committed to continuing our efforts to empower the youth."

This collaboration showcases a sustained effort by mPokket to support SWS in its mission. mPokket aims to contribute to a safer, empowered community where every child has equal opportunities to realize their full potential. This initiative is a small step towards creating a more equitable and inclusive society where children have access to quality education and learning resources.

Micron Foundation Partners With UNICEF and Local Nonprofits to Empower Underrepresented Children in India

Micron Technology, Inc. announced a key partnership between the Micron Foundation and UNICEF India aiming to build interest in science, technology, engineering and mathematics (STEM) education for children from rural and low-income communities. The Micron Foundation's $408,000 USD grant will fund UNICEF programs focused on strengthening systemic approaches to fostering STEM learning and 21st-century skills for vulnerable children and youth in Karnataka and Telangana, with a special focus on supporting girls.

With this support, UNICEF will partner with schools across Karnataka and Telangana to improve Atal Tinkering Labs (ATLs) and set up low-cost makerspaces in schools to increase girls' engagement with STEM education. The grant will help UNICEF strengthen ATLs by providing some of the funding necessary to build capacity and support for teachers, engage with volunteers to mentor students, and organize knowledge-sharing and workshops to expand girls' access to STEM education. By supporting UNICEF in its makerspace efforts in Telangana and Karnataka, the Micron Foundation will help create a customized design of low-cost makerspaces, enabling UNICEF to reach 20,000+ students in the two states by March 2025.

UNICEF will also enhance their Passport to Earning (P2E) platform, allowing girls and other marginalized groups in India to expand their

access to key 21st-century skills, helping to ready them for success in the modern world. The Micron Foundation's funding will help UNICEF increase P2E's outreach to vulnerable groups in India, in part by translating and contextualizing courses into additional languages to help expand access to traditionally underserved youth.

The partnership announced today bolsters Micron's long-term commitments in India. The company and the Micron Foundation both aim to deepen their community impact as Micron's operational footprint in India continues to grow, following the June 2023 announcement of Micron's plans to build India's first semiconductor assembly and test facility for memory and storage with an initial investment of $800 million.

"UNICEF's work will help to provide access to STEM and 21st-century skills for vulnerable children and youth, especially girls, and encourage them to pursue STEM education and careers," said Micron Technology President and CEO, and Chairman of the Micron Foundation, Sanjay Mehrotra. "Micron's innovations touch the lives of nearly every human being on the planet, and we feel a sense of responsibility to invest in our people and our communities."

"UNICEF works to improve education opportunities in India, and Micron's partnership with them exemplifies our commitment to long-term impact in the communities where we live and work," said Micron Managing Director in India Anand Ramamoorthy.

"Young people have highlighted in several consultations how 21st-century skills are critical for their future," said Chief of YuWaah (Generation Unlimited in India) at UNICEF Dhuwarakha Sriram. "Together with Micron, UNICEF is harnessing the power of technology and forging public-private-youth partnerships to strengthen the skilling ecosystem for young people to realize their full potential. Our partnership marks a pivotal step towards equipping young people, particularly the most marginalized and girls, with access to 21st-century skills and learning pathways through the Passport to Earning (P2E) initiative. This will also equip them with the knowledge necessary to make informed decisions about their lives and livelihoods."

Expanding access to education and opportunities through additional regional partnerships

In addition to the partnership with UNICEF, over the last several months, the Micron Foundation has invested in other nonprofits across India to expand access to education and critical life skills. These investments include:

Teach For India

With a special focus on Gujarat, the Micron Foundation is supporting Teach For India's efforts to develop a strong pipeline of STEM teachers to ensure students receive the academic foundations and the 21st-century skills required to succeed in the workforce of the future. Our support will allow Teach For India to reach 15,000 students in the 2023 – 2024 school year.

New partnership with UNICEF supports pathways to empowerment for vulnerable young people from Karnataka and Telangana

Udayan Care

The Micron Foundation is working with Udayan Care to support children aging out of childcare institutions and alternative care programs with opportunities and access to resources for skilling and economic empowerment. The program is implemented in Gujarat and Delhi and will directly support over 400 children and vulnerable youth.

SOS Children's Villages of India

The Micron Foundation will support SOS Children's Villages of India in their efforts to provide education sponsorship support for nearly 100 vulnerable children to continue their education and build pathways to economic empowerment.

UN Women

The Micron Foundation supports UN Women's 'WeSTEM' program, which aims to empower women in science, technology, engineering and mathematics. The initiative is focused on motivating and supporting 1,000 young women who are already enrolled in higher or vocational STEM education courses in select tribal areas of Madhya Pradesh, India. The program will enhance their employability skills, especially looking towards jobs of the future, and improve their access to higher education, internships, apprenticeships and decent job opportunities in STEM industries.

Providing equitable opportunities and enriching the communities where Micron's team members live and work are priorities of the Micron Foundation. These partnerships and other investments help increase and improve access to STEM education and opportunities for historically underrepresented and vulnerable groups.

IIT Guwahati's Waste Management Research Group: Architects of Sustainable Solutions for a Greener Tomorrow

Researchers from the Waste Management Research Group (WMRG) at Indian Institute of Technology, Guwahati led by Prof. Ajay S. Kalamdhad have developed a new approach to assist the municipal corporations to manage organic waste. The novel two-stage biodegradation technique combines Rotary Drum Composting with Vermicomposting (RDVC), resulting in an efficient and environmentally friendly process and enables municipal corporations to derive value-added products from organic waste. This technique was also used to produce nutrient-rich soil conditioner from invasive aquatic weeds like the Water hyacinth.

Municipal solid waste deposited in open dumpsites often contains over 50% organic material, generating substantial heat due to long-term decomposition. This not only poses environmental challenges but also hinders the achievement of sustainable development goals. Compared to other waste biodegradation techniques that require 2-3 months, Rotary Drum Composting (RDC) can convert diverse organic feedstocks into nutrient-dense compost within just 20 days and significantly reduce the municipal waste volume by 60-70%. However, the limitation of RDC is inferior compost quality. Vermicomposting is a superior biodegradation process that traditionally requires a minimum of 60 days, making the process less adaptable for urban municipal corporations.

Clubbing the benefits of both these processes WMRG, IIT Guwahati has developed a unique strategy of two-stage biodegradation. Speaking about the novel technique Prof. Ajay S. Kalamdhad, Department of Civil Engineering, IIT Guwahati said," We optimized the Rotary Drum Composting technique and combined it with vermicomposting to reduce the duration of biodegradation. The earthworms, Eisenia fetida, can acclimatise faster to partially degraded organic matter from the drum compost and produce vermicompost in just 27 days."

The microbial composition of the compost was identified with metagenomic analysis. The final product was proven to be non-toxic and safe to be used as a nutrient-rich soil conditioner from waste (4.2% total nitrogen).

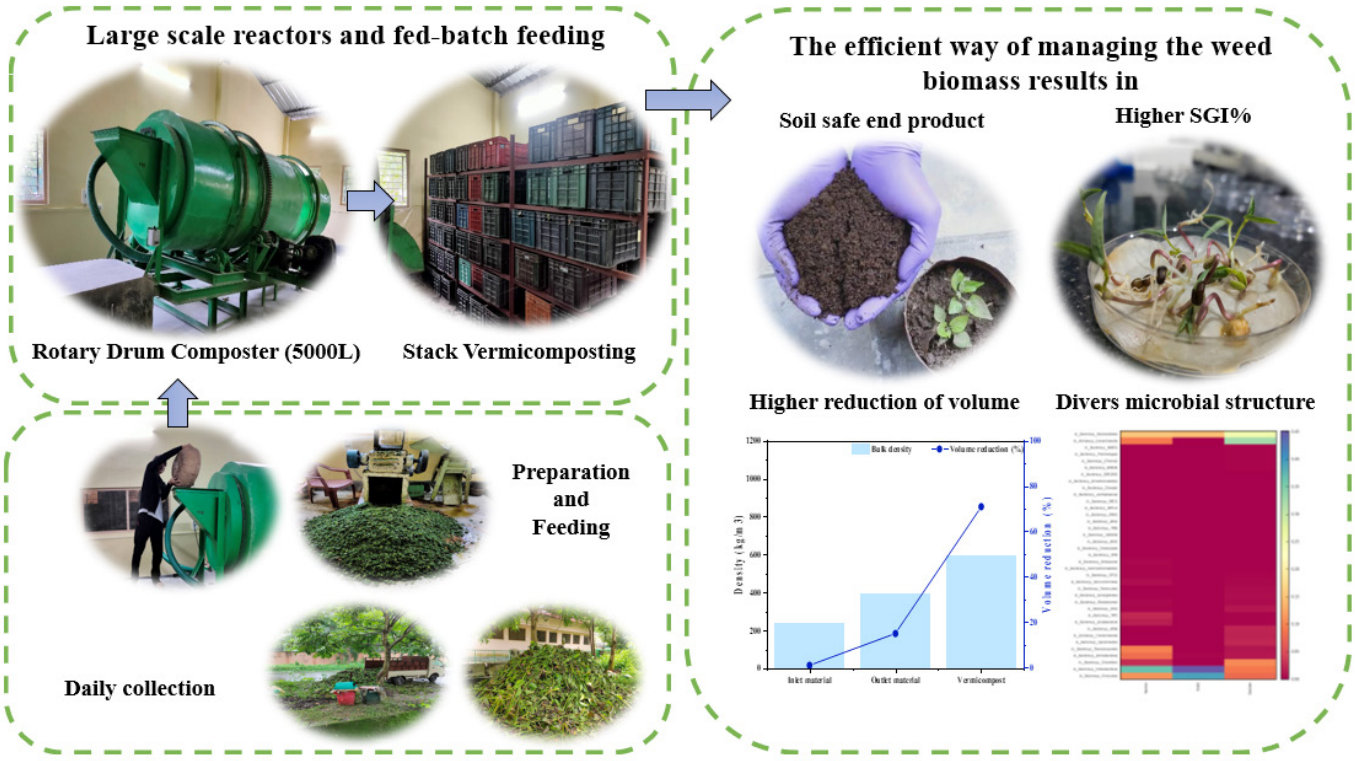
The experimental verification of this combined technique was conducted both in the laboratory

Mr Suryateja Pottipati, Prof Ajay S Kalamdhad

Substrate Preperation

Feeding the rotary drum reactor

Earthworms used for Vermicomposting



and on a large scale at the Solid Waste Laboratory of IIT Guwahati. A 5000-litre RDC unit and a 3000-litre stack vermicomposting unit were established to study the large-scale effect of the process, with the moisture content controlled using horticulture waste collected on campus.

Speaking about its application Prof Ajay S. Kalamdhad said, "This proven technique not only handles sizable quantities of organic waste but also offers immediate application feasibility for Municipal Corporations, Industries, Sewage treatment facilities, aquatic weeds and various organic waste management sectors."

The scaled-up process successfully produced 100 to 150 kg of vermicompost within a month from 250 to 300 kg of daily waste fed. The increased earthworm count resulted in the secondary end product being the earthworm itself.

The findings of the study have been published in multiple research papers in Journal of Biomass Conversion and Biorefinery, Journal of Environmental Management, Bioresource Technology and Waste Management among others. They have bee co-authored by Mr Suryateja Pottipati and Prof Ajay S. Kalamdhad

The researchers have developed a novel technology to minimize biodegradation time, yielding vermicompost in 27 days for urban waste management and reduces the waste volume by 71% and producing a nutrient-rich soil conditioner with 4.2% total nitrogen

Application extends to efficiently converting invasive aquatic weeds like Water hyacinth into nutrient-rich soil conditioner

Mati Dhan, a high-quality organic vermicompost produced by the IIT Guwahati researchers by the novel Two-Stage Biodegradation Technique is available in the market and benefiting local farmers

The innovative process introduced by the Waste Management Research Group at IIT Guwahati has the potential to reshape organic waste treatment facilities globally, providing an environmentally compatible solution to mitigate contamination hazards and produce an outstanding soil conditioner.

To reach the end user of the organic bioproducts, this novel two stage composting technology has been transferred to The Apshisht Management and Environmental Research Pvt. Ltd. (AMER technologies), a company based in IIT Guwahati incubation center and the product is being produced on a large scale. The produced product has been marketed as Mati Dhan Organic Vermicompost Fertilizer Manure for Plants on Amazon and INDIAMART.

JSW and Coolbrook ink strategic cooperation agreement for industrial electrification technology to drive decarbonisation

From Left to right: Lauri Peltola, CHief Commercial Officer(COO), Coolbrook. Finland; Joonas Rauramo, CEO, Coolbrook, Finland; PK Murugan, President – JSW Steel Vijayanagar & Salem Works; LR Singh - Chief Operations Officer(COO), JSW Steel Vijayanagar

JSW Group to deploy Coolbrook's RotoDynamic Heater technology across the steel & cement business

JSW Group, India's leading and fastest expanding US$ 23 billion diversified business conglomerate, has entered into a strategic cooperation agreement with Coolbrook, a transformational technology and engineering company headquartered in Finland. This strategic partnership will focus on implementing Coolbrook's RotoDynamic Heater™ (RDH™) Technology at JSW's manufacturing sites at Vijayanagar Works in Karnataka, India, with the primary goal of achieving low-CO2 emissions in steel and cement production.

The partnership between Coolbrook and JSW Group follows Coolbrook's successful completion of the first phase of its large-scale pilot tests for RotoDynamic Technology at the Brightlands Chemelot Campus in the Netherlands in 2023. The tests demonstrated the technology's heat-generating capabilities, surpassing the temperature of 1000°C significantly above the range of conventional resistive heaters, and proving the technology's capability to reach temperatures up to 1700°C—essential for the highest temperatures required in steel production.

The joint initiative encompasses the planning and execution of a commercial demonstration project at the Vijayanagar Works, showcasing RDH™ technology. As part of the agreement, both companies will collaboratively devise a roadmap aimed at achieving low-carbon production, facilitating the phased rollout of RDH™ Technology of JSW Steel & Cement manufacturing processes.

PK Murugan, President – JSW Steel Vijayanagar & Salem Works signed the agreement on behalf of JSW and stated, "JSW Group

has set ambitious sustainability targets of reducing its specific CO2 emissions, aligning with the Sustainable Development Scenario of the International Energy Agency and India's Nationally Determined Contributions. Deployment of RDH™ Technology is expected to have a sizeable impact on the decarbonisation of the Group's manufacturing process. We are happy to onboard Coolbrook as a partner on our journey to reduce CO2 emissions and achieve our climate targets."

Joonas Rauramo, CEO, Coolbrook, said: "Coolbrook's pilot test results have already proven the capabilities of our technology and deployment of RotoDynamic Heater technology in JSW Steel's production will demonstrate the impact of electrification with clean energy in steel manufacturing processes. Our patented electric technology enables significant decarbonization in steel production by reducing the need to burn fossil fuels. We are delighted to welcome JSW Steel to our partner network as a forerunner in the steel industry to start the implementation of Coolbrook's revolutionary technology enabling a Clean New Industrial Era."

RDH™ technology utilises renewable electricity to power high-temperature industrial processes in e.g. steel and cement production, significantly reducing the need to burn fossil fuels. In steel manufacturing, the technology targets the decarbonisation of manufacturing processes in traditional Blast Furnaces and the Direct Reduction of Iron (DRI) based production of iron and steel. This collaboration supports JSW Steel's commitment to accelerating decarbonisation and achieving the company's Net Zero aspirations.

Coolbrook's RDH™ Technology has the potential to reduce global CO2 emissions in heavy industries by 30%, equivalent to more than 2.4 billion tons annually, by replacing the burning of fossil fuels with electrification powered by renewable energy. The technology has two main applications: electrifying and decarbonising high-temperature process heating in the production of e.g., cement, steel and iron, and chemicals, and replacing fossil-fuel-fired steam crackers in petrochemical industry to reach 100% CO2 free olefin production. Both technologies have been successfully tested at Coolbrook's large-scale pilot plant in 2023 and are on track for commercial launch starting in 2024.

About JSW Steel:

- JSW Steel is the flagship business of the diversified, US$ 23 billion JSW Group. As one of India's leading business houses, JSW Group also has interests in energy, infrastructure, cement, paints, sports, and venture capital.
- Over the last three decades, JSW Steel has grown from a single manufacturing unit to become India's leading integrated steel company with a capacity of 29.7 MTPA in India and the USA. Its next phase of growth in India will take its total capacity to 38.5 MTPA by FY25. The Company's manufacturing unit in Vijayanagar, Karnataka is the largest single location steel-producing facility in India with current capacity of 12.5 MTPA.
- JSW Steel has always been at the forefront of research and innovation. It has a strategic collaboration with global leader, JFE Steel of Japan, enabling JSW to access new and state-of-the-art technologies to produce and offer high-value special steel products to its customers. These products are extensively used across industries and applications including construction, infrastructure, automobile, electrical applications, and appliances.
- JSW Steel is widely recognized for its excellence in business and sustainability practices. Some of these recognitions include World Steel Association's Steel Sustainability Champion (consecutively from 2019 to 2023), Leadership Rating (A) in CDP climate change disclosure (2022), Deming Prize for TQM for its facilities at Vijayanagar (2018), and Salem (2019). It was now part of the part of the World Dow Jones Sustainability Index (DJSI) and for Emerging Markets during 2023 and included in the S&P Global's Sustainability Yearbook (consecutively from 2020 to 2023).
- JSW Steel's SEED project has been awarded with "Energy Transition Changemaker" at COP28.
- In December 2023, JSW Steel was ranked 8th among the top 35 world-class steelmakers, according to the 'World-Class Steelmaker Rankings' by World Steel Dynamics (WSD), based on a variety of factors.
- As a responsible corporate citizen, JSW Steel's CO2 emission reduction goals are aligned with India's Climate Change commitments under the Paris Accord.
- JSW Steel aims to reduce its CO2 emissions by 42% from its steel-making operations and achieve net zero CO2 emissions at its subsidiary, JSW Steel Coated Products Ltd by 2030. JSW Steel aims to lead the energy transition by powering steel-making operations entirely by renewable energy by 2030.
- Other sustainability targets include achieving no-net loss in biodiversity at the operating sites by 2030, substantially improving air quality and reducing water consumption in all operations and maintaining Zero Liquid Discharge.
- JSW Steel has emerged as an organisation with a strong cultural foundation. It is certified by Great Places to Work (2021, 2022 and 2023) as well as ranked as one of the Best Employers among Nation Builders (2023).

HDFC ERGO and Genesis Foundation team up to aid 100 underprivileged children with congenital heart disease

HDFC ERGO General Insurance, India's leading non-life insurance company, and Genesis Foundation, a leading NGO that facilitates the medical treatment of underprivileged children born with a congenital heart defect, reached a significant milestone of supporting 100 lesser privileged children across the country. Of the 100 children supported, the partnership has given special attention to 31 critical cases, where immediate attention was required to ensure that these little hearts continued beating.

Since 2018, HDFC ERGO General Insurance and Genesis Foundation have been supporting pediatric cardiac interventions across the country, including for children living in tribal areas, offering healing, hope and a chance of a brighter future.

For instance, amid the COVID pandemic, 3-month-old Nikhil (alias name) was diagnosed with a complex defect - Transposition of Great Arteries with VSD and Pulmonary Stenosis. The child needed to be treated immediately but unfortunately tested COVID positive and the family was quarantined for 2 weeks. Despite the hurdles, Genesis Foundation maintained regular contact and post-quarantine, Nikhil underwent a successful 6-hour open-heart surgery in Coimbatore. In another story, 11-year-old Shalu (alias name), hailing from Bihar, could barely take 10 steps due to her heart defect. With support from the partnership, she was treated for her defect and now, she not only walks and climbs stairs effortlessly but is back in school, enabling her parents to focus on their other three children. Countless stories like Nikhil and Shalu illustrate how collaborative efforts between corporate partners and the trust have given children a chance at life and the pursuit of their dreams.

Congenital Heart Defects are the most common birth defects in India. With timely diagnosis and treatment, most children can live near-normal lives. However, only 25% of the children born with this defect are able to access treatment.

Commenting on this, Parthanil Ghosh, President-Retail Business, HDFC ERGO General Insurance said, "Every year, over 2 lakh children are born with congenital heart defects and approximately one-fifth of them require immediate medical intervention. At HDFC ERGO, we are honoured to join hands with Genesis Foundation, offering a second chance at life for little hearts battling congenital heart diseases. While we wish every child to be healthy and hale, we take pride in supporting those affected by congenital heart ailments and reaching the milestone of 100 surgeries, as part of our commitment to making a positive impact on lives."

Simran Sagar Singh, Operations Director, Genesis Foundation said, "Congenital Heart Defects are the most common birth defects in India. With timely diagnosis and treatment, most children can live near-normal lives. However, only 25% of the children born with this defect are able to access treatment. We have been working to make pediatric cardiac cardiac care services available to families who do not have the financial means to afford the same. We are immensely grateful to our long-standing CSR partner HDFC ERGO General Insurance, who stood by us during these last five years helping us move closer to our mission to Save Little Hearts. Their support has not only helped us save many lives across the country but also instilled hope and faith in families who face the daunting challenges of dealing with a child whose heart is not normal. As the Foundation celebrates this milestone, the focus remains on scaling up efforts to reach every child in need, irrespective of the circumstances."

In FY 2022-23 taking this partnership a step further, HDFC ERGO General Insurance and Genesis Foundation collaboratively conducted congenital heart defect screening camps to proactively reach children in remote areas, including Faridkot, Bathinda and Ramanathapuram, where access to specialised healthcare remains a challenge. Hundreds of children were screened across all the camps and the ones identified for support are being treated with the support of HDFC ERGO, Genesis Foundation and their partner hospitals.

ACC wins the IconSWM-CE Excellence Award for its sustainable co-processing practices

ACC, the cement and building material company of the diversified Adani Group, has been bestowed with 'Excellence Award in Co-processing' at the 13th International Conference on Sustainable Waste Management & Circular Economy (IconSWE-CE) and IPLA Global Forum 2023, acknowledging the Company's remarkable efforts in sustainability.

ACC's Wadi and Chanda units were presented awards, at an event held at K J Somaiya Institute of Management, shedding light on their exemplary efforts in implementing sustainable co-processing practices. The Company's waste management arm – 'Geoclean' offers sustainable waste management solutions to the agricultural, industrial, public,

and municipal sectors. Through co-processing the waste from these sectors, the Company is contributing to a cleaner environment and conserving natural resources through replacement of traditional fuels with alternate fuels & raw materials (AFR). Co-processing ensures recovery of energy and recycling of materials from waste, leaving zero residue.

Ajay Kapur, CEO, Cement Business, said "This recognition highlights our dedication to a substantial change that improves the environmental impact. We are honoured to have received recognition and awards for our efforts in the circular economy. Through our Geoclean platform, we provide the finest possible contribution to the ethical co-processing of garbage for a sustainable future."

ACC continues to prioritize sustainability in its operations, aligning with its commitment to excellence. The accolade not only acknowledges ACC's current achievements but also reinforces its dedication to pioneering sustainable practices in the cement industry.

MSEDCL achieves target of providing power supply to primitive tribes in just twelve days

In a matter of 12 days, the Maharashtra State Electricity Distribution Company Ltd (MSEDCL) has achieved the target of supplying electricity to 2,395 homes of primitive tribes in remote areas of the state.

The initiative was taken under the Pradhan Mantri Janjati Adivasi Nyaya Maha Abhiyan (PM Janman) scheme launched by Prime Minister Narendra Modi for the overall development of tribals in the country. The initiative of MSEDCL has actually succeeded in lighting up a total 2,454 houses of particularly vulnerable tribal groups (PVTG) by the first day of New Year.

Deputy Chief Minister Devendra Fadnavis, who holds the Energy portfolio, had instructed the MSEDCL to prioritize the implementation of the scheme launched under the PM Janman Yojana to provide benefit of all schemes to PVTG.

In a survey available to MSEDCL, it was found that 2,395 houses of primitive tribes in Chandrapur, Nanded, Nashik, Palghar, Raigad, Sindhudurg, Yavatmal and Thane districts were still without electricity supply after 75 years of independence.

"The scheme for PVTG started on November 15, 2023 through various departments in the state. In Maharashtra, 2,395 beneficiaries amongst PVTG who were found to have no electricity supply in the survey, were provided electricity," MSEDCL officials said.

MSEDCL Chairman and Managing Director Lokesh Chandra congratulated the concerned officers and employees for achieving the target in a short time.

In the scheme announced by the Prime Minister, the objective is to provide services in 11 priority areas such as housing, water, electricity, health facilities, skill development, gas connection etc to the tribals.

Tata Power and ICICI Foundation join hands to launch 'GhanVan' tree plantation programme; aim to plant 2.5 lakh indigenous trees in Western Ghats

With the belief that Sustainable Is Attainable, Tata Power, One of India's largest integrated power companies, joined hands with ICICI Foundation, the CSR arm of ICICI Bank and its Group Companies, to launch 'Project GhanVan' - a visionary tree plantation programme aimed at fostering environmental conservation. The formal Memorandum of Understanding (MoU) was signed as a part of the collaboration by senior officials of both the organisations. Over the next three years, the project plans to plant 2.5 lakh indigenous trees across 75 acres of fertile regions in the catchment areas of Tata Power Hydro locations at Bhivpuri, Khopoli and Bhira in Maharashtra, which is part of Western Ghats. This signifies a pivotal step towards a greener and more sustainable future.

As a part of the project, ICICI Foundation will support the initiative by executing plantation activity, installing solar water pumps with drip irrigation facility and maintaining them for a period of three years. It will also undertake special measures like trenching to help protect trees from forest fires. This collaborative effort unfolds in three phases which involves planting 50,000 local indigenous species, including Babul, Tok phal, Kinai, Reshim dhavada, Lakuch, Apta, Pivla Kanchan, Kadilimb, Undi, Kumbha, Bherli mahd, Bhokar selected based on climatic and topography conditions, to be planted on 15 acres. Project GhanVan prioritizes regional biodiversity preservation, leading to habitat conservation for native avifauna diversity. The project employs advanced methods, including using healthy 2-3-year-old saplings, drip irrigation, and rigorous monitoring until viability is established. Special measures are in place to protect against collateral damage such as grazing and forest fires, aiming for an impressive 90% survival rate. Beyond environmental impact, the project also creates employment opportunities for local communities for maintenance of the plantation sites, fostering sustainable development.

Dr. Praveer Sinha, MD & CEO at Tata Power, highlighted the company's focus on sustainability, asserting, "Our 'Sustainable Is Attainable' movement epitomizes our steadfast commitment towards sustainable development. Our century old efforts have made substantial contributions to the conservation of native biodiversity in the Western Ghats. The partnership with the ICICI Foundation for Project GhanVan is a testament to our ongoing commitment to endorse impactful green initiatives, ensuring a positive influence on both the environment and local communities, paving the way for a sustainable future."

Sanjay Datta, President, ICICI Foundation, said, "We are delighted to collaborate with Tata Power to launch 'Project GhanVan', a tree plantation programme, that embodies our collective commitment to a sustainable green future. Over the years, ICICI Foundation, through its various afforestation initiatives, has planted nearly 26 lakh trees across the country. ICICI Foundation is poised to take forward 'Project GhanVan' on the back of its experience from large afforestation and ecological projects in 52 forests and national parks across the country."

Project GhanVan resonates with

Tata Power's 'Tree Mittra' programme, a flagship virtual volunteering initiative by Tata Power, which encourages individuals to adopt, plant, and nurture trees, fostering environmental sustainability. This nationwide plantation drive has garnered participation from employees, families, customers, and stakeholders, resulting in the planting of 6 lakh native trees as part of the afforestation drive as of FY23.

Tata Power is dedicated to conserving biodiversity through multiple approaches that involve safeguarding wildlife and vegetation, as well as raising awareness among employees and local communities. By building waterholes for grassland creatures, studying the biodiversity potential of solar plants, and hosting webinars with specialist groups on subjects like elephant conservation, and river ecology, the organisation is devoted to minimising their environmental impact while also preserving biodiversity. Recently the company also received the prestigious UNDP Mahatma Gandhi Award for Biodiversity which underscores its commitment to sustainability through specific actions and initiatives in biodiversity conservation. ICICI Foundation is committed to protect and nurture the environment to ensure sustenance of future generations. The Foundation's key focus is towards activities for environment and ecology, healthcare, societal development and supporting sustainable livelihoods. It has been implementing several environment projects in the areas of tree plantation, sustainable forests, watershed management, and rainwater harvesting. ICICI Foundation has planted over 26 lakh trees till date. It has carried out interventions in 52 forest reserves by way of creating water bodies, habitat restoration, weed removal and protecting biodiversity.

Chola Finance committed towards uplifting the disabled in rural India

Cholamandalam Investment and Finance Company Limited (Chola), the financial services arm of the Murugappa Group, is committed towards empowering the lives of differently abled individuals.

Two of its initiatives, the financial support for lathe machines for students at WORTH Trust's Technical Training Centre (WTTTC), Trichy, who are physically challenged and have speech and vision impairments, and a vision centre under the Rural Eye Health Project in Aurangabad, Bihar, are intended to highlight the significance of accessibility and inclusivity for the visually impaired community.

Earlier, leprosy was a disease that was feared in India, leaving those who contracted it deformed, disabled, and distraught. As a result, WORTH Trust's Technical Training Centre (WTTTC) was established in Trichy for students with disabilities, providing training in Light Engineering and preparing them for examinations administered by the Government of India's National Council for Vocational Trades (NCVT).

Plasma Waters and Heartfulness Institute to Enable Sustainable Food Security Through New Collaboration Agreement

The Indian subsidiary of US Agri-Tech company Plasma Water Solutions Inc announced a very unique and promising partnership with one of the leading global NGOs of India, The Heartfulness Institute. The two organizations have signed a collaboration agreement to promote the common purpose of enabling food security in the most sustainable manner & introducing the Green Revolution 2.0 from India to the rest of the world.

Plasma Water Solutions' proprietary breakthrough cold-plasma technology converts water from any source, in continuous flow & real-time, to Plasma-ized WaterTM (PW). PW technology is used for seed treatment, crop spray and irrigation to enhance productivity through faster and more efficient germination, accelerated growth, preventing the transmission of plant pathogens and enhancing stress tolerance during the crop cycle.

With over 150+ years of collective experience and expertise in fields ranging from Forestry, Plantation, Plant Bio Technology to Plant Physiology and Environmental Engineering, the Heartyculture Nursery team of Heartfulness Institute has been recognized with multiple awards from the Government of Telangana (Green Kanha and Mayuri Haritha Vanam). Kanha Shantivanam, the world HQ of Heartfulness, has been awarded the Platinum Honour for being 'The Biggest Green Campus' from Indian Green Building Council in 2019. The entity specializes in nurturing native & endangered trees and plants of India too & actively leads various afforestation projects in private/public partnerships.

"The institute has been promoting good practices in agriculture, training farmers in natural solutions and

methods to promote plant health, soil health & water health without harming the environment while enhancing food productivity and farmers' income which is in perfect alignment with the value proposition that Plasma Waters technology offers," said Robert Hardt, President & CEO, Plasma Water Solutions Inc, USA, while expressing his gratitude to the President of Heartfulness Institute, Shri Kamlesh D Patel (Daaji), & the Heartfulness team for the proactive support extended in the last several months. He further said that he sees Heartfulness as a strategic partner in shaping the company's R&D efforts meaningfully in India & spreading the outcome to the rest of the world.

Different teams at Kanha Shantivanam have been testing the effects of Plasma Waters treatment on seeds, disease and plant health for the last several months as this was the first site of the company through Samunnati in India. This 1700-acre campus has been extensively using Plasma Waters sprays on multiple crops, vegetables, fruits, medicinal plants & trees. Applications range from treating 250 Neem trees' dieback issues, 350 Papaya plants' mosaic virus infestation, 74 date palm trees & 22 Pongamia Pinnata trees' infestation to seed treatment & sprays on a wide range of food crops, horticulture, hydroponics and nurseries.

The collaboration agreement states that the joint validation trials of Plasma-ized WaterTM application for Agriculture, R&D activities, Agro-Forestry & other agriculture-related uses will be conducted at a large scale & at multiple centers/nurseries of the Heartfulness Institute. The existing & new use cases will be tested & demonstrated to the farming community, various stakeholders and agriculture value-chain players to benefit the community at large.

The President of Heartfulness Institute, Shri Kamlesh D Patel (Daaji), Guide of Heartfulness and the visionary behind all the Green initiatives of Heartfulness, said, "Our experience with Plasma Waters has been very positive. It has shown significant results in germination, stand quality & disease management. Since this is a natural sustainable solution, Heartfulness would not only use it, recommend it but also meaningfully contribute to the R&D activities of the company in India."

While the core practices of Heartfulness Institute is in training individuals on the refinement of human consciousness through meditative practices, the Institute has been working incessantly towards the cause of education, environment, farming & reskilling at a very large scale under its holistic living principles based on minimum inputs for maximum outputs fundamentals. The goal is to take the least but give back to the environment & community in leaps and bounds. Located in the dry and arid environs of Reddy District, Telangana, on the Deccan Plateau, with fast depleting groundwater and once a dry barren land, this 1700 acre campus in the last 5 years, has undergone transformation in to a lush green place with the plantation of more than 200,000 trees. A sapling nursery with more than 600,000 saplings is acting as a supply for the plantation in the region, while close to 1,000 trees saved and translocated from faraway places resurrected here.

The Heartfulness Institute is a perfect partner for a purpose-driven Agri-Tech company like Plasma Waters and its R&D activities with the focus, patronage & passion for sustainable Green Revolution that is offered here heartfully.

"The diverse platform for demonstration & continuous refinement of the tech that is offered by Heartfulness through opportunities ranging from traditional farming, hydroponics, aeroponics, tissue culture processes, horticulture, floriculture, oil seeds, fruit orchards to agro-forestry & afforestation projects is very exciting & reassuring for our India journey," said, Pragya Kalia, MD, Plasma Water Solutions India Pvt Ltd.

Vamsi Chalagulla, Joint Secretary of Heartfulness and a tech-preneur himself, said, "Under Daaji's guidance, Heartfulness has trained thousands of farmers and farming communities so far on sustainable climate smart agri practices and techniques. Plasma Waters technology fits the offerings well since it is natural and helps the farming community on multiple fronts."

RPG Group pledges to conserve, restore and grow one million trees by 2030 as part of its Mega Plantation drive to be Nature-Positive

Initiative is pledged with 1t.org, a World Economic Forum platform

RPG Group, one of India's leading business conglomerates, has pledged to conserve, restore and grow one million trees by 2030. This initiative is pledged with 1t.org, a Geneva- based World Economic Forum platform that aims to mobilize a global reforestation community to attain the goal of conserving, restoring and growing 1 trillion trees worldwide by 2030.

1t.org is a vital part of the World Economic Forum's work to accelerate nature-based solutions in support of the UN Decade on Ecosystem Restoration (2021-2030).

RPG Group aims to reforest these trees across regions where they operate, including Maharashtra, Gujarat, Tamil Nadu, Telangana, Madhya Pradesh, West Bengal, and Rajasthan. RPG employees across group's various companies will be actively involved in nurturing and growing these trees. The restoration drive will be spearheaded by RPG Foundation, the CSR arm of the conglomerate. The goal is to increase the number of trees in the area and explore ways to bring more advantages to both the community and the environment.

Anant Goenka, Vice Chairman of RPG Group shared, "We are committed to sustainable growth. This tree conservation, restoration and growth drive is a testament to our dedication to environmental conservation and our contribution to the reforestation efforts of the World Economic Forum. It's not merely a pledge to grow a million trees; it's a promise to contribute to a cleaner and greener tomorrow for all."

Radha Goenka, CEO RPG Foundation said, "In keeping with RPG Foundation's longstanding commitment to philanthropy, particularly in addressing authentic community needs, we are proud to announce a strategic alignment of our philanthropic initiatives with RPG's sustainability efforts. Our initiatives have historically been geared towards addressing genuine needs and fostering happier communities."

The choice of conserving and growing trees is a symbolic representation of the group's focus on a green and clean environment. As trees represent life, growth, and interconnectedness, each tree grown becomes a tangible commitment to a brighter, happier, and greener world. Noteworthy is, that RPG Group's brand promise is –'Hello Happiness'. RPG Group's ethos revolves around a nature-positive philosophy, guiding its business decisions to transcend mere profitability. RPG Group's larger focus is to give back to communities and enrich them with happiness.

RPG Group's commitment to a nature-positive approach is demonstrated through concrete actions across Group's diverse business entities. Group's flagship company, CEAT Ltd has the vision to reduce carbon footprint by 50% by 2030. KEC International, Group's Engineering, Procurement, and Construction (EPC) major, has committed to reduce Greenhouse Gas emissions intensity of manufacturing plants by 20% by FY26. Zensar Technologies, a leading technology Solutions Company under RPG umbrella, has targeted to achieve Net Zero GHG emissions by FY 2040. Other RPG Group companies too have set ambitious goals geared towards achieving carbon neutrality, water circularity and creating a green supply chain.

The Group and its companies remain committed to sustainability initiatives and are driving positive environmental change in its endeavour to build a greener future. As a result, the RPG Group has taken up several shared commitments to Sustainability in line with the UNSDGs encompassing goals such as Circular Economy by aiming to minimize waste and ensuring zero waste to landfill, Water Management by aiming to become water positive, adoption of Energy Efficiency and Renewable power to enhance decarbonisation and work towards carbon neutrality.

RPG Group is dedicated to building a more sustainable future for all stakeholders. By implementing these initiatives and continuously innovating, the organization aims to create a positive impact on the environment, its employees, and the communities it serves. The dedication extends beyond meeting industry standards; the aspiration is to surpass them, shaping a future where sustainability remains not just a choice but a way of being.

CSR INDIA UNITED

IIT Guwahati Student Develops Award-Winning and affordable IoT-Enabled Affordable Water Quality Monitoring Device

During award ceremony

Mr. Satyam during the event

Indian Institute of Technology Guwahati (IIT Guwahati) student Satyam, PhD Scholar, Department of Biosciences and Bioengineering, IIT Guwahati, has recently achieved a significant milestone by winning the "Best Product Design" award under the category of Water and Sanitation, at the prestigious Vishwakarma Awards 2023, organized by the Indian Institute of Technology Delhi in partnership with Maker Bhavan Foundation and the WIN Foundation. This competition aimed to identify and support the brightest minds in technology innovation from science and engineering colleges across India. The theme for 2023 was Water & Sanitation, Clean Technology & Smart Mobility. Compared to existing water quality monitoring devices Satyam's device R-SAM-PRO is highly cost effective and integrated with IOT.

Congratulating Satyam, Prof. Sanjukta Patra, Department of Biosciences and Bioengineering, IIT Guwahati, said, "It has been a remarkable journey witnessing Satyam's dedication and innovation in developing the IoT-enabled water monitoring system. His project, a beacon of technological advancement, reflects a deep understanding of the challenges faced in water resource management, particularly in developing nations. The system's affordability, accessibility, and real-time data transmission capabilities are not just a testament to his technical prowess but also his commitment to societal betterment."

The R-SAM-PRO device stood out among numerous entries because it comprehensively addresses critical water and sanitation needs with technological innovation, integrating IoT, multiple sensors, and AI readiness for advanced water quality monitoring. The system's real-time data provision is crucial for environmental conservation and resource management. Its affordability and user-friendly design make it highly accessible, with potential for widespread adoption, especially in resource-limited settings, significantly enhancing water quality monitoring practices.

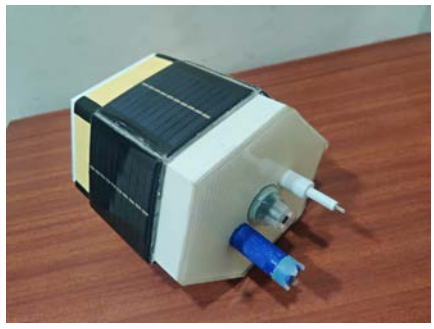
Speaking about his innovation Satyam, PhD Scholar, Department of Biosciences and Bioengineering, IIT Guwahati, said, "Our product's impact on social communities lies in its affordability, accessibility, and real-time data transmission capabilities. By providing a cost-effective, multi-parametric, IoT-enabled solution, we aim to empower communities and

authorities with the tools needed for effective water resource management and remediation. “

He further added, “I was Inspired by the critical issue of water pollution, especially in developing countries. My aim was to empower communities and authorities for effective water resource management”

The key features of this award-winning of the IoT-enabled real-time water monitoring system are :

- **Integrated GPS:** Enables precise location tracking of water quality metrics.
- **Diverse Sensors:** Measures turbidity, Total Dissolved Solids (TDS), oxygen levels, temperature, and pressure for a comprehensive water quality analysis.



Sensor developed by IITG Research Scholar

- **ESP32 Microprocessor:** Powers the device with efficient processing and communication capabilities.
- **Hybrid Power System:** Ensures adaptability to different environments, reducing reliance on a single power source.
- **AI Integration:** Designed to incorporate artificial intelligence, enhancing data analysis and predictive capabilities.
- **Advanced Data Retrieval:** Streamlines access to collected data for user-friendly interactions with various stakeholders.

Speaking about the project's future prospects, the innovators stated, “Over the next 1 to 7 months, our goals are to enhance our device by integrating more sensors, ensuring market readiness with necessary certifications and approvals. We envision expanding our impact by reaching a broader audience and contributing significantly to sustainable water resource management on a global scale.”

Games24x7 Foundation Unveils 'Wheels of Change' on National Girl Child Day

Games24x7 Foundation, the non-profit arm of Games24x7, one of India's largest online skill gaming company, is reshaping the landscape of education for underprivileged girls with the launch of 'Wheels of Change' on National Girl Child Day. A response to the staggering challenge of over 5.5 Lakh out-of-school girls in India1, this initiative addresses the prevalent issue of distance acting as a deterrent for girl students, often a decisive factor in their unfortunate dropout.

In unveiling the 'Wheels of Change' initiative, Bhavin Pandya, Co-Founder and Co-CEO of Games24x7, declared, "The Games24x7 Foundation passionately commits to dismantling barriers faced by aspiring girl students in an effort to promote education for all in our country. A small step towards this large endeavour is taken in the distant towns of Dharashiv, Maharashtra of ensuring access to high school education for girl students. At the Games24x7 Foundation, our vision is to empower the youth, catalysing lasting impact for future generations. Through the 'Wheels of Change' initiative, we aim to empower a cultural transformation, fostering a society where learning and aspiration know no bounds. This endeavour is fueled by the unwavering support of the Ministry of Public Health and Family Welfare, Government of Maharashtra, propelling our mission to build an inclusive and progressive future.”

Maharashtra's student dropout rates stand at a 10.7% annual rate at the secondary level (national average 12.6%) in 2021-2022. However, in five districts, it soars past 15%2. Recognizing this as a barrier to the new National Education Policy's 100% enrolment goal by 2030, Games24x7 Foundation is set to distribute 1000 bicycles in Dharashiv district—specifically Bhoom, Washi, Paranda. The initiative aims to offer a sense of independence, security, and shorter commutes, breaking barriers to education for deserving girls.

The 'Wheels of Change' is Games24x7 Foundation's impactful stride, building on Games24x7's successful ventures in education, hunger, and healthcare. Collaborating with local authorities, the Foundation will host orientation sessions on road safety and will compile data on attendance, punctuality, and educational aspirations, offering valuable insights into the initiative's transformative impact. This marks a pivotal step in the Foundation's mission for building a framework to stimulate impact for generations to come.

Capri Global Capital Ltd. Redefines Rural Women's Development: Impacts Lives of 50,000 Women Across 7 States/Region

Capri Global Capital Ltd., a leading non-banking financial company, is making waves in women's development & upskilling through its transformative CSR initiatives. Allocating an impressive Rs 392 lakhs this fiscal year, the philanthropic arm of Capri Global Capital Ltd. has partnered with renowned social organizations to champion women's development across Maharashtra, Rajasthan, Madhya Pradesh, Chhattisgarh, Assam, Nagaland, and Manipur.

In the financial year 2023-24 alone, Capri's CSR initiative has empowered over 50,000 women, and with an ambitious goal, it aims to reach an additional 2 Lakh women over the next 5 years. The initiative focuses on breaking barriers and creating a more equitable society through accessible and affordable financial services, community-led models, and initiatives that foster economic independence.

Rajesh Sharma, the Managing Director of Capri Global Capital Ltd., emphasizes the imperative of effective collaboration between corporates, government, and civil society to overcome barriers such as limited access to finance, education, resources, and entrenched social norms. He states unequivocally that investing in women's economic empowerment is the key to achieving gender equality, poverty alleviation, and inclusive economic growth. Capri Global's CSR initiative goes beyond rhetoric, manifesting in "Sustainable Agriculture Livelihood" projects across 4 states/region, with a vision to empower approximately 40,000 women farmers. Through regenerative agriculture, nutrition-sensitive practices, and digital technology training, the initiative seeks to ensure higher self-confidence, economic independence, and overall well-being in rural areas.

Capri Global Capital Ltd's Livelihood Initiative focuses on communication, business, and life skills, facilitating better livelihood opportunities and sustainable income enhancement for 7,000 Small Holder Women Farmers (SHWF). The interventions include regenerative & nutrition-sensitive agriculture, livestock management, fruit orchards, and natural resource management (land development & irrigation) along with the broad principles of Agro Ecological Practices.

In parallel, Capri's CSR initiative amplifies its impact by collaborating with local women's cooperatives, creating a ripple effect that not only supports Small Holder Women Farmers (SHWF) but also promotes environmental sustainability. The project aims to increase the use of traditional agricultural practices, seed treatment in a traditional way, and the use of organic fertilizers such as Ghan-Jeevamrut. A homemade combination of cow urine and neem oil is employed to improve soil productivity and induce chemical-free agriculture products, fostering environmental awareness. The horticulture initiative has additionally contributed to improvements in maternal and child health.

Moreover, the initiative includes mentorship programs connecting women entrepreneurs with industry experts, market linkages, fostering a supportive network for skill exchange, and professional growth. Community collectives are established to facilitate knowledge-sharing sessions, empowering women with market trends and modern techniques. The initiative leverages partnerships with vocational training institutes to offer specialized courses, ensuring that women stay abreast of evolving industry standards, further enhancing their economic prospects.

Capri Global Capital Ltd.'s multifaceted approach extends beyond conventional empowerment efforts, intertwining education, technology, mentorship, and environmental sustainability to create a holistic impact on the lives of low-income and underserved rural communities.

By prioritizing the economic, academic, health, and livelihood empowerment of women, children, youth, and under-served marginalized sections of society, Capri Global Capital Ltd. aligns its focus with various Sustainable Development Goals (SDGs), including good health and well-being, quality education, gender equality, decent work and economic growth, and reduced inequality.

Transworld Group and HelpAge India Hold Annual Eye Screening Camp for Cataract Surgeries

Senior citizens benefit from eye camp in Mumbai

Transworld Group collaborated with HelpAge India to host eye screening camps to diagnose cataracts and conduct surgeries for underprivileged senior citizens.

The annual event took at two locations: Chendani Koliwada Thane West; and Gholvad PHC, Bordi Road, Tal Dahanu. Through this initiative, Transworld Group supported 50 cataract surgeries to be held at Bhakti Vedanta Hospital.

Following the surgeries, a comprehensive follow-up will be conducted after 4 weeks to ensure the successful recovery and well-being of the patients. “Providing access to basic medical facilities has been the company’s mission over the years. I am glad that we work with talented team members who understand the value of giving back. Our Transworld Group employee volunteers played a crucial role in managing the registration process and assisting beneficiaries and their families,” said Anisha Ramakrishnan, Director, Transworld Group.

Cab Driver's Son Overcomes Odds with a Rare Double Arm Transplant Through Heartfelt Crowdfunding on Milaap

In yet another success story, a Milaap fundraiser has helped a Delhi cab driver fund for his son's treatment, who met with a life-altering train accident in 2019.The family had initiated a fundraiser to garner support for the boy's medical needs and over the last 4 years an overwhelming generosity from 4700 donors contributed to raise over INR. 90 lakhs. The significant contribution facilitated a successful prosthetic leg surgery, and in a groundbreaking development, a recent transformative double arm transplant. This inspiring journey is a testament to the power of community and goodwill that crowdfunding can have on individuals facing challenging medical circumstances.

In 2019, Devansh, then a class 9 student, lost three of his limbs after a near-fatal train accident. The boy fell down and got stuck to the track at a railway crossing on his way back from school, and was run over by a railway engine. Soon after the accident, his right leg and both the arms had to be amputated. As the effects of sedatives faded away, Devansh was confronted with the harsh reality of his condition, leaving him speechless for days. Vinit and Priyanka, Devansh's parents, were shattered by the sight of their son's predicament.

Shortly thereafter, Devansh received a prosthetic leg to enable his mobility after the amputation. At that point, the doctors suggested he undergoes an arm transplant only once he turns 18 years of age. After a prolonged wait for a suitable donor and adequate funds for the surgery, Devansh successfully underwent a double arm transplant at the start of this month. He is now on the path to recovery—gratitude owed to the generous donors on Milaap who played a crucial role. The funds not only covered the surgical expenses but also supported him through years of medication, nutrition, and prosthetics since the unfortunate incident.

Devansh after surgery

Devansh's mother expressed heartfelt gratitude to everyone who played a vital role in her son's journey. "After years of anticipation following the tragic train accident, my son has successfully undergone the transplant at the beginning of this new year. I am deeply thankful to Milaap and all the donors who provided financial support to make the surgery possible for my son and our family. I would also like to appeal to people to continue helping each other, ensuring that nobody is left in pain."

Milaap plays a pivotal role in funding healthcare crises for both children and adults across India. The crowdfunding platform has been instrumental in financially enabling individuals and families facing high costs for medical ailments such as cancer, organ transplantation, accidents, etc. The platform works to ensure the online giving ecosystem is easy and transparent, thereby earning trust of donors and beneficiaries alike. As the world shifts toward online giving as the primary way to help others, Milaap is proud to lead the way.

If you know someone who is in need of financial assistance, start your fundraiser today.

About Milaap:

Milaap is India's largest crowdfunding platform for personal and social causes, especially healthcare and related needs. The platform enables anyone in need to raise funds for causes typically outside a common person's financial ability such as tertiary healthcare including cancer care, organ transplants and accidents, or for education and community-related causes.

Milaap's community of donors come from over 130 countries across the world and have contributed over INR Rs. 2400 Crores for 899,000+ projects across India. Over the last 13 years, Milaap has become the preferred platform for people to raise and contribute funds towards their cherished causes in India.

EESL celebrates 9 years of transforming India's lighting industry, with UJALA and SLNP, The LED program launched by Hon'ble Prime Minister in 2015

Energy Efficiency Services Limited (EESL), a joint venture of Public Sector Undertakings under the administration of Ministry of Power commemorates the 9th anniversary of its flagship programmes, Unnat Jyoti by Affordable LEDs for All (UJALA) and Streetlighting National Programme (SLNP) launched by Prime Minister Shri Narender Modi on 5 January 2015.

Over the past nine years, EESL has been a catalyst in revolutionizing India's lighting industry, distributing over 36.86 crores LED bulbs, 72.18 lakh tube lights, and 23.59 lakh energy-efficient fans under UJALA. Additionally, 1.30 crore LED streetlights have been deployed in Urban Local Bodies (ULBs) and Gram Panchayats across the nation, resulting in remarkable energy savings of 57.17 billion kWh per year, and GHG emission reduction of 45.33 million t CO2 per year.

Reaffirming its dedication to sustainable energy solutions and conservation, the company is introducing advanced technologies to broaden its impact. This initiative encompasses the deployment of 1 crore energy-efficient BLDC Fans, 2 lacs emergency/invertor LED Bulbs, and 20 Lakh induction cookstoves. Distinguished by Brushless Direct Current (BLDC) motors, these fans utilize an innovative brushless DC motor, boasting a 2.5-year warranty and delivering high performance even at low voltage. Recognized for their unparalleled quality, these fans excel in both durability and energy efficiency, positioning them as a superior choice for sustainable cooling solutions. With the distribution of 1 crore BLDC fans, EESL aims to reduce CO2 emissions by 1485675 TCo2 per annum and enable energy savings of 225 MW.

Similarly, EESL's 10W emergency inverter bulbs are tailor-made to provide illumination during power failures or disruptions. These bulbs seamlessly combine energy efficiency, durability, and emergency functionality, catering to diverse settings, including institutional environments. With an automatic switch to battery power during power outages, these bulbs ensure uninterrupted lighting for up to 4 hours. Furthermore, EESL's induction cookstoves present a 25-30% cost advantage over conventional methods. By deploying 20 Lakh Induction cookstoves across India, EESL seeks to reduce the environmental and health impact of traditional cooking methods.

Celebrating the success of both the initiatives, Animesh Mishra, Head (Sales and Public Relations), EESL, said "At EESL, we take immense pride in the transformative journey of revolutionizing India's lighting industry through our pioneering programs, UJALA and SLNP. These initiatives stand as a global exemplar, showcasing how strategic interventions can lead to widespread adoption of energy-efficient lighting solutions. Moving forward, our commitment extends beyond lighting as we venture into energy-efficient appliances. I firmly believe that these appliances, from LED bulbs to ceiling fans, hold tremendous potential in contributing to our nation's decarbonization goal and aim to double the rate of energy efficiency. The adoption of such innovations in every household across India can truly make a significant impact on our journey towards a more sustainable and energy-efficient future."

Over the years, UJALA and SLNP have contributed significantly to the adoption of LED lighting technology. In the next phase of UJALA, the company is strategically transitioning from 9W to 6W LED bulbs as part of its ongoing initiative. EESL has also floated a tender for the distribution of its BLDC Fans, inverter bulbs and induction cookstoves to provide access to energy efficient solutions to every part of the nation. These innovative steps by EESL are propelling energy efficiency in India to unprecedented heights, with the potential to contribute significantly to doubling the rate of energy efficiency by 2030, aligning with the COP28 commitment.

To enhance accessibility, EESL will make energy-efficient products available through various channels, including offline stores and its upcoming EESL e-marketplace. This strategic move aims to broaden consumer reach and promote wider adoption of energy-efficient solutions. As EESL marks this significant milestone, the organization looks forward to continued success in contributing to India's energy efficiency goals. The journey of UJALA and SLNP stands as a testament to the positive impact achievable through innovation, collaboration, and a commitment to sustainability.

ACC's Lifesaving Water Project Transforms Dhakori Village's Agriculture

ACC, the cement and building material company of the diversified Adani Group, has achieved a milestone in its extensive community development efforts by effectively combating water scarcity in Dhakori village of Wani Taluka, Yavatmal District. ACC along with Adani Foundation has enabled sustainable irrigation solutions for the local farmers to improve the overall water conservation efforts in the region. Since lift irrigation schemes (LIS) are one of the most effective solution to provide water for drinking and irrigation, many places are adopting it to solve water crisis in the rural areas.

In fact, the feat that the Company achieved at Dhakori comes on the heels of successful completion of four LIS by ACC's Chanda Cement Works in Usgaon and Paramdoh village over last five years. The LIS initiative undertaken in Dhakori village has not only been a success but has also significantly impacted over 100-acres of arable land. Before this initiative, the village which received an average annual rainfall of 911.34 mm, faced several challenges due to limited water conservation infrastructure. These challenges resulted in crop failures during the kharif season, creating employment challenges for the community.

ACC's implementation of LIS in Dhakori village started with a rapid baseline survey to establish rapport with the primary stakeholders and necessary permissions were obtained for excavation work and electricity supply. The company also adopted advanced lift irrigation technology, which included a detailed GPS survey to determine the shortest path and static level difference. The pumping unit, supply pipeline, protection valves, and

ACC's Lift Irrigation Scheme (LIS) in Dhakori village positively impacts over 100-acres of arable land.

This initiative has directly impacted and benefited the farmers and families in the village.

distribution lines in the field were all designed to ensure efficient water management and irrigation.

While the implementation of LIS has resulted in the irrigation of more than 100-acres of land, over 10 farming families in Dhakori village have directly benefited from this initiative. With the LIS in place, farmers are now able to cultivate a wider variety of crops including cotton, soyabean, red gram, gram (chana), and vegetables throughout the year.

Ajay Kapur, CEO, Cement Business, said. "The successful realization of the Lift Irrigation Scheme in Dhakori village fills us with a sense of accomplishment. This project not only tackles the urgent problem of water scarcity but also enhances the livelihoods of the farming families. The village community can depend on this scheme for assistance during emergencies. The evident improvements in crop diversity, quality, and income stand as proof of the transformative influence of accessible water. ACC's support has played a crucial role in making water accessible to the Dhakori village community."

Water availability stands as the paramount factor influencing the success of any water resource-centric project. Acknowledging its utmost importance, particularly in the context of diminishing groundwater levels that have adverse effects on ecosystems nationwide, ACC and Adani Foundation has embarked on various water resources projects as part of its CSR initiatives. It exemplifies their commitment to addressing critical issues like water scarcity and supporting sustainable development in the communities it operates.

I-STEM to host SAMAVESHA National Event to connect Researchers, Industry & Start-ups with Lab facilities in Bengaluru on 16th Jan 2024

An initiative from Office of Principal Scientific Advisor, this initiative aims to revolutionize research collaboration by providing a platform to provide Research infrastructure & Labs that can be availed by users across India

A Renewable Energy equipment at IIT (BHU) Varanasi, which is enroled under I-STEM Initiative of Office of Principal Scientific Adviser

A Renewable Energy equipment at IIT (BHU) Varanasi, which is enroled under the I-STEM Initiative of the Office of Principal Scientific Adviser

I-STEM (Indian Science, Technology, and Engineering facilities Map), an initiative from the Office of Principal Scientific Advisor, Government of India, is launching a major project called 'Samavesha' to revolutionize research collaboration in India by enhancing accessibility to facilities and labs.

The launch event of 'Samavesha' will be held at IISc, Bengaluru, on 16th January 2024. The project is working towards optimizing resource utilization nationwide. I-STEM is planning to conduct around 50 'Samavesha' across India during 2024.

The project targets connecting researchers with scientific institutes through an online portal. The Researcher or the industry looking to avail advanced scientific equipment can connect with the institution that has the equipment they are looking for and rent it to conduct their experiments, through I-STEM Portal.

The vision of I-STEM is to create a future where one million New-Age researchers, brimming with ideas, are seamlessly connected to a network of 10,000 cutting-edge labs across India. By 2024, I-STEM aims not only to connect individuals to equipment but also to ignite a collaborative ecosystem where start-ups, industries, and academia co-create the next wave of innovation.

This saves the researchers, industry and start-ups the prohibitive capital expenditure of purchasing advanced equipment. At the National level, this prevents duplication of resources in the research institutions.

Highlighting the importance of Samavesha, Dr. Harilal Bhaskar, Chief Operating Officer and National Coordinator, I-STEM, said, "We are thrilled to announce India's research is getting a superpower

I-STEM Skill Development Program on 'Column Chromatograph' underway at Dibrugh University, Assam

– collaboration! Samavesha unlocks the missing ingredient – seamless connections, shared resources, and a nationwide research surge. From hidden labs to groundbreaking landmarks, Samavesha empowers minds, unites forces, and builds a future of collaborative breakthroughs. Join the revolution – register your lab, share your resources, and make history with Samavesha!"

Dr. Harilal Bhaskar added, "The objective is to provide New Age Researchers, start-ups and industries across India with access to advanced, and expensive, research

CeNSE Facility at IISc, Bengaluru, which is available for researchers through I-STEM Initiative for connecting researchers with labs

infrastructure, which would help drive innovation. We envision a future where researchers have unparalleled access to cutting-edge facilities, leading to a surge in research and indigenous product innovation."

The key impact envisaged from Samavesha include

- Increased Indigenous Product Innovation: Collaborative synergy is expected to significantly boost innovation.
- Knowledge Exchange Ecosystem: SAMAVESHA seeks to create a thriving knowledge exchange environment, driving research and development.
- National Advancements: Breaking down access barriers, the event aspires to make India a hub for groundbreaking discoveries and homegrown advancements.

I-STEM looks forward to new institutions and researchers registering and participating in the event. The Existing active users are also encouraged to list equipment, execute FBRs, and share catalogues. Public users and research labs are encouraged to provide feedback during the event to inform future decisions about the I-STEM program.

Maruti Suzuki announces winners of 2nd Cohort of its Incubation Program with IIM Bangalore

Maruti Suzuki India Limited concluded the 2nd Cohort of its 'Incubation Program for Mobility Startups'. The early-stage startups 'Woloo', 'Hala Mobility' and 'SwitchOn' were declared as winners.

They will now get an opportunity to undertake a paid Proof-of-Concept with Maruti Suzuki to co-create solutions using disruptive technologies for actual business use.

The initiative is being undertaken in partnership with Nadathur S. Raghavan Centre for Entrepreneurial Learning (NSRCEL), the startup hub at Indian

Institute of Management Bangalore (IIM-Bangalore).

Applications open for Cohort 3

Incubation Program is now open for applications for the 3rd Cohort. Startups offering innovative solutions in the areas of Green Manufacturing, Mobility/Mobility Infrastructure, Vehicle Technology, Data & AI, and Clean Tech can apply for the program.

STATE OF THE CLIMATE

2023 SMASHES RECORDS FOR SURFACE TEMPERATURE AND OCEAN HEAT

Last year was the warmest since records began in the mid-1800s – and likely for many thousands of years before, writes Zeke Hausfather, Carbon Brief

The year 2023 was the warmest on record for both the world's land and ocean regions. It was also the first year where global average land temperatures exceeded 2°C and the first year in which global ocean temperatures exceeded 1°C relative to pre-industrial levels. *Image: uusc4all, CC BY-SA 3.0, via Flickr.*

It was the first year in which average global temperatures at the surface exceeded 1.5°C above pre-industrial levels in at least one global temperature dataset.

Here, Carbon Brief examines the latest data across the oceans, atmosphere, cryosphere and surface temperature of the planet.

Noteworthy findings from this 2023 review include:

- **Global surface temperatures:** It was the warmest year on record by a large margin – at between 1.34°C and 1.54°C above pre-industrial levels across different temperature datasets.
- **Exceptional monthly temperatures:** Global temperatures set a new record each month between June and December. September smashed the prior record for the month by a "gobsmacking" 0.5°C.
- **Warmest over land:** It was the first year the global average land temperature was more than 2°C above pre-industrial levels.

- **Warmest over oceans:** It was the first year that global average ocean surface temperatures exceeded 1C compared with pre-industrial levels.
- **Ocean heat content:** It was the warmest year on record for ocean heat content, which increased notably between 2022 and 2023.
- **Regional warming:** It was the warmest year on record in 77 countries – including China, Brazil, Austria, Bangladesh, Germany, Greece, Ireland, Japan, Mexico, the Netherlands, South Korea and Ukraine – and in areas where 2.3 billion people live.
- **Unusual warmth:** 2023 was much warmer than scientists estimated it would be at the start of the year and there remain open questions about what precise factors have driven the exceptional warmth. Even El Niño – the usual suspect behind record warm years – does not clearly explain 2023 temperatures.
- **Comparison with climate models:** Observations for 2023 are above the central estimate of climate model projections in the Intergovernmental Panel on Climate Change (IPCC) sixth assessment report, but well within the model range.
- **Warming of the atmosphere:** It was the warmest year in the lower troposphere – the lowest part of the atmosphere. The stratosphere – in the upper atmosphere – is cooling, due in part to heat trapped in the lower atmosphere by greenhouse gases.
- **Sea level rise:** Sea levels reached new record-highs, with notable acceleration over the past three decades.
- **Shrinking glaciers and ice sheets:** Cumulative ice loss from the world's glaciers and from the Greenland ice sheet reached a new record high in 2023, contributing to sea level rise.
- **Greenhouse gases:** Concentrations reached record levels for CO2, methane and nitrous oxide.
- **Sea ice extent:** Arctic sea ice saw its sixth-lowest minimum extent on record, while Antarctic sea ice saw a new record low extent for almost the entire year, much of it by an exceptionally large margin.
- **Looking ahead to 2024:** Carbon Brief predicts that global average surface temperatures in 2024 are most likely to be slightly warmer than 2023 and set a new all-time record. However, large uncertainties remain given how exceptionally and unexpectedly warm 2023 was.

WARMEST YEAR ON RECORD FOR THE EARTH'S SURFACE

Global surface temperatures were exceptionally hot in 2023, exceeding the prior record set in 2016 by between 0.14°C and 0.17°C across different surface temperature datasets. It was unambiguously the warmest year since records began in the mid-1800s.

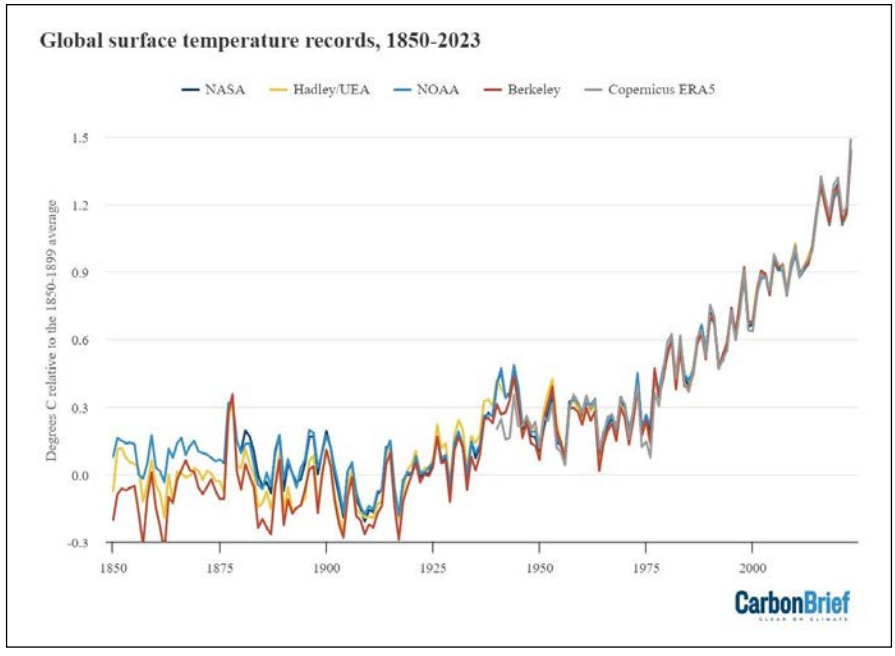
The figure below shows global surface temperature records from five different datasets: NASA; NOAA; the Met Office Hadley Centre/University of East Anglia's (UEA) HadCRUT5; Berkeley Earth; and Copernicus ERA5.

Other surface temperature datasets not shown, including JRA-55, the AIRS satellite data and the Japanese Meteorological Agency, also show 2023 as the warmest year on record.

Global surface temperature records can be calculated back to 1850, though some groups such as NASA GISTEMP choose to start their records in 1880 when more data was available.

Prior to 1850, records exist for some specific regions, but are not sufficiently widespread to calculate global temperatures with high accuracy (though work is ongoing to identify and digitise additional records to extend these further back in time).

These longer surface temperature records are created by combining ship- and buoy-based measurements of ocean sea surface temperatures with temperature readings of the surface air temperature from weath-

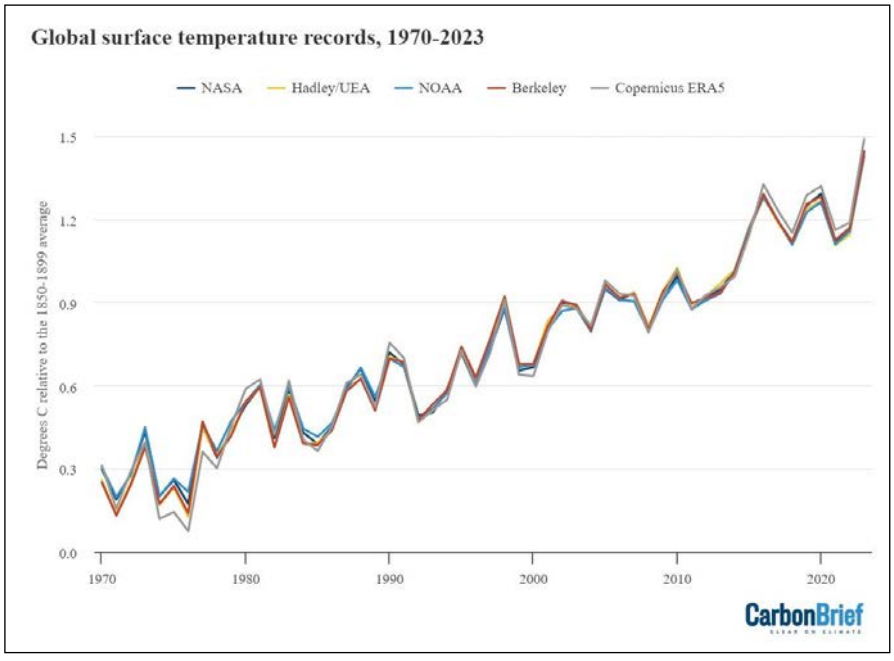


Annual global average surface temperatures over 1850-2023. Data from NASA GISTEMP, NOAA GlobalTemp, Hadley/UEA HadCRUT5, Berkeley Earth and Copernicus ERA5. Temperature records are aligned over the 1981-2010 period and use the average of NOAA, Berkeley and Hadley records to calculate warming relative to the pre-industrial baseline. *Chart by Carbon Brief.*

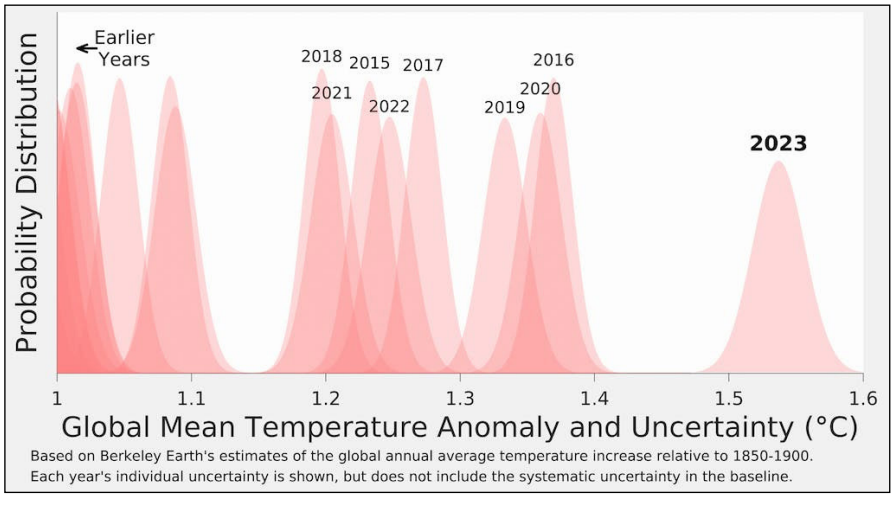
er stations on land. (Copernicus ERA5 and JRA-55 are an exception, as they use weather model-based reanalysis to combine lots of different data sources over time.)

Some differences between temperature records are apparent early in the record, particularly prior to 1900 when observations are more sparse and results are more sensitive to how different groups fill in the gaps between observations. However, there is excellent agreement between the different temperature records for the period since 1970, as shown in the figure below.

Global temperatures in 2023 clearly stand out as much warmer than anything that has come before. This can be seen in the figure below from Berkeley Earth. Each shaded curve represents the annual average temperature for that year. The further that curve is to the right, the warmer it was. The width of each year's curve reflects the uncertainty in the annual temperature values (caused by factors such as changes in measurement techniques and the fact that some parts of the world have fewer measurement locations than others).



Annual global average surface temperatures as in the prior chart, but showing the period from 1970-2023. *Chart by Carbon Brief.*



Global average surface temperatures for each year, relative pre-industrial, with their respective uncertainties (width of the curves) from the Berkeley Earth surface temperature record. Note that warming is shown here relative to the temperature to the 1850-1900 period. *Figure from Berkeley Earth.*

The year 2023 was the warmest on record for both the world's land and ocean regions.

It was also the first year where global average land temperatures exceeded 2°C and the first year in which global ocean temperatures exceeded 1°C relative to pre-industrial levels.

The figure below shows land (red) and ocean (blue) temperatures along with their respective confidence intervals, relative to pre-industrial levels, in the Berkeley Earth surface temperature record.

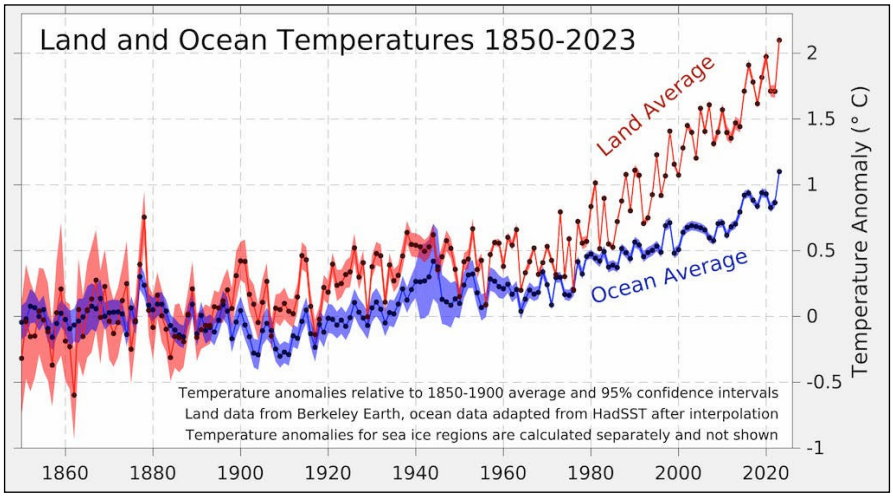
Global land regions – where the global human population lives – has been warming around 70 per cent faster than the oceans – and 40 per cent faster than the global average in the years since 1970.

While 2023 as a whole has been exceptionally warm, it started off a bit cooler, with the first few months of the year failing to set any new records. However, from June onward each month was warmer than the same month in any prior year since records began. September was particularly "gobsmacking", shattering the prior September record by a full 0.5°C.

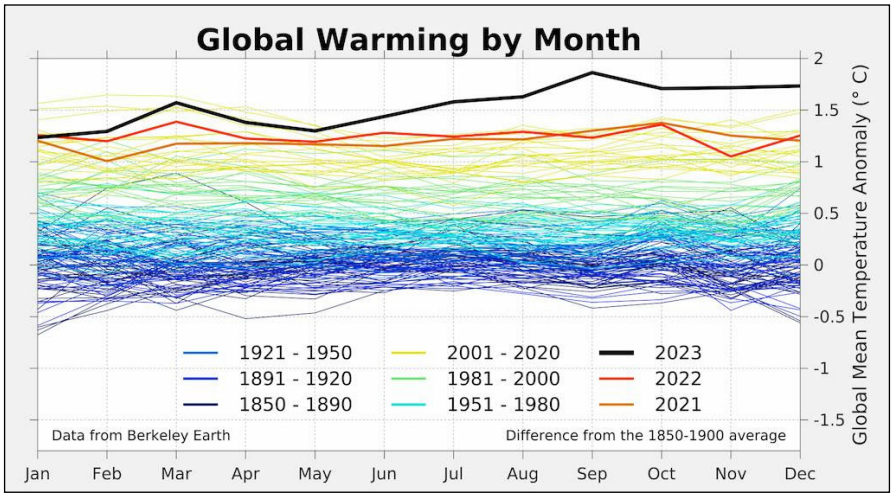
The figure below shows each month of 2023 in black, compared to all prior years since 1850. Each year is coloured based on the decade in which it occurred, with the clear warming over time visible as well as the exceptional margin by which 2023 exceeded past years between July and December.

PUSHING UP AGAINST THE 1.5°C TARGET

In the 2015 Paris Agreement, the world agreed to work to limit global temperatures to well-below 2°C and to pursue efforts to "limit the



Land and ocean temperature rise since the pre-industrial 1850-1900 period. *Figure from Berkeley Earth.*



Monthly global surface temperatures for each year since 1850, with anomalies shown relative to the pre-industrial 1850-1900 period. *Figure from Berkeley Earth.*

Temperature record	2023 temperatures relative to preindustrial
NOAA GlobalTemp	1.34C
NASA GISTEMP	1.39C*
Hadley/UAE HadCRUT5	1.46C
Copernicus/ECMWF	1.48C
Berkeley Earth	1.54C

Global temperature anomalies for 2023 relative to preindustrial temperatures (1850-1899). *Note that GISTEMP uses a 1880-1899 baseline as it does not cover the 1850-1879 period.

temperature increase to 1.5°C above pre-industrial levels".

While the exceedance of these climate targets was not specifically defined in the agreement, it has since been widely interpreted (for example, by the IPCC) as a 20-year average period.

Crucially, the limits refer to long-term warming, rather than an individual year that includes the short-term influence of natural fluctuations in the climate, such as El Niño.

However, a single year exceeding 1.5°C still represents a grim milestone, a sign that the world is quickly approaching the target. And, in the Berkeley Earth dataset, 2023 was the first year above 1.5°C.

It came in a hair's width below 1.5°C in the Copernicus and Hadley datasets, at 1.48°C and 1.46°C, respectively, and was lower on NOAA and NASA datasets as shown in the table below.

As noted earlier, these datasets are nearly identical over the past 50 years. Differences in warming relative to pre-industrial levels emerge earlier in the record, particularly prior to 1900 when observations are more sparse and the choice of how to fill in the gaps between observations has a large impact on the resulting temperature estimate.

The figure below shows how different temperature records look if each is calculated relative to its own pre-industrial baseline, rather than using an average pre-industrial baseline as shown in the prior section. Focusing on warming since pre-industrial – rather than more recent warming – magnifies differences between groups, with the variation in warming across groups largely due to the most uncertain early part of the record.

HIGHEST OCEAN HEAT CONTENT ON RECORD

Last year was the warmest on record for the heat content of the world's oceans. Ocean heat content (OHC) has increased by around 473 zettajoules – a billion trillion joules – since the 1940s. The heat increase in 2023 alone compared to 2021 – about 15 zettajoules – is around 25 times as much as the total energy produced by all human activities on Earth in 2021 (the latest year in which global primary energy statistics are available).

Human-emitted greenhouse gases trap extra heat in the atmosphere. While some of this warms the Earth's surface, the vast majority – around of 93 per cent – goes into the oceans. About two-thirds

of this accumulates in the top 700 metres, but some also ends up in the deep oceans.

The figure below shows annual OHC estimates between 1950 and present for both the upper 700 metres (light blue shading) and 700-2,000 metres (dark blue) of the ocean.

In many ways, OHC represents a much better measure of climate change than global average surface temperatures. It is where most of the extra heat ends up and is much less variable on a year-to-year basis than surface temperatures. It shows a distinct acceleration after 1991, matching the increased rate of greenhouse gas emissions and other radiative forcing elements over the past few decades.

This year saw a substantial update to the OHC dataset provided by the Institute for Atmospheric Physics (IAP) that Carbon Brief features in its State of the Climate reports. The transition from version 3 to version 4 introduced a new quality control system to detect and remove spurious measurements across different instrument types.

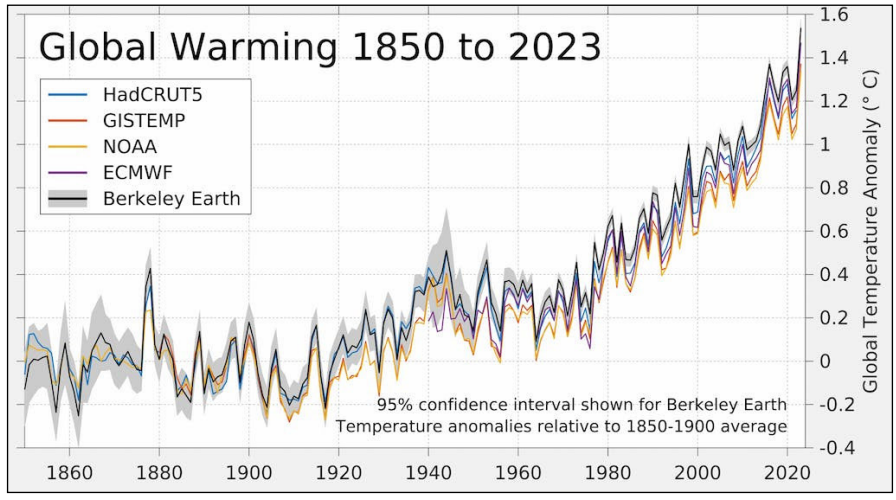
As the figure below highlights, this results in a notable increase in OHC over the past decade (red lines and shading) relative to the prior version of the dataset (black lines).

A YEAR OF CLIMATE EXTREMES

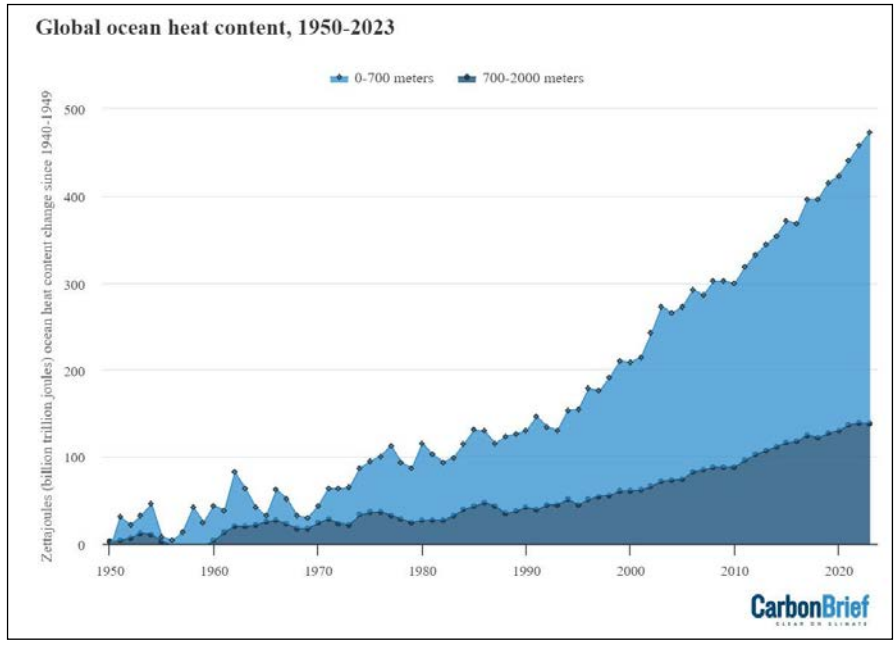
While media coverage of 2023 temperatures has largely focused on the global average, there have been many different regions of the planet experiencing climate extremes.

The figure below shows global temperature anomalies in 2023 across the world, with red areas warmer than the baseline period (1951-80) used by Berkeley Earth and blue areas experiencing cooler temperatures.

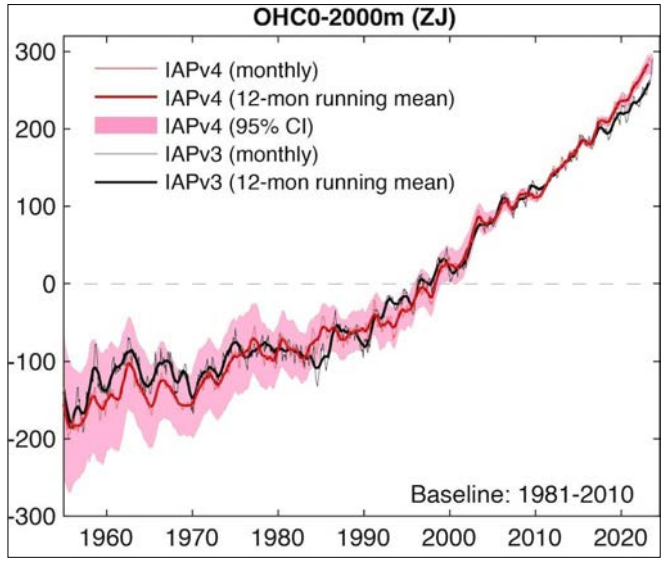
In 2023, 77 countries saw their warmest year on record, including: Afghanistan, Albania, Antigua and



Annual global surface temperatures since 1850, with anomalies shown relative to the pre-industrial 1850-1900 period for each dataset. *Figure from Berkeley Earth.*



Annual global ocean heat content (in zettajoules - billion trillion joules, or 10^21 joules) for the 0-700 metre and 700-2,000 metre layers. Data from Cheng et al. (2024). *Chart by Carbon Brief.*

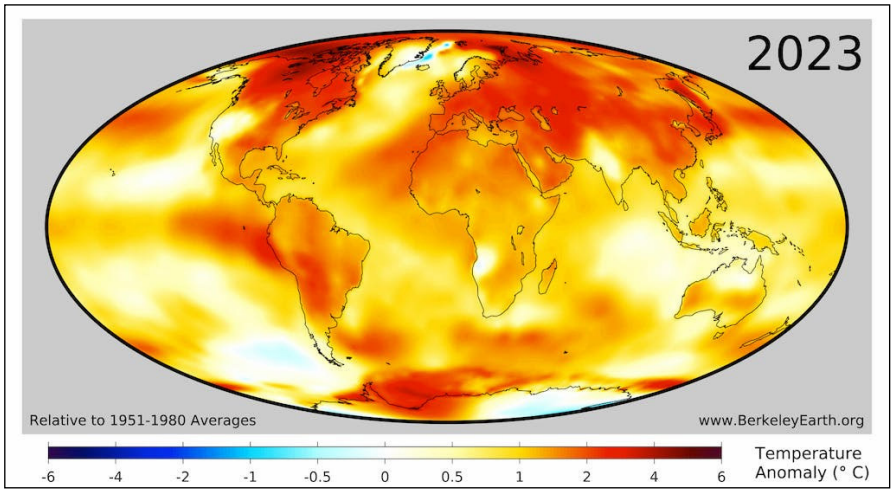


Monthly global ocean heat content (in zettajoules - billion trillion joules, or 10^21 joules) for the 0-2,000 metres for version 3 and version 4 of the IAP dataset. *Figure from Cheng et al. (2024).*

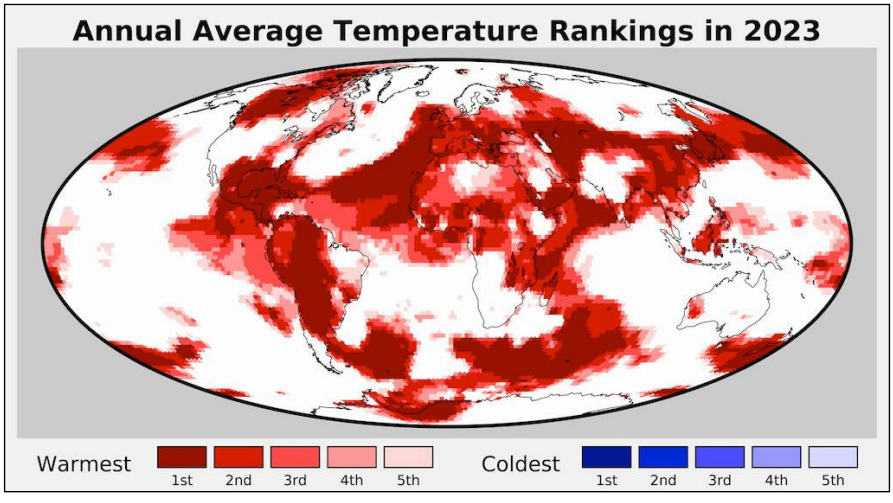
Barbuda, Argentina, Austria, Azerbaijan, Bangladesh, Bhutan, Bolivia, Bosnia and Herzegovina, Brazil, Bulgaria, Cape Verde, Cameroon, China, Comoros, Costa Rica, Croatia, Cuba, Czechia, Dominica, Dominican Republic, Ecuador, El Salvador, Federated States of Micronesia, Gambia, Germany, Greece, Grenada, Guatemala, Guinea, Guyana, Haiti, Honduras, Hungary, Ireland, Ivory Coast, Jamaica, Japan, Kazakhstan, Kiribati, Kosovo, Kyrgyzstan, Liechtenstein, Macedonia, Mexico, Moldova, Montenegro, Morocco, Myanmar, Netherlands, Nicaragua, Nigeria, North Korea, Oman, Panama, Paraguay, Peru, Republic of the Congo, Romania, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, San Marino, Senegal, Serbia, Slovakia, Slovenia, South Korea, Tajikistan, The Bahamas, Trinidad and Tobago, Turkmenistan, Ukraine, Uzbekistan, Venezuela and Yemen.

Approximately 2.3 billion people, or around 29 per cent of Earth's population, live in places that observed their locally warmest year during 2023.

The figure below highlights regions of the planet that experienced their top-five warmest (red shading) or coldest (blue) temperatures on record in 2023. Overall, around 17 per cent of the planet set a new record, including 23 per cent of the land and 14 per cent of the ocean. No location on the planet experienced record cold temperatures (or even top-5 record cold temperatures) for the year as a whole.



Surface temperature anomalies for 2023 from Berkeley Earth. Note that Berkeley uses a 1951-80 baseline to calculate anomalies.



Regions of the world among the five warmest (reds) of five coolest (blues) on record for average annual temperatures in 2023. *Figure from Berkeley Earth.*

EXPLAINING 2023'S UNUSUAL HEAT

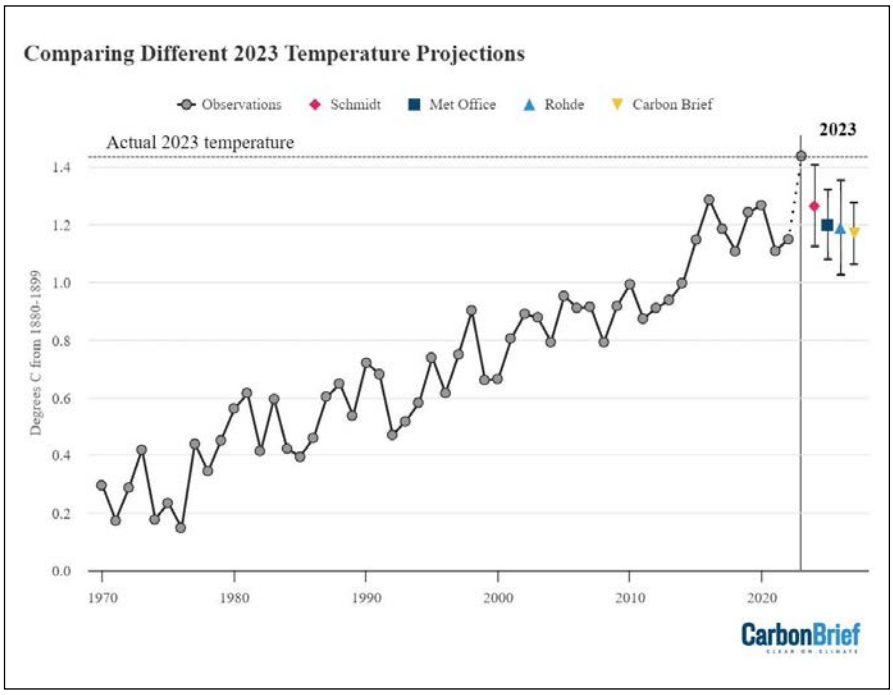
Scientists did not expect 2023 to be all that exceptional at the start of the year. As Carbon Brief reported at the start of 2023, four different groups provided temperature predictions for the year prior to any data being collected – the UK Met Office, NASA's Dr Gavin Schmidt, Berkeley Earth and Carbon Brief's own estimate.

As Carbon Brief noted in January 2023:

"La Niña conditions are expected to persist for at least the first three months of 2023. Because there is a lag of a few months between when El Niño or La Niña conditions peak in the tropical Pacific and their impact on global temperatures, these La Niña conditions will likely have a lingering cooling influence on 2023 temperatures."

Carbon Brief estimated that 2023 was "very likely to be between the third and ninth warmest year on record, with a best estimate of being the fifth warmest on record – similar to 2022", and suggest that if an El Niño develops in latter half of 2023 it would make it likely that 2024 will set a new record.

This estimate, alongside all the other groups predicting 2023 temperatures, was wrong. Not only did 2023 turn out to be the warmest year on record, but it fell well outside the confidence intervals of any of the estimates. And while there are a number of factors that researchers have proposed to explain 2023's exceptional warmth, scientists still lack a clear explanation for why global temperatures were so unexpectedly high.



Temperature predictions for 2023 from the UK Met Office, NASA's Dr Gavin Schmidt, Berkeley Earth and Carbon Brief relative to pre-industrial (1880-99) temperatures. *Chart by Carbon Brief.*

Over the longer-term, human emissions of CO2 and other greenhouse gases alongside planet-cooling aerosols are the main driver of global temperatures. Global temperatures have risen by approximately 1.3°C since pre-industrial times as a result of human activity. However, on top of long-term warming, global temperatures vary year to year by up to 0.2°C.

These variations are primarily driven by El Niño and La Niña events that redistribute heat between the atmosphere and oceans. However, other factors such as volcanic eruptions, the 11-year solar cycle and changes in short-lived climate forcers can influence year-to-year temperature changes.

The figure below, created by Dr Robert Rohde at Berkeley Earth, explores some of the main drivers of temperature change over the past decade.

These include continued accumulation of greenhouse gases, the evolution of El Niña and La Niña, and the 11-year solar cycle. It also includes two new factors that emerged during the decade: the 2022 eruption of the Hunga Tonga volcano and the 2020 phase-out of sulphur in marine fuels. Both of these are estimated to have relatively modest effects at present – less than 0.05C each – but with large scientific uncertainties.

However, both the Tonga eruption and the phase-out of sulphur in marine fuel are problematic explanations of extreme temperatures in 2023.

There is still a vigorous debate in the scientific literature about whether the eruption cooled or warmed the planet based on estimates of both sulphur dioxide and water vapour in the atmosphere, with some papers arguing for warming and others for cooling. Some modelling suggests that the largest impacts of the eruption would be in winter months, which does not match the timing of extreme summer temperatures experienced in 2023.

Similarly, the phase-out of sulphur in marine fuels occurred in 2020. If it had a large climate impact, it would show up in 2021 and 2022 rather than suddenly affecting the record in 2023. While it definitely has had a climate impact – alongside the broader reduction in aerosol emissions over the past three decades – the timing suggests that its likely not the primary driver of 2023 extremes.

Even El Niño – the usual suspect behind record warm years – does not clearly explain 2023 temperatures. Historically global temperatures have lagged around three months behind El Niño conditions in the tropical Pacific; for example, El Niño developed quite similarly in 1997, 2015 and 2023. But it was the following year – 1998 and 2016 – that saw record high temperatures.

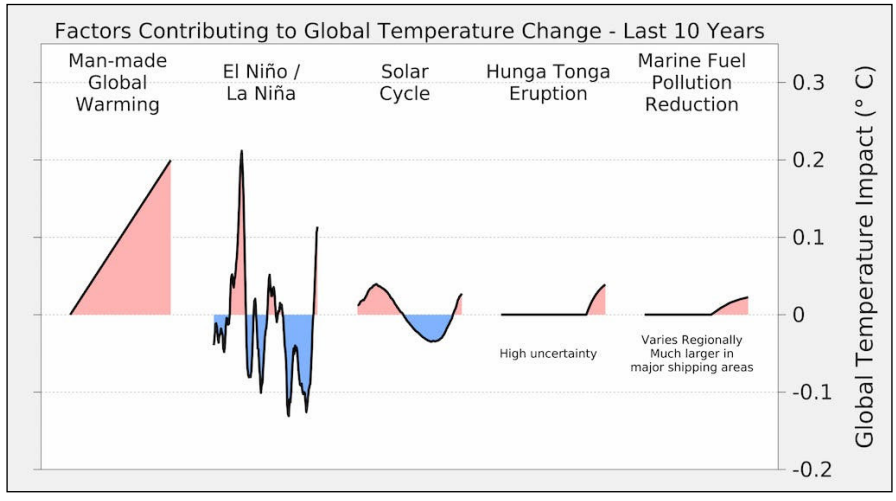
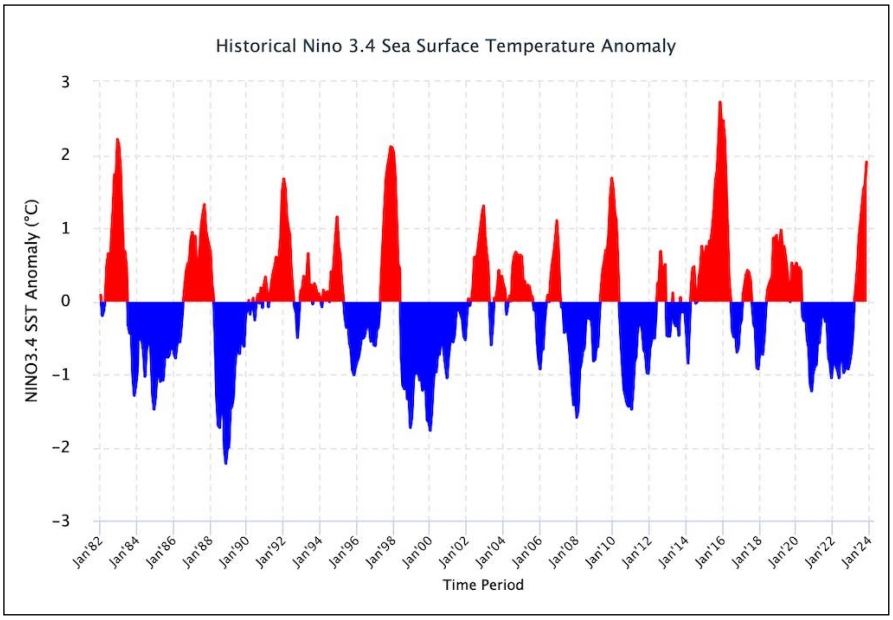
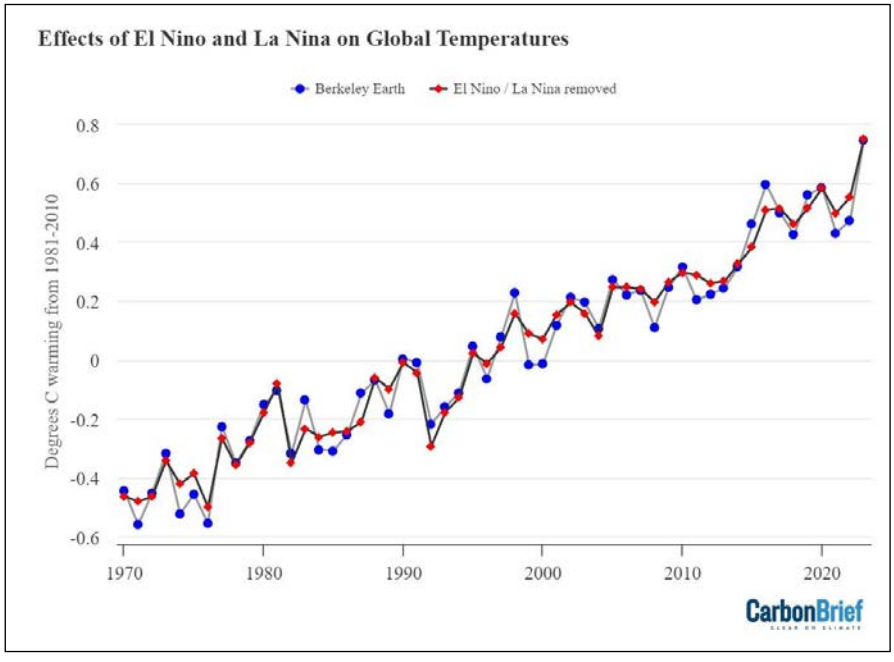


Illustration of contributing factors driving global surface temperatures over the past decade. *Figure from Berkeley Earth.*

The figure below shows the El Niño (red shading) and La Niña (blue) conditions over the past 40 years (collectively referred to as the El Niño-Southern Oscillation, or "ENSO"). While not unprecedented, the extended La Niña conditions since the latter part of 2020 have extended for an unusually long period of time. Carbon Brief has used this historical relationship between ENSO conditions and temperature to effectively remove the effects of El Niño and La Niña events from global temperatures, as shown in the figure below.



Niño3.4 sea surface temperature anomalies relative to the ocean average, for 1982-2023. Deviations below 0.5C and above 0.5C are generally used to determine La Niña and El Niño conditions, respectively. *Figure from International Research Institute (IRI) at Columbia University.*



Annual global average surface temperatures from Berkeley Earth, as well as Carbon Brief's estimate of global temperatures with the effect of El Niño and La Niña (ENSO) events removed using the Foster and Rahmstorf(2011) approach. *Figures are shown relative to a 1981-2010 baseline. Chart by Carbon Brief.*

However, this approach – which has worked well for prior years – indicates that there would be almost no effect of El Niño on temperatures in 2023. This is because the lingering global temperature impact of La Niña conditions on the first half of the year would approximately cancel out the influence of El Niño on the second half. This model would suggest that the current El Niño event would primarily affect 2024 temperatures, analogous to what occurred in 1998 and 2016.

It is possible that this El Niño event is behaving differently and that the rapid switch from a rare and extended triple-dip La Niña event from late 2020 to the start of this year into strong El Niño conditions is resulting in a more rapid global temperature response.

But this remains speculative at this point and researchers are just starting to disentangle the causes of the unexpected extreme global heat the world experienced in 2023.

OBSERVATIONS BROADLY IN-LINE WITH CLIMATE MODEL PROJECTIONS

Climate models provide physics-based estimates of future warming given different assumptions about future emissions, greenhouse gas concentrations and other climate-influencing factors.

Here, Carbon Brief examines a collection of climate models – known as CMIP6 – used in the 2021 science report of the IPCC's sixth assessment. In CMIP6, model estimates of temperatures prior to 2015 are a "hindcast" using known past climate influences, while temperatures projected after 2015 are a "forecast" based on an estimate of how things might change.

Using the CMIP6 ensemble is a bit more challenging than past generations of models because a subset of models have unrealistically high climate sensitivity and poorly reproduce historical observations. Rather

than simply average all the models – as had been done in prior assessments – the IPCC used an approach that effectively weights models by their performance. This means the models align better with the range of climate sensitivity derived from multiple different lines of evidence.

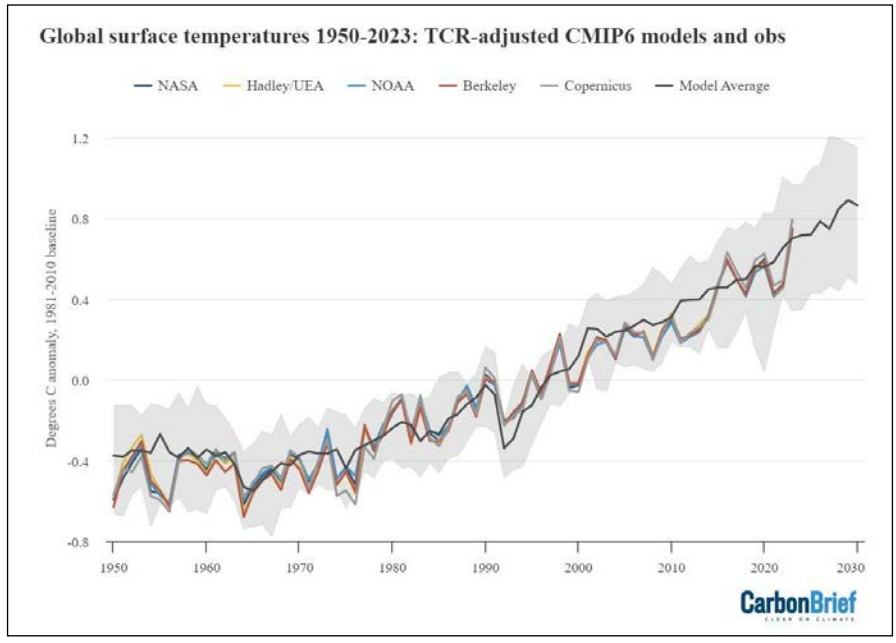
The figure below shows the range of individual CMIP6 model projections since 1950, as well as future projections through to 2100 under the middle-of-the-road SSP2-4.5 emissions scenario.

The black line shows the average of 22 different models whose transient climate response (TCR) falls within the IPCC's "likely" range (which results in temperature projections nearly identical to the IPCC assessed warming). The grey area shows the 95 per cent (two standard deviation) range of the TCR-screened model projections. Observational temperatures are plotted on top of the climate model data, with individual observational records represented by coloured lines.

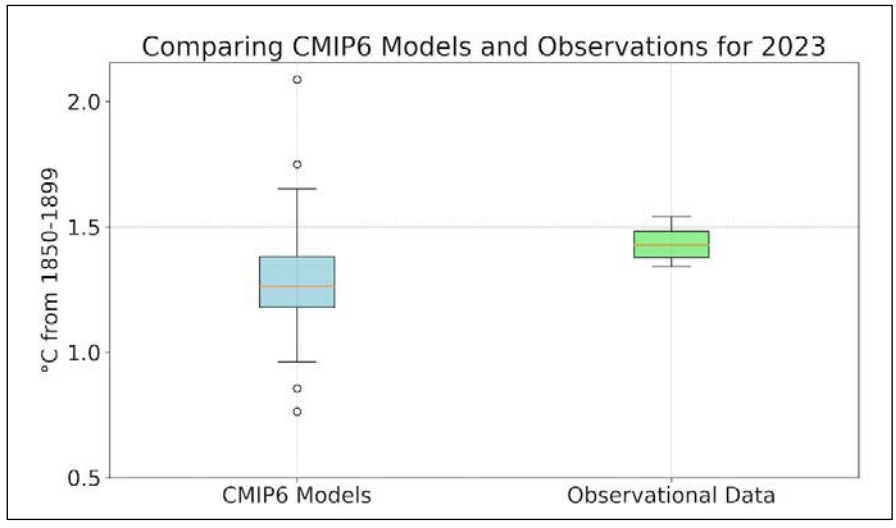
Using the TCR-screened subset, the findings show that 2023 temperatures are above the model average, but still well within the range of climate model projections. While some individual months have approached the upper end of the model range, the year as a whole is less anomalous.

The figure below shows the observed warming since pre-industrial (1850-99) in the five different observational datasets compared with climate model projections. The box plot below shows the 25th to 75th percentile of models and observations with a solid box, while the whiskers show 1.5 times the interquartile range.

Temperatures in 2023, relative to pre-industrial, were in the upper quartile (>75th percentile) of climate models assessed. However, this is not unexpected, as models do not have internal variability such as El Niño or La Niña events that occur



Annual global average surface temperatures from CMIP6 models and observations between 1950 and 2030 (through to 2023 for observations). Models use the SSP2-4.5 scenario after 2015. They are screened to only include those models with a transient climate response (TCR) in-line with the IPCC's "likely" range as discussed in Hausfather et al (2022). Anomalies plotted with respect to a 1981-2010 baseline. *Chart by Carbon Brief.*



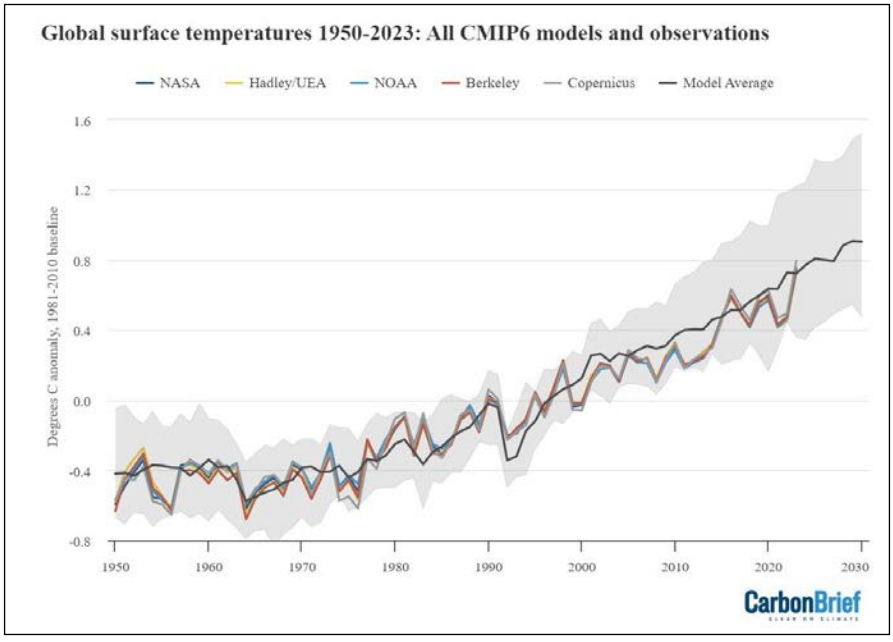
2023 temperatures for both TCR-screened CMIP6 models and observations compared to pre-industrial. Models use the SSP2-4.5 scenario after 2015. *Chart by Carbon Brief.*

at the same time as they do in the real world. (Scientists would expect observations to be on the high end of the model range during El Niño years and on the low end in La Niña years even if climate models were perfectly accurate.)

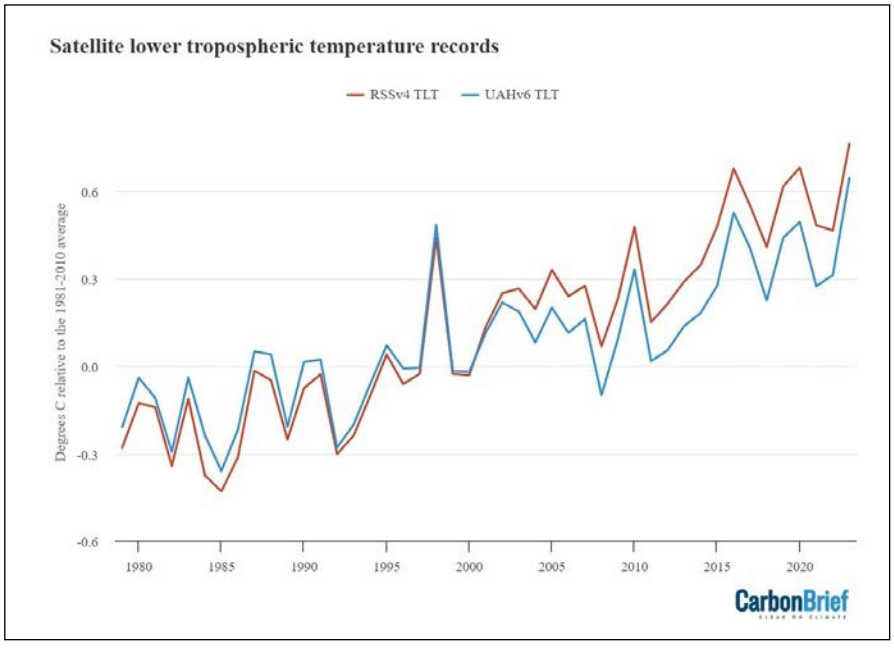
Finally, the figure below shows how observations compare to the full ensemble of 37 CMIP6 models, with no screening for transient climate response. Here, observations are generally below the model average over the past two decades and are roughly equal to the model average in 2023.

RECORD ATMOSPHERIC TEMPERATURES

In addition to surface measurements



Annual global average surface temperatures from CMIP6 models and observations between 1950 and 2030 (through 2023 for observations). Models use the SSP2-4.5 scenario after 2015. Anomalies plotted with respect to a 1981-2010 baseline. *Chart by Carbon Brief.*



Global average lower-troposphere temperatures from RSS version 4 (red) and UAH version 6 (blue) for the period from 1979-2023, relative to a 1981-2010 baseline. *Chart by Carbon Brief.*

over the world's land and oceans, satellite microwave sounding units have been providing estimates of temperatures at various layers of the atmosphere since 1979.

The lowest layer they estimate – the lower troposphere – reflects temperatures a few kilometres above the surface and shows a pattern of warming similar – though not identical – to surface temperature changes. The records produced by Remote Sensing Systems (RSS) and the University of Alabama, Huntsville (UAH) both show 2023 as the warmest year on record in the lower troposphere. The chart below shows the two records – RSS in red and UAH in blue – for the lower troposphere (TLT).

The lower troposphere tends to be influenced more strongly by El Niño and La Niña events than the surface. Therefore, satellite records show correspondingly larger warming or cooling spikes during these events. This is why, for example, 1998 shows up as one of the warmest years in satellites, but not in surface records.

The two lower-tropospheric temperature records show large differences after the early 2000s. RSS shows an overall rate of warming quite similar to surface temperature records, while UAH shows considerably slower warming in recent years than has been observed on the surface. Both have seen large adjustments in recent years that have warmed RSS and cooled UAH compared to prior versions of each record.

Overall, there is more agreement with RSS to other records that include satellite data (such as reanalysis products ERA5 and JRA-55, as well as the shorter AIRS satellite-based surface temperature record), while the UAH record is a bit of an outlier compared to the others.

In addition to a temperature record of the lower troposphere, RSS and UAH also provide measurements of the lower stratosphere – a region of the upper atmosphere around 18km above the surface. The figure below shows lower stratospheric temperature (TLS) records for both RSS (red) and UAH (blue) from 1979 through 2023.

The stratosphere has been cooling for the past few decades in a clear fingerprint of human greenhouse gases, which warm the lower part of the atmosphere by trapping heat while cooling the upper atmosphere as less heat escapes. If other factors – such as changing solar output – were causing climate change, both the stratosphere and troposphere would be warming.

GREENHOUSE GAS CONCENTRATIONS REACH NEW HIGHS

Greenhouse gas concentrations reached a new high in 2023, driven by human emissions from fossil fuels, land use and agriculture.

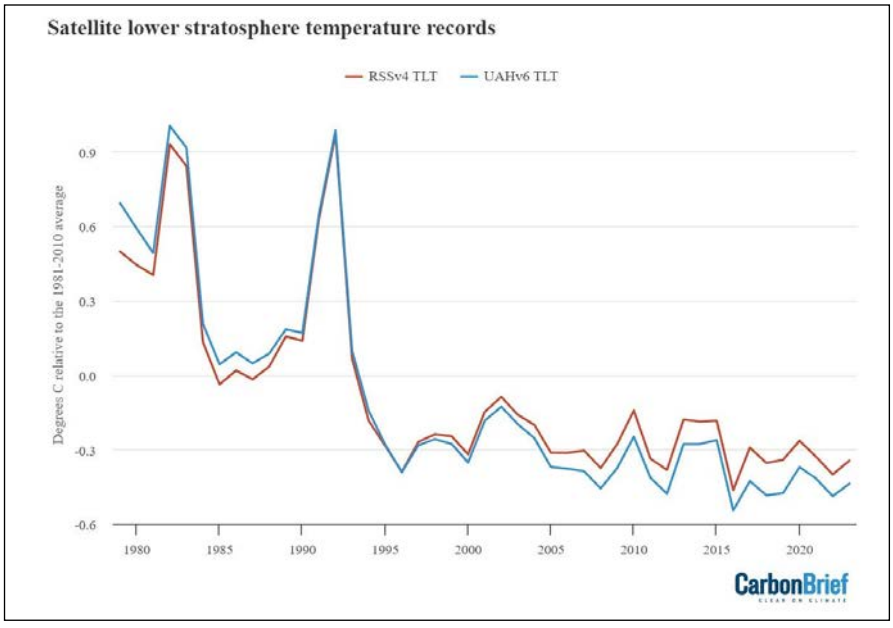
Three greenhouse gases – CO2, methane (CH4) and nitrous oxide (N2O) – are responsible for the bulk of additional heat trapped by human activities. CO2 is by far the largest factor, accounting for roughly 42 per cent of the increase in global surface temperatures since the pre-industrial era (1850-1900).

Methane accounts for 28 per cent, while nitrous oxide accounts for around 5 per cent. The remaining 25 per cent comes from other factors including carbon monoxide, black carbon and halocarbons, such as CFCs.

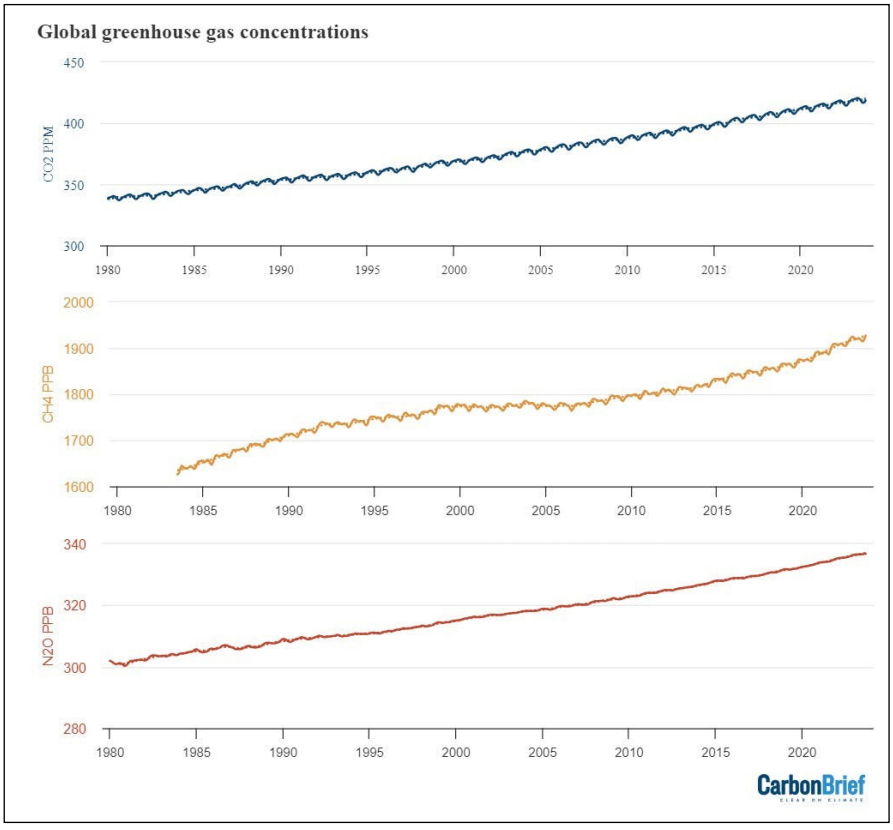
Human emissions of greenhouse gases have increased atmospheric concentrations of CO2, methane and nitrous oxide to their highest levels in at least a few million years – if not longer.

The figure below shows concentrations of these greenhouse gases – in parts per million (ppm) for CO2 (blue line) and parts per billion (ppb) for methane (orange) and nitrous oxide (red) – from the early 1980s through to October 2023 for CO2 and September 2023 for CH4 and N2O (the most recent data currently available).

Methane concentrations, in particular, have seen a sharp rise over the past decade after a plateau in the 2000s. This appears to be driven by both increased emissions from agriculture and fossil fuels, in roughly equal measure. Thawing Arctic permafrost and other sources of methane in high-latitude regions are growing, but emissions above a latitude of 60 degrees north are only around 4 per cent of the total global methane emissions.



Global average lower stratospheric temperatures from RSS version 4 (red) and UAH version 6 (blue) for the period from 1979-2023, relative to a 1981-2010 baseline. *Chart by Carbon Brief.*

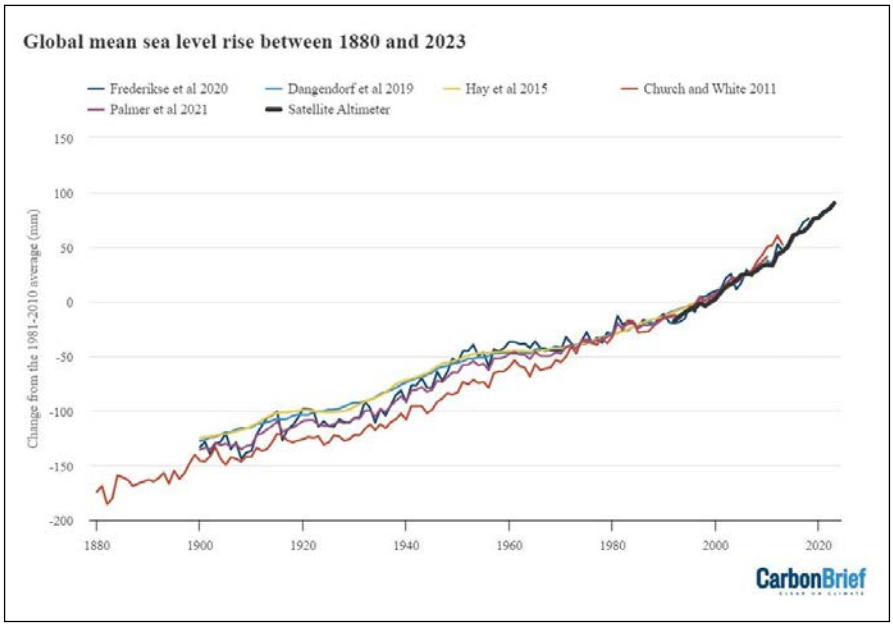


Global concentrations of CO2, methane (CH4) and nitrous oxide (N2O). Based on data from NOAA's Earth Systems Research Laboratory. Note that the y-axes do not start at zero. *Chart by Carbon Brief.*

ACCELERATING SEA LEVEL RISE

Modern-day sea levels have risen to a new high, due to a combination of melting land ice (such as glaciers and ice sheets), the thermal expansion of water as it warms and changes in land water storage.

In recent years, there have been larger contributions to sea level rise from melting ice sheets and glaciers,



Global average sea level rise reconstructed from tide gauge data between 1880 and 2023 from Frederikse et al 2020, Dangendorf et al 2019, Hay et al 2015, Church and White 2011, and Palmer et al 2021. Satellite altimeter data from 1993 (black) to present is taken from the University of Colorado. *Chart by Carbon Brief.*

as warmer temperatures accelerate ice sheet losses in Greenland and Antarctica.

Since the early 1990s, the increase in global sea level has been estimated using altimeter data from satellites. Earlier global sea levels have been reconstructed from a network of global tide gauge measurements. This allows researchers to estimate how sea level has changed since the late 1800s.

The chart below shows five different modern sea level rise datasets (coloured lines), along with satellite altimeter measurements from NASA satellites as assessed by the University of Colorado (in black) after 1993. (As sea level rise data has not yet been released for the whole year, the 2023 value is estimated based on data through October.)

Sea levels have risen by over 0.2 metres (200mm) since 1900. While sea level rise estimates mostly agree in recent decades, larger divergences are evident before 1980. There is also evidence of accelerating sea level rise over the post-1993 period when high-quality satellite altimetry data is available. (See Carbon Brief's explainer on how climate change is accelerating sea level rise.)

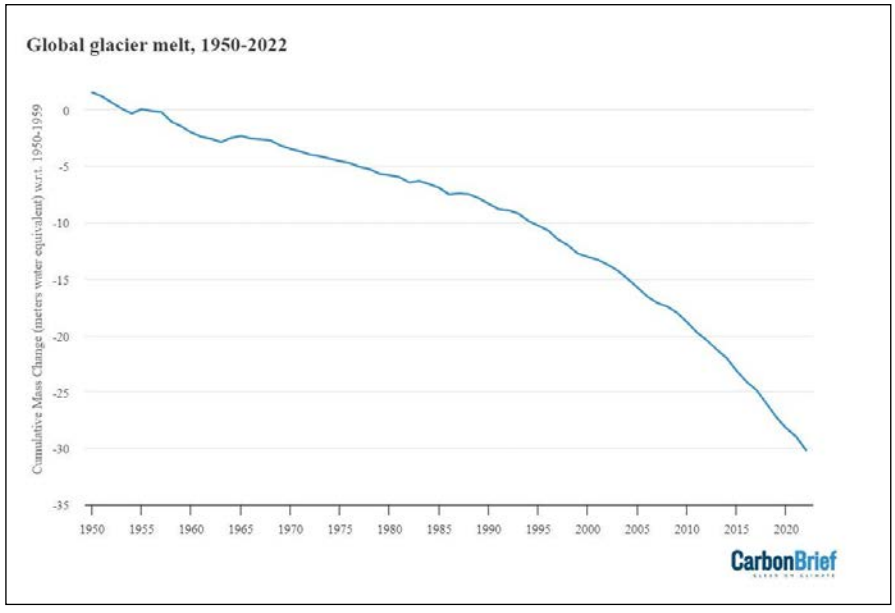
SHRINKING GLACIERS AND ICE SHEETS

A portion of this sea level rise is being driven by melting glaciers on land. Scientists measure the mass of glaciers around the world using a variety of remote-sensing techniques, as well as through GRACE measurements of the Earth's gravitational field. The balance between snow falling on a glacier and ice loss through melting and the breaking off – or "calving" – of icebergs determines if glaciers grow or shrink over time.

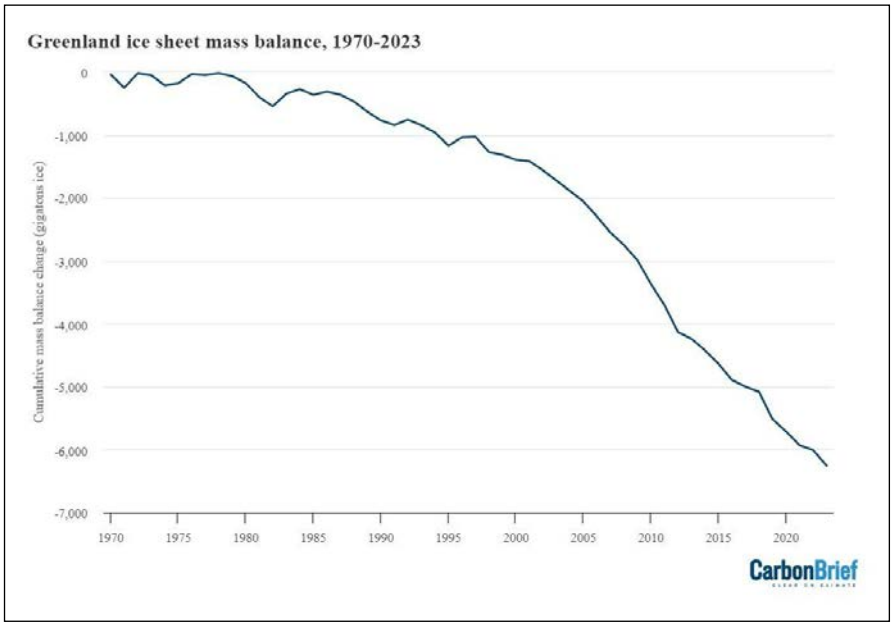
The World Glacier Monitoring Service is an international consortium that tracks 164 different glaciers in 19 different regions around the world. The figure below shows the change in global average glacier mass from 1950 through to the end of 2022 (2023 values are not yet available). Note that glacier melt is reported in metres of water equivalent, which is a measure of how much mass has been lost on average.

Greenland ice sheets have become a larger contributor to sea level rise in recent years due to accelerating loss of mass. The year 2023 was the 27th in a row where Greenland lost ice overall, with 196Gt of ice lost over the 12 months from September 2022 to August 2023. Greenland last saw an annual net gain of ice in 1996.

The figure below shows the cumulative mass balance change – that



Global average glacier melt over the 1950-2022 period from the World Glacier Monitoring Service, in metres of water equivalent. *Carbon Brief.*



Cumulative ice loss from Greenland in billion metric tonnes (gigatonnes) between 1970 and 2023 from Mankoff et al 2021, updated through December 2023. *Chart by Carbon Brief.*

is, the net ice loss – from Greenland between 1970 and October 2021. The different coloured lines indicate estimates from different studies. The authors find that Greenland has lost over 6tn metric tonnes of ice over the past 50 years – more than 700 tonnes lost per person for every person on the planet.

RECORD-LOW ANTARCTIC SEA ICE LEVELS

Arctic sea ice was at the low end of the historical (1979-2010) range for most of 2023, but did not set any new all-time low records apart from a few individual days in February and March. The summer minimum extent – the lowest recorded level for the year – was the sixth-lowest since records began in the late 1970s.

Antarctic sea ice, on the other hand, saw new record low levels for virtually the entire year – except for periods in April, November and December of the year.

Antarctic sea ice was particularly low between June and November, shattering prior records by a substantial margin. While long-term trends in Antarctic sea ice have been ambiguous in the past (unlike in the Arctic where there is a consistent long-term decline), there is increasing evidence that human-driven warming is starting to drive significant loss of sea ice in the region.

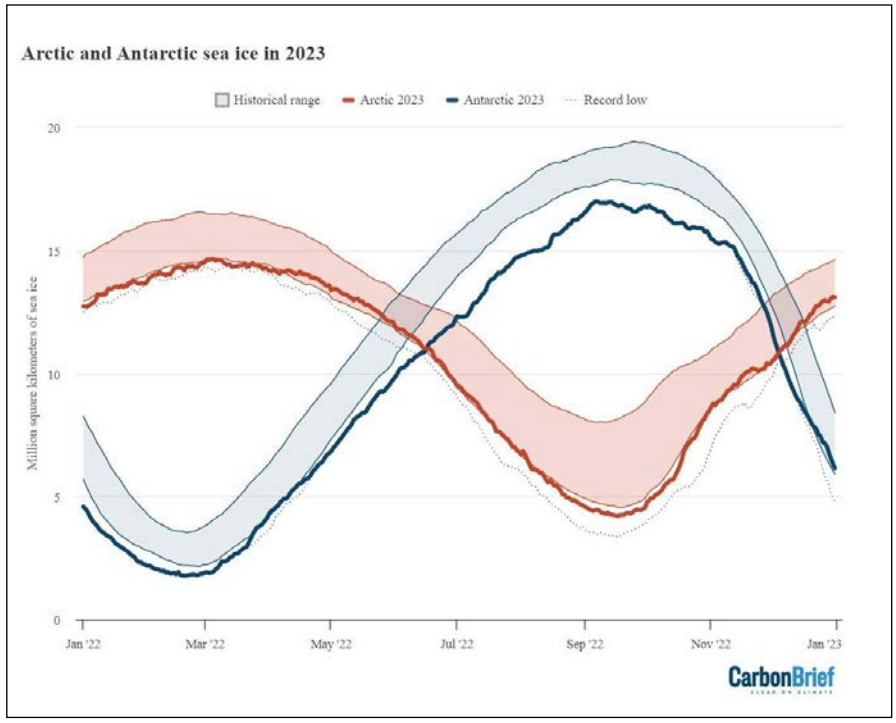
The figure below shows both Arctic (red line) and Antarctic (blue line) sea ice extent for each day of the year, along with how it compares to the historical range (corresponding shading).

LOOKING AHEAD TO 2024

The unusual global temperatures experienced in 2023 makes it more challenging to predict what 2024 might have in store.

If history is any guide here, the year after the development of an El Niño event tends to be considerably warmer than the year in which it develops. For example, strong El Niño events developed over the latter half of both 1997 and 2015 and peaked early the following year, and 1998 and 2016 both set new records by a large margin.

However, 2023 was so exceptionally warm that it suggests that this El Niño might be behaving differently, with global surface temperatures responding more rapidly than in the past. If this is the case,



Arctic and Antarctic daily sea ice extent from the US National Snow and Ice Data Center. The bold lines show daily 2023 values, the shaded area indicates the two standard deviation range in historical values between 1979 and 2010. The dotted black lines show the record lows for each pole. *Chart by Carbon Brief.*

2024 would not necessarily follow the pattern of past El Niño events and is less likely to be substantially warmer than 2023.

There have been four published predictions – from the UK Met Office, NASA's Dr Gavin Schmidt, Berkeley Earth and Carbon Brief (in this article) – of what temperatures might look like in 2024.

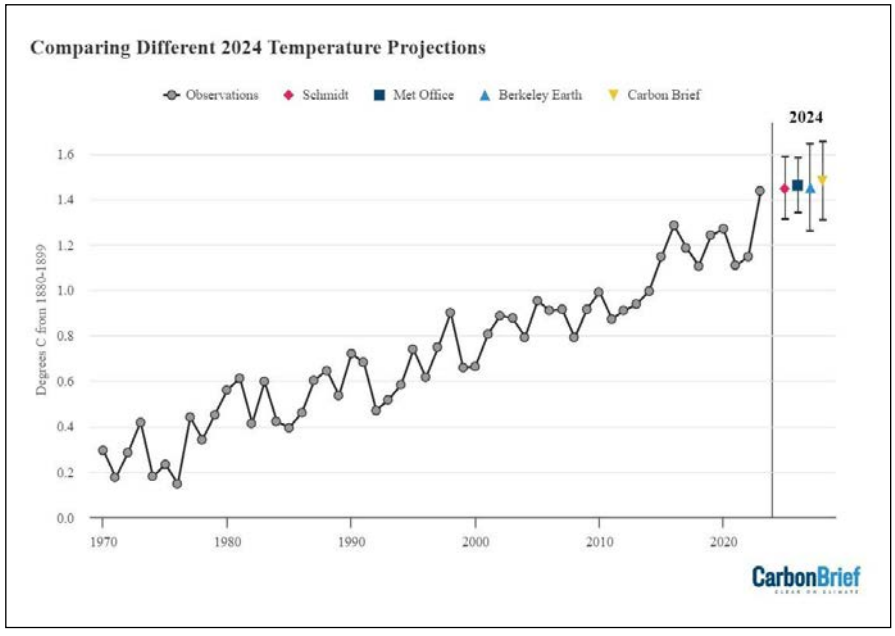
The figure below shows the four different 2024 predictions compared to the average of six different temperature records (NASA, NOAA, Hadley, Berkeley, Copernicus, and the Japanese JRA-55 reanalysis) used by the World Meteorological Organization (WMO). These have been "normalised" to show 2024 warming relative to 2023 in the WMO dataset. This is to remove any differences in predictions due to divergences in the baselines used by different temperature records.

Carbon Brief's prediction of likely 2024 temperatures is based on a statistical model using the year, the average temperature of the past year, and projections of El Niño/La Niña conditions over the first three months to predict the temperatures of the year.

The Met Office, Dr Schmidt, Berkeley Earth and Carbon Brief estimates all have 2024 as more likely than not to be warmer than 2023 – but only by a small margin. In all estimates it is close to a coin flip which will end up as the warmer year.

Against a 1880-99 pre-industrial baseline, the central estimate of all four forecasts is just below 1.5°C of warming, with ranges suggesting that temperatures could top 1.5°C next year.

However, the poor performance by all of these groups in accurately predicting 2023 temperatures mean these should be treated with some caution. Until scientists have a clearer understanding of the drivers of the unusual warmth the world experienced in 2023, it will not be possible to fully predict how temperatures will evolve in 2024 as the current El Niño event peaks and fades away.



Temperature projections for 2024 from the UK Met Office, NASA's Dr Gavin Schmidt, Berkeley Earth, and Carbon Brief, relative to pre-industrial (1880-99) temperatures and compared to the historical average of six different datasets produced by the WMO. *Chart by Carbon Brief.*

Ultimately, what matters for the climate is not the leaderboard of individual years. Rather, it is the long-term upward trend in global temperatures driven by human emissions of greenhouse gases. Until the world reduces emissions down to net-zero, the planet will continue to warm.

As the chart below highlights, if the warming trend over the past 40 years continues, average surface temperatures are likely to pass 1.5°C in the early 2030s and 2°C by around 2060.

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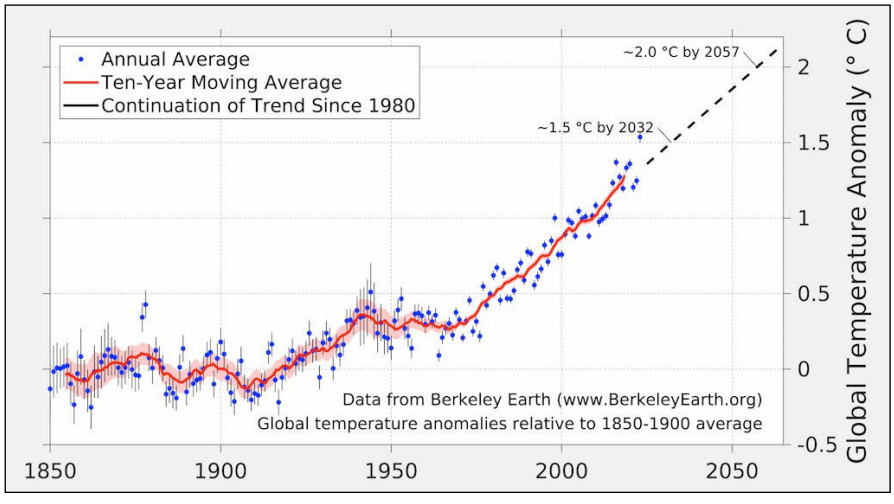
(Source: https://www.eco-business.com/news/state-of-the-climate-2023-smashes-records-for-surface-temperature-and-ocean-heat/)



Expected exceedance years of 1.5°C and 2°C given a continuation of the long-term warming trend. Note that exceedance is defined as the long-term average temperature, rather than any individual year. *Figure from Berkeley Earth.*

Flooding in Kolkata, India. The Global South is disproportionally affected by the catastrophic effects of climate change. *Image: Dibakar Roy via Unsplash*

JUSTICE FOR CLIMATE MIGRANTS

Climate change is expected to displace tens of millions of people by mid-century, especially in the Global South. By enhancing international cooperation, we could improve the lives and livelihoods of the displaced and develop sustainable solutions that enable affected communities to rebuild, state **Sameh Shoukry** and **Amy E. Pope**

In recent years, climate change has emerged as one of the leading drivers of migration. Shifting weather patterns, together with the growing severity and frequency of extreme weather events, have affected millions of people around the world, posing a significant threat to their lives and livelihoods.

In March, the Intergovernmental Panel on Climate Change (IPCC) published its sixth assessment report (AR6), revealing that for every additional 1° Celsius rise in global temperatures, the risk of involuntary displacement due to flooding is expected to increase by roughly 50 per cent. In Sub-Saharan Africa, South Asia, and Latin America, slow-onset climate disasters such as water stress, crop failure, and rising sea levels could displace 31-72 million people by 2050 under a

low-warming scenario. In a high-warming scenario, the number of displaced people could surge to 90-143 million. In Sub-Saharan Africa, flood-related displacement could rise by 200-600 per cent by the 2070s, depending on the rate of population growth and anticipated temperature increases ranging from 1.6°C to 2.6°C.

While the Global South is disproportionally affected by the catastrophic effects of climate change, no part of the world is immune. The climate crisis will have far-reaching implications for global stability, security, and sustainable development, affecting not only migrants' countries of origin but also transit and destination countries.

The COP27 Presidency and the International Organization for Migration (IOM) are committed to addressing the challenge of climate-induced migration with the goal of fostering a more just and equitable world. Over the past year, we have collaborated with governments, civil-society organizations, other UN agencies, and various stakeholders to develop and promote sustainable approaches to climate-related mobility, including displacement.

To reduce the adverse effects of climate change that compel migrants to leave their countries of origin, we advocate the full implementation of the Global Compact for Migration. With the support of the IOM, the COP27 Presidency has highlighted Egyptian programs like the Climate Responses for Sustaining Peace and the Decent Life Initiative as models that could be replicated worldwide. Taken together, these initiatives offer a roadmap for sustainable development, enabling governments to improve living standards and maintain peace in the face of climate-related threats. We have actively promoted these initiatives in various formal and informal forums, including the Global Forum on Migration and Development.

For sure, there is still much work to be done. To address the urgent threat posed by climate change, the international community must support adaptation efforts, particularly in the Global South. Strengthening resilience is crucial to empowering populations to make informed decisions about whether to relocate or remain where they are. Achieving this, however, requires immediate and substantial financing for adaptation initiatives, including the much-anticipated Loss and Damage Fund for developing countries announced at COP27 in Sharm El-Sheikh. Other crucial steps include ensuring the complementarity and accessibility of climate-funding instruments and incorporating human-mobility considerations into climate negotiations.

As we approach COP28, we must focus on climate-related migration and displacement and develop concrete solutions that promote the safety and well-being of affected communities and individuals. This involves supporting the implementation of effective initiatives and the integration of migrants' perspectives and experiences into decision-making processes.

Climate change often exacerbates existing challenges and vulnerabilities, forcing communities to confront compounding crises. Therefore, it is crucial to recognise and address these underlying factors, including conflict, poverty, and inequality. To this end, we must adopt a holistic approach that promotes peace and security, reduces poverty and inequality, and fosters sustainable development.

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Displacement is a complex and daunting challenge that requires a comprehensive, coordinated, and forward-looking response. By enhancing international cooperation, we could significantly improve the lives and livelihoods of those displaced by climate disasters and develop sustainable solutions that enable them to rebuild and contribute to their communities' development. This approach is not only the right thing to do; it is also a crucial step toward building a more peaceful, just, and sustainable future for everyone.

The stakes of the current climate crisis are, or should be, obvious. The Mediterranean region, in particular, is no stranger to devastating environmental changes, as historical evidence suggests that extreme weather events may have triggered mass displacement and led to the downfall of great civilizations during what is now known as the Late Bronze Age Collapse.

To address climate-related displacement effectively, we must first understand and acknowledge the scale and complexity of the challenge. Only then will we recognise the need to engage all relevant stakeholders to develop proactive and sustainable solutions, avert the catastrophic effects of climate change, and build a world that is both prosperous and just.

Sameh Shoukry is COP27 President and Egyptian Minister of Foreign Affairs.

Amy E. Pope is Director-General of the International Organization for Migration.

(SOURCE: https://www.eco-business.com/opinion/justice-for-climate-migrants/)

At COP28, which begins in Dubai at the end of November, countries will debate how to build new ambition under the first Global Stocktake. This will inform the next round of NDCs that countries should submit in 2025, which will have targets for 2035.
Image: World Bank Photo Collection, CC BY-SA 3.0, via Flickr.

GLOBAL WARMING ON COURSE FOR 2.9°C, UN REPORT WARNS

Action continues to fall far short of pledges, even as temperature and greenhouse gas records are repeatedly broken, writes **Catherine Early**

Countries must make far greater efforts to implement their climate strategies this decade to stand a chance of keeping global temperature rise within 1.5°C of the pre-industrial average. Continued delays will only increase the world's reliance on uncertain carbon dioxide removal technologies (CDR), according to the UN Environment Programme (UNEP).

In its latest annual assessment of progress on global climate action, the Emissions Gap Report 2013, UNEP pointed to progress since the Paris Agreement. When it was adopted in 2015, greenhouse gas emissions were projected to rise 16 per cent by 2030. Today, that increase is projected to be 3 per cent.

But from now emissions must fall 28 per cent by 2030 to keep temperature rise to 2°C, or 42 per cent to stay within 1.5°C, and countries are failing to match this need with action, UNEP found.

Current climate policies will result in a rise of 3C this century. The increase will be limited to 2.9°C if countries fully implement their national climate plans (known as Nationally Determined Contributions, or NDCs). This could be kept to 2.5°C if plans by developing countries, which are currently conditional on obtaining financial support, are carried out – since that would result in a 9 per cent fall in emissions.

In UNEP's most optimistic scenario, where all conditional NDCs and net zero pledges are met, limiting temperature rise to 2°C could be achieved, UNEP says. This scenario is considered to give at best a 14 per cent chance of limiting warming to 1.5°C.

Now, 97 countries have pledged to meet net zero emissions, up from 88 last year. Pledges cover 81 per cent of the world's greenhouse gases (GHGs). However, the authors do not consider these pledges to be credible, pointing out that none of the G20 countries are reducing emissions at a pace consistent with their net-zero targets. National net zero plans have several flaws, according to Anne Olhoff, chief scientific editor of the report. Many are not legally binding, or fail to have clear implementation plans, and there is a lack of targets between now and the dates when governments claim to be aiming for net zero, she says.

> **Emissions are still going up in countries that have put forward zero emission pledges. There are many ways to net zero, but at some point you need to peak and reduce. And the longer you wait until you peak, the more difficult it's likely to be to actually get to net zero.**
>
> **–ANNE OLHOFF**
> Chief Scientific Editor, Emissions Gap Report 2022

"But most importantly, emissions are still going up in countries that have put forward zero emission pledges. There are many ways to net zero, but at some point you need to peak and reduce. And the longer you wait until you peak, the more difficult it's likely to be to actually get to net zero," she says.

Under the Paris Agreement, ambition in the NDCs is designed to be ramped up over time. At COP28, which begins in Dubai at the end of November, countries will debate how to build new ambition under the first Global Stocktake. This will inform the next round of NDCs that countries should submit in 2025, which will have targets for 2035.

Countries should focus on implementing existing policies this decade, rather than pledging higher targets for 2030, says Olhoff.

"Whether or not the ambition of the 2030 targets is raised or not is less important than achieving those targets. If countries find that they can also strengthen ambition for 2030, that's an added benefit," she says. The more action taken this decade, the more ambitious countries can be in their new targets for 2035, and the easier it will be to

achieve those targets, she points out. The report states that high-income and high-emitting countries among the G20 should take the most ambitious and rapid action, and provide financial and technical support to developing nations.

However, it adds that low- and middle-income countries already account for more than two-thirds of global greenhouse gas emissions. Development needs in these countries need to be met with economic growth that produces low emissions, such as by reducing energy demand and prioritising clean energy, it says.

"This is an extremely large and diverse group of countries, and the opportunities for low-emissions growth depend a lot on national circumstances," Ohloff says. Proposed reforms to international finance through multilateral development banks should improve access to finance and the ability of developing countries to attract investment. Borrowing often costs a lot more in these countries than in developed ones, she says.

But some countries who suffer from corruption need to "get their own house in order" and improve governance to avoid this, she adds.

The role of carbon removal

The report points out that the world will also need to use carbon dioxide removal (CDR), which the authors see as having a role on three timescales. It can already contribute to lowering net emissions, today.

In the medium term, it can contribute to tackling residual emissions from so-called hard-to-abate sectors, such as aviation and heavy industry.

And in the longer term, CDR could potentially be deployed at a large enough scale to bring about a decline in the global mean temperature. They stress that its use should be in addition to rapid decarbonisation of industry, transport, heat and power systems.

CDR refers to the direct removal of CO2 from the atmosphere and its durable storage in geological, terrestrial or ocean reservoirs, or in products. It is different to carbon capture and storage (CSS), which captures CO2 from emissions at their sources, such as a power station, and transfers it into permanent storage. While some CCS methods share features with CDR, they can never result in CO2 removal from the atmosphere.

Some CDR is already being deployed, mainly through reforestation, afforestation and forest management. However, this is very small scale, with removals estimated at 2 gigatonnes of carbon dioxide equivalent (GtCO2e) annually. Research and development into more novel technologies is increasing, with methods including sequestering carbon in soil; enhanced weathering, which speeds up the natural weathering of rocks to store CO2; and direct air capture and storage (DACC), where CO2 is extracted from the atmosphere.

There are multiple risks associated with scaling up CDR. These include competition with land for food, protection of tenure and rights, as well as public perception. In addition, the technical, economic and political requirements for large-scale deployment may not materialise in time, UNEP says. Some methods are very expensive, particularly DACC, which UNEP estimates at US$800 per tonne of CO2 removed.

Governments have tended not to specify the extent to which they plan to use CDR to achieve their emission-reduction targets, nor the residual emissions they plan to allow annually when achieving net-zero CO2 and greenhouse gas emission targets, UNEP found. Estimates of the implied levels of land-based removals in long-term strategies and net-zero pledges are 2.1-2.9 GtCO2 of removals per year by 2050, though this is based on an incomplete sample of 53 countries, the report notes.

Politicians need to coordinate the development of CDR, the report states. Dr Oliver Geden, lead author of the chapter on CDR, explains that governments need to clarify its role in national and global climate policy, and develop standards for MRV that can eventually be included in national GHG inventories under the UN climate change process.

"At COP28, the [Global Stocktake] decision could clarify the role of CDR in global climate policy and demand the inclusion of CDR as a separate item in NDCs for 2035, which are due by 2025," he says.

Governments need to clarify its role in national and global climate policy, and develop standards for MRV that can eventually be included in national GHG inventories under the UN climate change process.

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