



# EARTH ROOT

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# About E-magazine

“Earth Root” is an open access e-magazine in the discipline of Environmental sciences published by Earth Root Foundation. The aim of the e-magazine is to provide information and upgradation of knowledge about environmental issues on wider scale and to share ideas and resources to the readers. Using essential knowledge people can lead a healthy life, which is more sustainable and can connect with ongoing efforts for stopping catastrophically the climate change. E-magazine caters to all related environmental aspects ranging from big issues like climate change, renewable energy and pollutants in the atmosphere to the health of human and living beings on Earth. We also take topics of water resources and efforts and measurement to provide optimum use of it; including large scale atmospheric circulation linked with oceans and ecology.

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# ENDING PLASTIC POLLUTION: A GLOBAL IMPERATIVE FOR PLANETARY AND HUMAN HEALTH

**-Dr. Vivek Panwar,**  
**Assistant Professor, Sri Venkateswara College,**  
**University of Delhi**

World Environment Day 2025, celebrated on June 5th, brings the global spotlight to one of the most pressing environmental crises of our time: plastic pollution. With the theme “Putting an End to Plastic Pollution,” this year’s observance underscores the urgency of collective action to address the plastic pandemic that is choking our ecosystems, contaminating food chains, and threatening human health. Hosted by Japan, the event serves as a call to governments, industries, civil society, and individuals to transition toward sustainable alternatives and strengthen global resolve to combat plastic waste.

Plastic, once hailed as a miracle material for its durability and versatility, has become a symbol of environmental degradation. Since the 1950s, more than 9 billion tonnes of plastic have been produced globally, and about 7 billion tonnes have ended up as waste. Shockingly, only around 9% of this has been recycled, while the rest is either incinerated, landfilled, or released into the environment. Every year, more than 400

million tonnes of plastic waste are generated, and at least 11 million tonnes leak into the oceans—equivalent to dumping a garbage truck full of plastic into the sea every minute.

The consequences of plastic pollution are far-reaching. In marine environments, plastic debris entangles sea turtles, seabirds, and marine mammals. Microplastics, formed by the breakdown of larger plastics, are ingested by fish, shellfish, and eventually by humans. Studies have found microplastics in table salt, honey, drinking water, and even human blood and placenta, raising alarms about potential health effects ranging from hormonal disruption to inflammation and reproductive issues.

On land, plastic waste clogs drains, contributes to urban flooding, and creates breeding grounds for disease vectors like mosquitoes. Open burning of plastic waste—common in low-income regions—releases toxic gases including dioxins, furans, and polychlorinated biphenyls (PCBs), which are known to cause cancer and respiratory illnesses. In agriculture, plastic



mulch and packaging pollute soil, disrupt microbial communities, and hinder crop productivity.

Economically, plastic pollution imposes a staggering burden. The United Nations Environment Programme (UNEP) estimates the annual economic costs of plastic pollution to marine ecosystems alone at over \$13 billion. These costs stem from revenue losses in fisheries and tourism, as well as the expenses associated with cleanup efforts. Yet, the true cost may be far higher when human health and climate impacts are considered.

Despite these grim statistics, there is hope. A global movement is gathering momentum to tackle plastic pollution through systemic change, innovation, and behavioral transformation. In 2022, at the UN Environment Assembly in Nairobi, 175 countries agreed to negotiate a legally binding global treaty on plastic pollution, expected to be finalized by 2025. This treaty represents a historic opportunity to create a comprehensive framework covering the full lifecycle of plastics—from production and design to disposal and circular reuse.

Countries like Rwanda, Chile, and India have already made significant strides by banning single-use plastics and encouraging biodegradable alternatives. Japan, as the host of World Environment Day 2025, is investing in circular economy models that promote material reuse and recycling innovations. However, regulations alone will not suffice. Industries must shift toward eco-design principles, minimizing packaging and investing in materials that are truly compostable and safe for the environment. Innovation is also playing a critical role. From bioplastics made from algae and cassava starch to enzyme-based recycling and plastic-eating bacteria, science is offering promising solutions. Startups around the world are exploring ways to turn waste plastic into bricks, textiles, road material, and fuel. Scaling these innovations and integrating them into national waste management systems is crucial.

Individual actions, though often underestimated, are powerful drivers of change. Consumers can make a significant impact by refusing



unnecessary plastic, carrying reusable bags and bottles, and supporting zero-waste products. Community cleanups, educational campaigns, and pressure on retailers to reduce packaging all contribute to a larger culture of environmental responsibility.

Education and awareness, especially among youth, are vital. School programs, eco-clubs, and digital platforms can instill values of sustainability from an early age. Encouraging creative engagement—through art, innovation challenges, and storytelling—can amplify the message and inspire action across demographics.

As we commemorate World Environment Day under the banner of “Putting an End to Plastic Pollution,” the message is clear: the plastic crisis is not just an environmental issue—it is a threat to human rights, health, and the well-being of future generations. Ending plastic pollution requires more than just bans or cleanup drives. It demands a complete rethinking of how we produce, consume, and dispose of materials.

We must recognize that plastic is not inherently evil—it is how we manage and misuse it that determines its impact. By investing in sustainable materials, enforcing sound policies, redesigning products, and fostering global cooperation, we can break free from our toxic dependence on plastic.

This World Environment Day is not just a celebration of nature—it is a clarion call to safeguard it. Let this be the year the world unites with unwavering determination to eliminate plastic pollution and pave the way for a cleaner, healthier, and more sustainable planet.



# UNDERSTANDING HEAT STRESS IN INDIA'S CHANGING CLIMATE

**-Prof. S K Dhaka,  
Rajdhani College  
University of Delhi**

India is increasingly confronting a silent but deadly crisis heat stress brought on by rising global temperatures and frequent extreme heat events. As climate patterns shift, heatwaves are becoming longer, more intense, and more widespread across the country. In April 2025, New Delhi recorded temperatures exceeding 40°C much earlier than usual, with Barmer in Rajasthan touching 46.4°C breaking decades-old temperature records. Such extremes are not isolated; they reflect a worrying trend of climate volatility, particularly in South Asia.

Heat stress arises when the body struggles to regulate its internal temperature due to prolonged exposure to high heat and humidity. This can result in dehydration, reduced mental and physical function, and in severe cases, heatstroke or death. Vulnerable groups such as daily wage laborers, the elderly, children, and those without access to cooling infrastructure are at the greatest risk. In India, where a significant portion of the population lives in densely packed urban areas or works outdoors, these impacts are particularly acute.

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Urbanization has amplified the dangers of heat stress. Cities like Delhi, Hyderabad, and Ahmedabad often experience the urban heat island effect, where built-up areas trap heat, causing nighttime temperatures to remain high. Lack of tree cover, reflective building materials, and access to shade in these urban zones exacerbates discomfort and health risks. As more people move to cities and construction continues at a rapid pace, these conditions are likely to worsen.

Recent assessments have highlighted how pervasive and dangerous this phenomenon has become. A study published in May 2025 found that over 75% of India's population now resides in districts that face high or very high risk from heatwaves. States like Uttar Pradesh, Bihar, Madhya Pradesh, and West Bengal have seen both an increase in daytime maximum temperatures and sustained nighttime heat, which prevents the body from recovering after a day of exposure. This emerging threat is not only a health concern but also a socio-economic burden.

Economically, heat stress has already begun reducing worker productivity and affecting livelihoods. In sectors like agriculture and construction where labor is physically intensive and conducted outdoors workers are being forced to reduce their working hours to avoid heat-related illness. According to estimates by international labor organizations, India stands to lose millions of work hours annually due to extreme heat. This not only impacts individual earnings but also strains local and national economies.

India has taken initial steps to address this growing threat. Cities such as Ahmedabad were among the first to adopt Heat Action Plans (HAPs), which include early warning systems, public education campaigns, and training of health workers to recognize and treat heat-related illnesses. These plans also aim to make drinking water more accessible, distribute cooling kits, and advise on work-rest cycles for vulnerable groups. However, the coverage and implementation of such plans remain uneven across the country.

A comprehensive approach to heat resilience must go beyond emergency response. Cities need to redesign public spaces with shade structures, green corridors, and heat-reflective building materials. Rooftop gardens, cool roofs, and increased vegetation can significantly reduce ambient temperatures. For rural areas, promoting water conservation, community cooling centers, and traditional building techniques that reduce indoor heat can be effective.

Strengthening the healthcare system is another key area. Hospitals must be prepared to handle heat-related emergencies, particularly during peak summer months. Data collection systems should monitor heat illnesses in real-time, enabling quicker response and better planning. Community outreach programs must prioritize educating people on how to stay safe during heatwaves, especially in local languages and through grassroots networks.

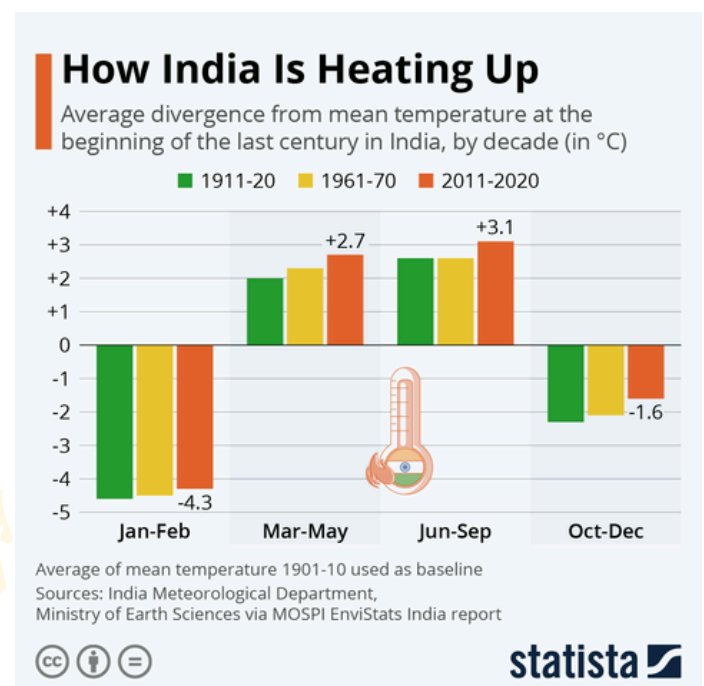
The crisis of heat stress also underscores broader concerns around climate equity. Those who contribute least to climate change such as

rural farmers or slum dwellers suffer its effects the most. It is therefore imperative that adaptation strategies prioritize these communities by providing access to resources, information, and infrastructure that can shield them from the worst effects.

Addressing heat stress in India requires coordinated action across multiple sectors urban planning, health, energy, labor, and education. As the climate continues to change, India must act swiftly to adapt and protect its population. Recognizing heat stress as both an immediate and long-term challenge is essential for ensuring public health, economic resilience, and sustainable development in a warming world.

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# THE 2023-2025 GLOBAL CORAL BLEACHING EVENT: A CLIMATE-INDUCED MARINE CRISIS

-Ankur Goel

Director, Copper Cross Solutions

The ongoing coral bleaching event spanning 2023 to 2025 has emerged as a major environmental concern, drawing the attention of scientists, policymakers, and conservationists worldwide. Declared as the fourth global coral bleaching event by the National Oceanic and Atmospheric Administration (NOAA) in April 2024, this episode is now recognized as the most widespread and severe in recorded history. Covering over 84% of the world's coral reef ecosystems across 54% of the ocean surface, the event is a dramatic illustration of the escalating threats posed by climate change to marine biodiversity.

Coral reefs, often referred to as the "rainforests of the sea," are some of the most diverse and valuable ecosystems on Earth. They cover less than 1% of the ocean floor yet support about 25% of all marine species. Beyond their ecological importance, coral reefs provide billions of dollars in economic value annually through fisheries, tourism, and coastal protection. However, their existence is under siege from warming ocean temperatures a direct outcome of anthropogenic climate change.

Coral bleaching is a physiological stress response that occurs when sea temperatures rise beyond the threshold corals can tolerate. Corals live in symbiosis with tiny algae called zooxanthellae that reside within their tissues. These algae provide the corals with food through photosynthesis and are responsible for their vibrant colors. When the water becomes too warm, corals expel the zooxanthellae, leading to the loss of pigmentation and turning the corals ghostly white. If these conditions persist for extended periods, the corals may starve and die, drastically affecting the entire reef ecosystem.

The 2023–2025 event has been triggered primarily by persistently high sea surface temperatures, further exacerbated by the El Niño phenomenon and compounded by long-term climate warming trends. In many tropical regions, sea temperatures have exceeded historical norms by more than 1.5°C, reaching extremes that some corals have never experienced. According to NOAA's Coral Reef Watch, mass bleaching was observed in all tropical ocean basins Pacific, Atlantic, and

Indian making this the most geographically extensive event to date.

Some of the most iconic and biodiverse reef systems have borne the brunt of this crisis. The Great Barrier Reef in Australia, already a victim of multiple bleaching events since 1998, has reported mass bleaching across large sections in 2024. The Florida Keys, one of the United States' most vital reef areas, recorded temperatures as high as 38°C (101°F) during summer 2023, resulting in near-total mortality in certain coral sites. In the eastern Pacific, reefs off the coast of Mexico witnessed coral deaths exceeding 90%, while regions in the Indian Ocean and Southeast Asia also reported extensive bleaching.

The severity of this event is not just about the area affected but also about the recurrence and intensity of bleaching. Reefs that had not yet recovered from earlier events such as the 2014–2017 global bleaching episode were hit again, leaving little time for natural regeneration. Repeated bleaching events weaken coral health, reduce reproductive capacity, and make it harder for reefs to bounce back, raising concerns about the long-term survivability of some coral species.

The socio-economic implications of coral bleaching are immense. Over 500 million people globally depend on coral reefs for food, livelihoods, and coastal defense. Fisheries collapse as coral-dependent fish populations dwindle. Tourism industries, especially in countries like Indonesia, Maldives, Australia, and Caribbean nations, suffer significant losses as degraded reefs lose their aesthetic and ecological appeal. Furthermore, healthy reefs act as natural barriers, protecting coastlines from storm surges and erosion. Their decline leaves coastal communities more vulnerable to natural disasters.

Ecologically, coral bleaching reduces reef biodiversity. Corals form the physical structure that shelters thousands of marine organisms. As corals die and erode, this structure disintegrates, resulting in the loss of habitat and cascading effects throughout the food web.

Apex predators, reef fish, invertebrates, and even microbial communities are all affected, altering ecosystem dynamics and resilience.

Addressing this crisis demands both immediate and long-term responses. In the short term, local conservation strategies can play a role in mitigating stress on reefs. These include reducing pollution, managing overfishing, and regulating coastal development. Marine Protected Areas (MPAs), when effectively enforced, can improve reef resilience by providing refuges for vulnerable species and allowing ecosystems to function with minimal human interference.

However, such measures are not sufficient on their own. The root cause of mass bleaching events global climate change requires aggressive international action. The continued reliance on fossil fuels and rising greenhouse gas emissions are driving ocean warming and acidification, making marine heatwaves more frequent and severe. Limiting global warming to below 1.5°C, as urged in the Paris Agreement, remains critical to giving coral reefs a fighting chance.

Technological interventions are also being explored. Scientists are experimenting with selective breeding and assisted evolution to develop heat-resistant coral strains. Coral gardening and reef restoration projects aim to regrow damaged areas using fragments from more resilient corals. While promising, these efforts are still nascent and cannot yet compensate for the scale of loss being experienced.

In addition, public awareness and education campaigns are vital. Empowering coastal communities with knowledge about reef conservation, engaging citizen scientists in monitoring efforts, and incorporating reef health into school curricula can foster stewardship and collective action. Coral reefs must not only be seen as scientific marvels but as shared heritage worth protecting for future generations.

The ongoing coral bleaching event is a sobering indicator of the planet's environmental trajectory. It sends a clear message: the climate crisis is not a distant threat it is here, now, and



devastating ecosystems in real time. Coral reefs are canaries in the coal mine of climate change.

Their decline foreshadows broader ecological upheaval unless humanity decisively curbs its carbon footprint and reorients its relationship with the natural world.

In conclusion, the 2023–2025 global coral bleaching event is more than a marine disaster—it is a global wake-up call. As we bear witness to the slow fading of the ocean's most vibrant ecosystems, the need for urgent, unified climate action has never been clearer. The health of coral reefs is not just a matter of biodiversity—it is a reflection of planetary health itself.

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## The Value of Coral Reefs

Coral reefs are both architectural and biological masterpieces. Not only are corals critical for biodiversity, they are living ramparts holding back waves, as well as food factories, medicine chests and magnets for visitors.



### COASTAL PROTECTION

Coral reefs **reduce wave energy by 97%** before hitting the shore.

### HEALTH

We are **300 times more likely** to find new drugs in the ocean than on land.

### MARINE LIFE

**25% of all marine life** live around coral reefs, despite corals only covering 1% of the Earth's surface.

### FLOOD PROTECTION

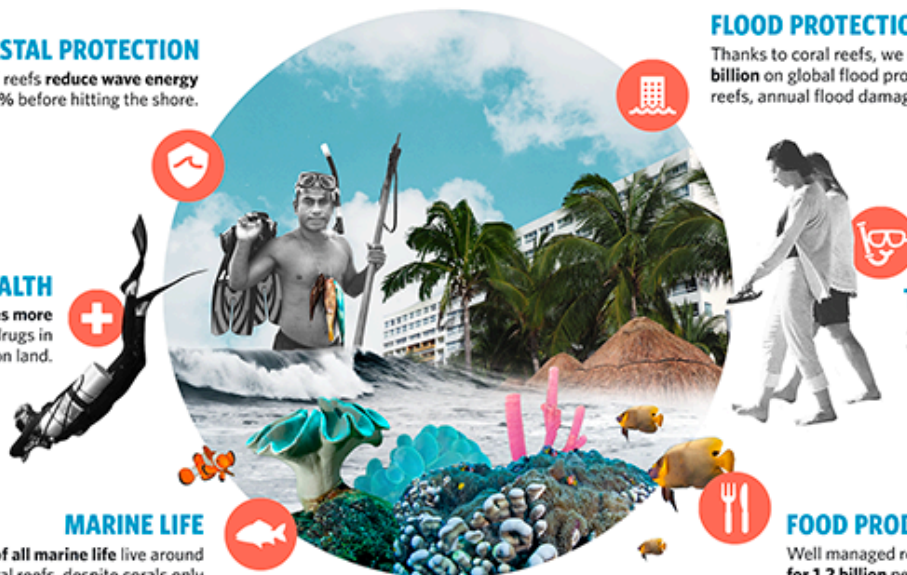
Thanks to coral reefs, we can save up to **\$272 billion** on global flood protection, without coral reefs, annual flood damage could double.

### TOURISM VALUE

A potential **\$36 billion** global value towards tourism.

### FOOD PRODUCTION

Well managed reefs **provide food** for **1.2 billion** people globally.





# MICROPLASTIC POLLUTION IN HUMAN BLOOD

- kamaldeep kumar  
Freelance writer.

In recent years, the ubiquity of microplastic pollution has transformed a largely marine-centered environmental issue into a direct human health concern. Initially detected in ocean sediments and marine life, microplastics—tiny fragments less than 5 mm in size—have now been found in bottled water, table salt, air, and even human blood. This alarming development challenges long-held assumptions about the boundaries between environmental contamination and human biology, signaling a new frontier in environmental health science.

The groundbreaking study that confirmed the presence of microplastics in human blood was published in 2022 by researchers from Vrije Universiteit Amsterdam. Using sophisticated analytical techniques, they detected plastic particles in the blood samples of 17 out of 22 healthy adult donors. The plastics identified included polyethylene terephthalate (PET), commonly used in beverage bottles; polystyrene, found in food packaging; and polymethyl methacrylate (PMMA), used in various consumer products. This revelation was significant—not only had microplastics made

their way into the human body, but they had also entered the circulatory system, potentially enabling them to reach vital organs.

The sources of microplastic exposure are widespread and insidious. They include ingestion through food and water, inhalation of airborne fibers from synthetic textiles and household dust, and even absorption through skin contact. Packaging, cosmetics, automotive tire dust, and urban air pollution contribute to the continuous breakdown of larger plastic items into microscopic particles. These particles persist in the environment due to their non-biodegradable nature, accumulating across ecological boundaries and integrating into the food chain.

Once inside the human body, the behavior of microplastics is not yet fully understood, but the potential health risks are deeply concerning. Laboratory studies on animals and cell cultures suggest that microplastics can cause inflammation, oxidative stress, and cellular damage. In particular, nanoplastics (particles smaller than 1 micron) can cross cell membranes and even breach the blood-brain



barrier in animal models, raising questions about their impact on human neurological and immune systems.

Furthermore, microplastics can act as vectors for other toxic chemicals. They often carry additives such as phthalates, bisphenol A (BPA), and flame retardants, many of which are known endocrine disruptors. These substances can interfere with hormonal function, potentially affecting reproductive health, metabolism, and fetal development. In polluted environments, microplastics also attract heavy metals and persistent organic pollutants (POPs), increasing their toxicity when ingested or inhaled.

The implications of these findings extend beyond individual health to broader questions of environmental justice and policy. Communities located near plastic manufacturing plants or waste disposal sites often bear a disproportionate burden of exposure. Workers in textile, packaging, and recycling industries may face heightened risks due to prolonged contact with microplastic-rich environments. Moreover, low-income populations may lack access to clean water and air filtration systems, further exacerbating health disparities.

In response to these developments, scientists, health agencies, and policymakers are calling for a multifaceted strategy to mitigate microplastic pollution and understand its health impacts. Key priorities include:

- **Enhanced Monitoring and Research:** Governments and research institutions must invest in long-term epidemiological studies to determine the health outcomes associated with chronic microplastic exposure. Standardized methods for detecting and quantifying microplastics in biological samples are essential to establishing exposure thresholds.
- **Product Regulation and Innovation:** Banning or reducing the use of microplastic-containing ingredients in cosmetics, paints, and cleaning products is a critical step. Simultaneously, innovation in biodegradable materials and sustainable packaging alternatives

can reduce plastic leakage into the environment.

- **Waste Management Reform:** Improving recycling systems, reducing single-use plastics, and encouraging circular economy models can drastically cut down plastic pollution. Policy mechanisms such as Extended Producer Responsibility (EPR) can hold manufacturers accountable for the full lifecycle of plastic products.
- **Public Awareness and Behavior Change:** Consumer education about microplastic sources and reduction strategies—such as using natural fiber textiles, minimizing plastic packaging, and using air purifiers—can empower individuals to reduce their personal exposure and environmental footprint.
- **International Collaboration:** Since plastic pollution transcends national boundaries, global frameworks like the proposed UN Plastics Treaty must play a central role. These agreements can establish common standards, fund research, and enforce cross-border regulations on plastic production and disposal.

The discovery of microplastics in human blood represents a critical turning point in the discourse on environmental pollution. No longer confined to the oceans or to distant wildlife, the consequences of our plastic dependency are now circulating within us. This underscores an urgent need to shift from a reactive to a preventive approach in environmental health.

As the 21st century unfolds, the challenges of plastic pollution demand both scientific inquiry and ethical reflection. What kind of world are we creating when synthetic polymers pervade not only the planet but our very bloodstream? The answer lies not just in laboratories or legislatures, but in the collective choices we make—about consumption, innovation, and our relationship with the environment.

If unaddressed, microplastics could become a major contaminant like asbestos, with risks recognized too late. Action is needed to rethink lifestyles & production methods to safeguard human and planetary health amid rapid change.

## World Environment Day 2025: Plastic Cleanup Drive at Yamuna Ghat No. 24, New Delhi Organized by Earth Root Foundation in collaboration with Students for Development

Date: June 5, 2025

Location: Yamuna Ghat No. 24, New Delhi

Event: Plastic Waste Cleanup Drive

Organizers: Earth Root Foundation and Students for Development

Participants: Over 50 volunteers, including students, environmentalists, and local residents

In observance of World Environment Day 2025, Earth Root Foundation, in partnership with Students for Development, orchestrated a significant plastic cleanup initiative at Yamuna Ghat No. 24 in New Delhi. This endeavor aimed to address the escalating issue of plastic pollution along the Yamuna River and to foster environmental consciousness among the community.





## Objectives

- **Plastic Waste Removal:** To systematically collect and dispose of plastic debris contaminating the riverbanks.
- **Community Engagement:** To involve local youth and residents in environmental conservation efforts.
- **Awareness Promotion:** To educate participants and the broader community about the detrimental effects of plastic pollution and the importance of sustainable practices.

## Activities Conducted

- **Cleanup Operation:** Volunteers equipped with gloves and biodegradable bags conducted a thorough cleanup of the ghat area, collecting various plastic items such as bottles, bags, and packaging materials.
- **Waste Segregation:** Collected waste was sorted for recycling and proper disposal, ensuring minimal environmental impact.
- **Educational Sessions:** Informative talks were held to discuss the significance of maintaining river cleanliness and adopting eco-friendly habits.
- **Pledge Ceremony:** Participants committed to reducing plastic usage and advocating for environmental preservation within their communities.

## Outcomes

- **Waste Collected:** Approximately 100 kilograms of plastic waste were removed from the riverbank.
- **Community Impact:** The event successfully mobilized local youth and raised awareness about the importance of environmental stewardship.
- **Sustainable Practices:** Participants were encouraged to continue engaging in eco-friendly activities and to spread the message of sustainability.

The cleanup drive at Yamuna Ghat No. 24 exemplifies the power of collective action in addressing environmental challenges. Through the dedicated efforts of Earth Root Foundation, Students for Development, and community volunteers, a significant step was taken towards restoring the health of the Yamuna River. This initiative not only contributed to the immediate reduction of plastic pollution but also instilled a lasting sense of environmental responsibility among participants.



# MOVIE

## RECOMMENDATION

### PLASTIC CHINA

- **Movie Name:** Plastic China
- **Director:** Jiu-Liang Wang
- **Run Time:** 81m
- **Year of Release:** 2016

Plastic China is a powerful and eye-opening documentary directed by Wang Jiuliang that dives into the hidden world of global plastic waste. The film follows the life of a young girl and her family working in a makeshift recycling workshop in rural China, exposing the harsh realities behind the plastic we throw away. Through raw, unfiltered storytelling, it sheds light on environmental injustice, poverty, and the global consequences of plastic pollution.

This film reminds us that our discarded plastic doesn't just vanish — it travels, it affects lives, and it leaves a lasting footprint on both people and the planet.

### PLOT SYNOPSIS

Plastic China (2016) is a documentary that delves into the lives of a family working in a plastic recycling workshop in rural China. The story centers on an 11-year-old girl, Yi-Jie, who lives with her family in a small village where they work with massive amounts of discarded plastic waste, much of it imported from wealthier countries. The film captures their daily struggles as they manually sort, melt, and repurpose the plastic, often in harsh and unsafe conditions.

Yi-Jie's parents, along with many others in the community, rely on this work as their primary source of income. However, the impact of the plastic industry is far from just economic; it also takes a toll on their health, as the family members are constantly exposed to toxic fumes and dangerous chemicals from the plastic they handle. Despite the challenges, Yi-Jie dreams of escaping this life and going to school, offering a poignant contrast between her innocent hopes and the grim reality she faces.

The documentary highlights the broader issue of plastic waste and the global chain of disposal, revealing how the trash of industrialized nations often ends up in developing regions, where it harms both people and the environment. Through Yi-Jie's perspective, Plastic China explores the environmental, social, and human costs of the world's addiction to plastic.







From its invention in 1907 as a revolutionary material, plastic has become one of the world's greatest environmental threats. What was once a symbol of progress now pollutes our oceans, air, soil and has made its way into the food we eat and even our blood.

This Environment Day, we pledge:

- To refuse single-use plastics and unnecessary packaging.
- To choose sustainable, eco-friendly alternatives.
- To raise awareness about plastic pollution's hidden dangers.
- To support actions, policies, and innovations for a cleaner, plastic-free future.

Let us act today, so future generations inherit a healthier, safer planet.

#PlasticFreeEarth #BeatPlasticPollution #WorldEnvironmentDay2025

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