ISSN: 2583-6013

EARTH ROOT

Volume 50
JULY

ISSN: 2583-6013

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.

Title -	Earth Root
Frequency -	Monthly
ISSN -	2583-6013
Publisher -	Earth Root Foundation
Chief Editor -	Dr. Vivek Panwar
Copyright -	Earth Root Foundation
Starting Year -	2021
Subject -	Environment
Language -	English
Publication Format -	Online
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Editorial Board

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GLOBAL WARMING: THE ONGOING THREAT

- Pratishtha Sharma
USEM
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As a 21st-century kid, I would like to throw light on Global Warming, something that has been taken for granted for a while now. Younger youth are often taught in their textbooks about Sustainable Development and Global Warming. But are we taking action upon them? The answer, sadly, is no. Unfortunately, no one cares to talk about it anymore. We often get the thought "if no one else is taking any action, why should I?"

And that's exactly where the problem begins.

Here in, I would discuss global warming, its ongoing impact, and what we can do at our personal level to make a real difference.

As we have approached summer, the scorching heat is breaking records year after year. Every other day, we see Red Alerts flashing on news channels and social media notifications about how dangerously high the temperatures have become. The heat is unbearable, and naturally, to overcome the drenching sweat and suffocating air, most of us turn to air conditioning. Air Conditioners are running almost 90% of the day in many households, malls, offices, and public spaces.

But if we pause for a moment and reflect on why the temperatures have risen so dramatically in recent years, we would be sensible enough to recognize the cause and work towards reducing it. Instead, ironically, we end up contributing further to the problem. The basics, which we all are taught in school, clearly state that one of the primary reasons for this unbearable heat is the depleting ozone layer, allowing harmful UV rays to pierce through and heat the Earth's surface.

This depletion isn't accidental. It is driven by human activities like burning fossil fuels for electricity and transportation, cutting down forests, manufacturing without sustainable checks, and releasing greenhouse gases like carbon dioxide, methane, and nitrous oxide into the atmosphere. These gases trap heat, causing what we know as the greenhouse effect, leading to global warming.

To put things in perspective, carbon dioxide levels are now 50% higher than pre-industrial levels and the highest they've been in at least 800,000 years. That's not a small statistic it's a glaring warning. 1.2 trillion tons of ice are lost each year, with a staggering 28 trillion tons

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gone since the mid-1990s.

If we continue on this path, according to climate experts, global warming could reach between 1.0–1.8°C under a very low emissions scenario to a terrifying 3.3–5.7°C under a very high emissions scenario by 2100.

Now, the question is — what can we do?

The answer lies in reducing greenhouse gas emissions and transitioning to a sustainable, low-carbon economy. This sounds big and complicated, but change can start small — from each one of us. At a global level, this involves shifting towards renewable energy sources like solar, wind, and hydropower, improving energy efficiency in buildings and industries, adopting eco-friendly transportation options like cycling, electric vehicles, and public transport, and promoting responsible consumption and production habits.

Additionally, protecting and restoring natural ecosystems like forests and wetlands is crucial because they act as natural carbon sinks, absorbing vast amounts of carbon dioxide from the atmosphere. Implementing carbon taxes or cap-and-trade systems can also motivate industries and governments to take emission reduction seriously.

But beyond policy and international agreements, there's immense power in individual action.

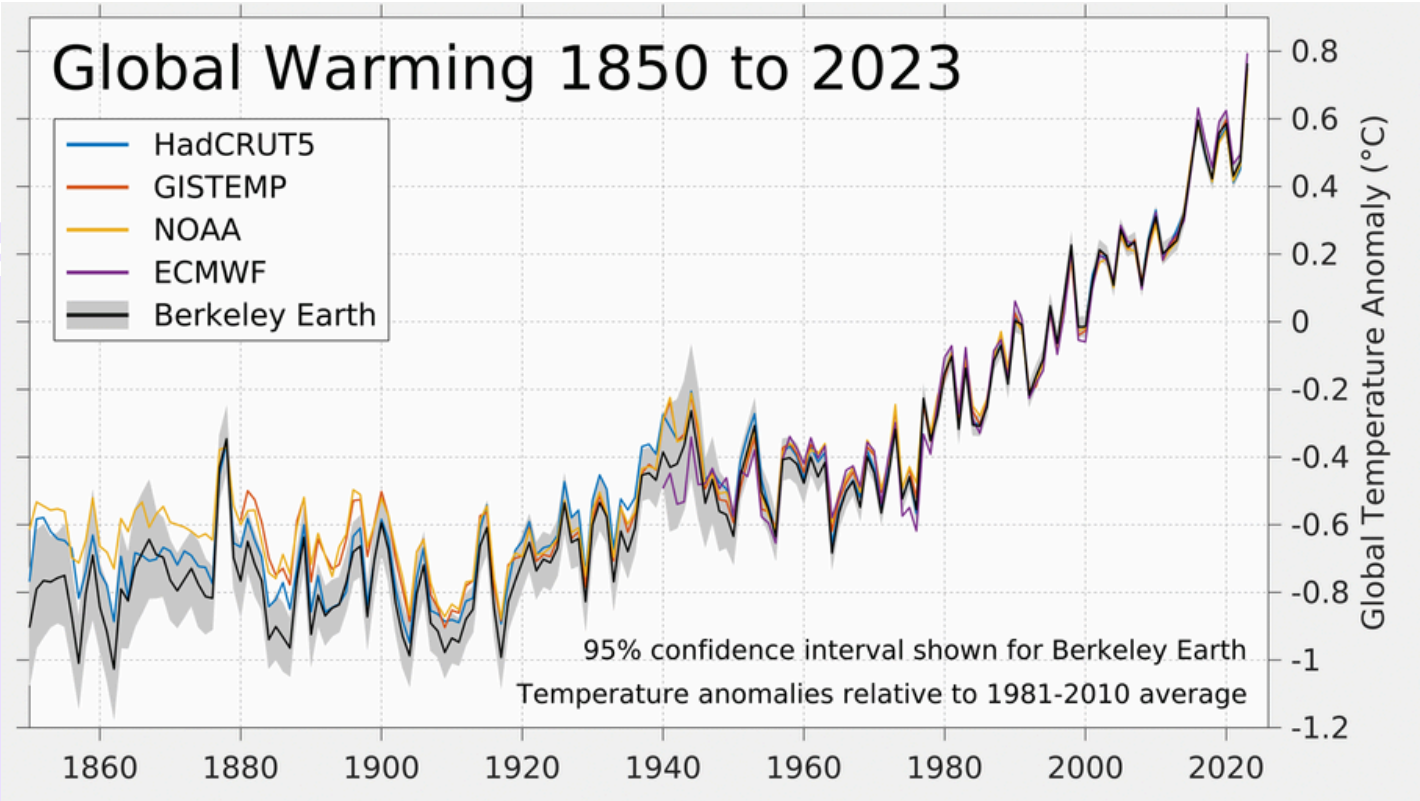
Simple habits like switching off appliances when not in use, reducing plastic consumption, planting trees, supporting local and sustainable products, conserving water, and spreading awareness can collectively make a massive impact. Encouraging schools, colleges, and communities to engage in climate action programs can further amplify these efforts.

Because as the famous quote says — "The greatest threat to our planet is the belief that someone else will save it."

If we continue to think that the environment is someone else's responsibility, we'll soon be left counting money in a world where we can't breathe, where seasons blur into extremes, and where natural disasters become a daily affair.

In case you think the environment is less important than the economy, try holding your breath while you count your money. It won't take long to realize what truly matters.

It's time we stop seeing climate change as someone else's problem and start acting — not tomorrow, not next year, but right now.



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MONSOON MAYHEM: HIMACHAL & UTTARAKHAND GRAPPLE WITH UNRELENTING FLOODS AND DISASTERS

-Prof. S K Dhaka,
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The Himalayan states of Himachal Pradesh and Uttarakhand are enduring one of the most punishing monsoon seasons in recent memory. From late June into mid-July 2025, torrential rains, relentless cloudbursts, flash floods, and catastrophic landslides have badly damaged and disturbed life in both states. In a matter of days, vital infrastructure has crumbled, lives have been lost, and entire communities have been left cut off and scrambling for survival as rivers burst their banks and mountain slopes gave way under the relentless downpour.

This is not a natural disaster in isolation. It is a troubling reminder of the growing climate vulnerability of India's hill states places where fragile ecosystems, unregulated development, and the accelerating impacts of global warming collide with deadly consequences.

Himachal Pradesh: A State Under Siege

Between June 20 and July 13, 2025, Himachal Pradesh has been battered by a deadly sequence of natural disasters:

31 flash floods, 22 cloudbursts, 17 landslides

The devastation has claimed at least 92 lives, including 56 directly from rain-related calamities and 41 from road accidents on crumbling, rain-damaged highways. An additional 40 people remain missing, and hundreds more have been injured.

Mandi district has emerged as the epicenter of the catastrophe. With over 150 roads blocked some entirely washed away power and water supplies crippled, and homes and public structures collapsing, the region is struggling to restore even basic services. The first floor of a national bank in Thunag submerged completely, symbolizing the sheer intensity of the disaster.

Yet amid the devastation, stories of survival and courage have surfaced. In Syathi village, a dog's persistent, urgent barking at midnight warned villagers just in time to escape an approaching flash flood. In Seraj valley, a young woman buried under landslide debris managed to dig herself out over five harrowing hours before rescuers could reach her.

Rainfall data has been equally staggering. The state has already received 33% above average

rainfall between June 1 and July 8, with Mandi witnessing over double its normal rainfall in just two weeks. According to meteorological reports, Shimla district saw 89% excess rainfall, and Una district recorded an 86% surplus.

The property damage bill has crossed ₹770 crore, with over 450 homes either damaged or completely destroyed, alongside bridges, schools, and utility services.

Uttarakhand: Caught in a Rising Tide

Neighboring Uttarakhand has fared little better. Since June 1, over 20 people have lost their lives, and nine remain missing. Cloudbursts in Chamoli and Uttarkashi districts have triggered deadly landslides and flash floods, washing away houses, roads, and lives.

On one ominous day, a sudden cloudburst in Mukh village, Chamoli swept away homes, left workers missing, and prompted emergency deployments of the SDRF. In Uttarkashi, two construction laborers were killed while seven others disappeared as landslides ravaged a makeshift shelter along the Yamunotri highway.

Rivers across the region have surged ominously, with the Alaknanda in Rudraprayag swelling so dramatically that it submerged a towering riverside Shiva idol, a visual metaphor for the overwhelming force of nature.

Flood alerts have been issued for 11 districts, and landslide warnings remain in effect across four. The situation forced the suspension of the famed Char Dham Yatra, leaving thousands of pilgrims stranded as rockslides cut off access to holy shrines and towns. In Kumaon, over 40,000 residents are affected by the rain-triggered chaos, with dozens of major roads rendered impassable.

A Dangerous New Normal

What's unfolding in Himachal and Uttarakhand isn't a one-off tragedy. Climate change is intensifying monsoon patterns, with more frequent cloudbursts and flash floods battering already fragile hill slopes. Decades of deforestation, unchecked construction, and unregulated hydropower projects have further weakened the region's resilience.

Experts warn this pattern will only worsen unless urgent, science-based planning, stricter environmental safeguards, and climate-resilient infrastructure become priorities for these vulnerable Himalayan states.

Relief, Recovery — and the Road Ahead

Rescue teams from the NDRF, SDRF, ITBP, and Army continue to battle difficult terrain to reopen highways, restore water and electricity, and deliver essential supplies. Thousands of people remain in temporary shelters, while medical teams and drones aid in search and relief efforts.

But while immediate relief is critical, the long-term priority must be building climate resilience. Experts urge stricter environmental clearances, scientific risk assessments before development, slope stabilization, better early warning systems, and regulated hydropower projects. Sustainable tourism, decentralized energy, and land restoration must shape future planning for these fragile hill states.

Courage in the Hills, Action from the Nation

The people of Himachal and Uttarakhand are showing remarkable resilience — rebuilding homes, clearing farms, and restoring lives. Their courage deserves more than applause. It demands urgent, climate-smart action from governments and policymakers. Because with climate extremes becoming routine, preparedness, not luck, will decide how well these hills and their people endure the storms ahead.

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ENHANCED ROCK WEATHERING (ERW) FUELS NEW CARBON OPPORTUNITIES IN INDIA

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

Enhanced Rock Weathering (ERW) is rapidly emerging as one of the most promising nature-based carbon dioxide removal (CDR) strategies in the fight against climate change. By accelerating the natural process of silicate mineral weathering, ERW captures atmospheric CO_2 and converts it into stable bicarbonates, which are eventually transported to the oceans, offering long-term, measurable carbon sequestration benefits. Yet beyond just locking away carbon, ERW provides critical ecological and agricultural co-benefits improving soil structure, enhancing fertility, and restoring degraded landscapes, making it uniquely positioned for dual wins in both climate mitigation and rural development.

India, with its vast basaltic landscapes of the Deccan Plateau and rich reserves of ultramafic rocks like olivine and serpentine scattered across states like Odisha, Jharkhand, and parts of the Northeast, holds immense potential for deploying ERW at meaningful scale. These rock types, abundant in magnesium and calcium silicates, react efficiently with atmospheric CO_2 in the presence of water and soil acidity, forming carbonates and bicarbonates. This mineral carbonation process not only traps carbon but also releases essential nutrients such as magnesium, calcium, potassium, and trace elements, improving soil health and boosting crop productivity.

Integrating finely crushed rock application into existing agricultural systems, particularly in rain-fed and marginal lands, could offer a cost-effective and scalable pathway to enhance food security while simultaneously drawing down carbon from the atmosphere. Small and marginal farmers could gain from improved soil pH, increased water retention, enhanced crop yields, and reduced reliance on chemical fertilizers. In this sense, ERW elegantly aligns with India's push towards climate-smart agriculture, soil health missions, and the Pradhan Mantri Krishi Sinchai Yojana (PMKSY) aimed at improving farm productivity through sustainable interventions.

The global carbon market is increasingly shifting focus from conventional emission reduction

projects to verifiable, durable carbon removals, and ERW fits well into this evolving narrative. With international frameworks like Article 6 of the Paris Agreement and rapidly growing voluntary carbon markets demanding high-integrity removal projects, ERW offers a natural fit for India's emerging climate finance strategy. By establishing scientifically robust pilot projects and standardized protocols for quantifying carbon sequestration through soil sampling, mineral dissolution rate measurements, carbon accounting models, and life cycle assessments (LCA) India could position itself as a credible supplier of high-quality carbon credits.

This presents a timely opportunity for India to not only meet its ambitious net-zero target by 2070 but also to access new avenues of climate finance, strengthen its carbon credit inventory, and support rural green livelihoods. The co-benefits extend far beyond carbon. ERW can combat soil degradation, enhance land productivity, replenish micronutrients in nutrient-depleted soils, and even aid in combating desertification in vulnerable arid regions of Rajasthan, Gujarat, and parts of Telangana.

Incorporating ERW into national afforestation and land restoration programs such as the Green India Mission and the National Mission for a Green India could amplify its impact, combining carbon drawdown with ecosystem restoration. Additionally, it can be integrated into employment guarantee schemes like MGNREGA, creating rural jobs in quarrying, crushing, transporting, and applying crushed rocks to fields further strengthening rural economies while addressing environmental challenges.

On the technological front, the declining cost of remote sensing, geochemical monitoring tools, and digital MRV (Monitoring, Reporting, and Verification) systems is making it increasingly feasible to track ERW's impact with greater precision and affordability. Collaborations with research institutions, universities, and technology startups can help develop predictive models and site selection tools, ensuring that ERW applications are optimized for local soil types, rainfall patterns, and cropping systems.

Globally, Enhanced Rock Weathering is gaining momentum. Countries like the UK, USA, Australia, and Brazil have launched pilot programs, with private sector players and agri-tech startups actively exploring its commercial viability. India, given its geological resources, agriculture-dependent economy, and commitment to climate leadership, is well-placed to emerge as a pioneer in this field within the Global South.

Yet challenges remain. Awareness among farmers, initial logistical costs, and public policy clarity on CDR pathways will need to be addressed. It's essential for policymakers to develop incentive structures, perhaps through carbon farming subsidies, carbon credit pre-purchase agreements, or climate-resilient agriculture funds, to make ERW adoption attractive and economically viable for farmers.

As climate pressures mount and hard-to-abate sectors like cement, steel, and heavy industry look to offset residual emissions, India's potential to supply nature-based, scientifically credible carbon removals through ERW could prove invaluable. It's not just a climate solution — it's a green economic opportunity, a pathway to healthier soils, sustainable farming, rural job creation, and an equitable transition for communities most vulnerable to climate change.

Going forward, multi-stakeholder partnerships involving state governments, research institutions, carbon market experts, industry leaders, and farming cooperatives will be critical to develop pilot demonstrations, establish robust MRV frameworks, and create scalable business models. With strategic policy backing and climate finance alignment, Enhanced Rock Weathering could be a cornerstone of India's next-generation climate strategy, setting a global example of how nature-based solutions can be deployed at scale in developing economies.

It is time to turn this geological asset into a climate ally, unlocking a new chapter in India's carbon removal and sustainable development journey.

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THE BURNING CITY OF INDIA

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Visualize a place where the very ground beneath your home could collapse or catch fire at any time where toxic smoke is not a rare event but part of daily life. This is not science fiction. This is Jharia, a mining town in Jharkhand, which was once famous for its rich deposits of high-quality coal and is now tragically known as the Burning City of India.

Beneath its surface, underground coal seam fires continue to rage relentlessly, releasing toxic gases into the air and making it one of the most dangerous places to live in India. To understand how such a disaster came to be, let's take a step back and look at its past.

Coal mining in Jharia began aggressively during the British colonial era, driven by the insatiable demand for coal during the Industrial Revolution and later for the British Empire's military and industrial needs, particularly during World War I and World War II. Back then, coal was black gold, a resource so valuable that its extraction was prioritized over human safety or environmental preservation. Mines were dug without any structural reinforcements, and after their resources were exhausted, they were simply abandoned — left open and unsealed.

This negligence, compounded by decades of over-mining and disregard for ecological balance, led to the spontaneous combustion of exposed coal seams, which slowly ignited fires underground. What began as isolated, manageable blazes gradually transformed into an uncontrollable inferno beneath the earth's surface. What might have been dismissed as a minor mishap a century ago has now evolved into a catastrophic environmental disaster, spanning more than 200 square kilometres of land.

Today, dozens of underground coal fires continue to burn tenaciously. Smoke billows out from cracks in roads, floors, and open fields. Vast patches of land have turned barren, homes collapse without warning as the ground below turns hollow, and entire neighbourhoods are being swallowed by the earth. Residents of Jharia live in perpetual danger, where stepping out means inhaling poisonous fumes and staying indoors doesn't promise safety either.

Breathing itself has become a hazard here. Respiratory issues such as chronic bronchitis, asthma, silicosis, and tuberculosis are alarmingly common not just in older residents

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but in children as well, whose tender lungs grow up alongside smoke and soot. Toxic gases like carbon monoxide (CO), sulfur dioxide (SO_2), methane (CH_4), along with harmful fine particulate matter (PM2.5 and PM10), fill the atmosphere relentlessly. The health consequences are devastating: skin diseases, persistent eye irritations, and even long-term exposure-related cancers are increasingly prevalent. And to make matters worse, access to healthcare remains scarce, burdened by financial constraints and poor infrastructure.

But the problem doesn't stop at the surface. These coal fires emit greenhouse gases such as methane and carbon dioxide year-round, contributing not only to local hazards but also to global climate change. While the world debates carbon emissions and climate policies in conference rooms, Jharia's residents have been living with the consequences for generations.

The environmental degradation here is heartbreaking. The intense underground heat and acidification have rendered the soil infertile, killing off vegetation and eliminating agricultural opportunities. The once-thriving fields have withered, leaving farmers in debt and despair, and forcing entire communities into poverty. Local water bodies and underground aquifers have been contaminated by combustion residues and toxic chemical runoff from the mines, making drinking water unsafe and unusable. Rivers and ponds dry up or turn toxic, further stressing human life and collapsing local ecosystems. Biodiversity has disappeared, and what was once fertile, life-giving land has become a bleak, smoking wasteland.

The constant land subsidence — where large sections of the ground suddenly cave in — adds yet another layer of terror to life in Jharia. Massive craters open up without warning, swallowing homes, roads, and even people. Residents live with an eerie, constant uncertainty, never knowing when the earth beneath them might collapse.

Yet, despite this dystopian reality, people continue to live here — not out of choice, but out of compulsion. Generations of families, tied to the land by history, poverty, and lack of alternatives, remain trapped.

The government and concerned authorities, like the Jharia Rehabilitation and Development Authority (JRDA), have launched relocation and rehabilitation plans, but progress has been painfully slow, plagued by bureaucracy, logistical hurdles, and inadequate resources. For many, promises of new homes and safer settlements remain empty words, while the next generation grows up with chronic ailments, injuries, and trauma that have become a part of everyday life.

As India moves forward with ambitious plans for urban development, industrial growth, and clean energy initiatives, Jharia stands as a grim reminder of what can happen when economic greed overshadows environmental responsibility. It's not just a local tragedy but a reflection of our national and global negligence towards environmental justice.

The voices of Jharia's people deserve to be heard — not as cautionary tales, but as urgent calls for action. The Burning City of India must not be forgotten, buried under the weight of coal dust and silence. Its story should remind us that environmental disasters aren't abstract concepts or distant concerns; they are lived realities for millions of people today. And unless addressed decisively, they could be tomorrow's reality for many more.

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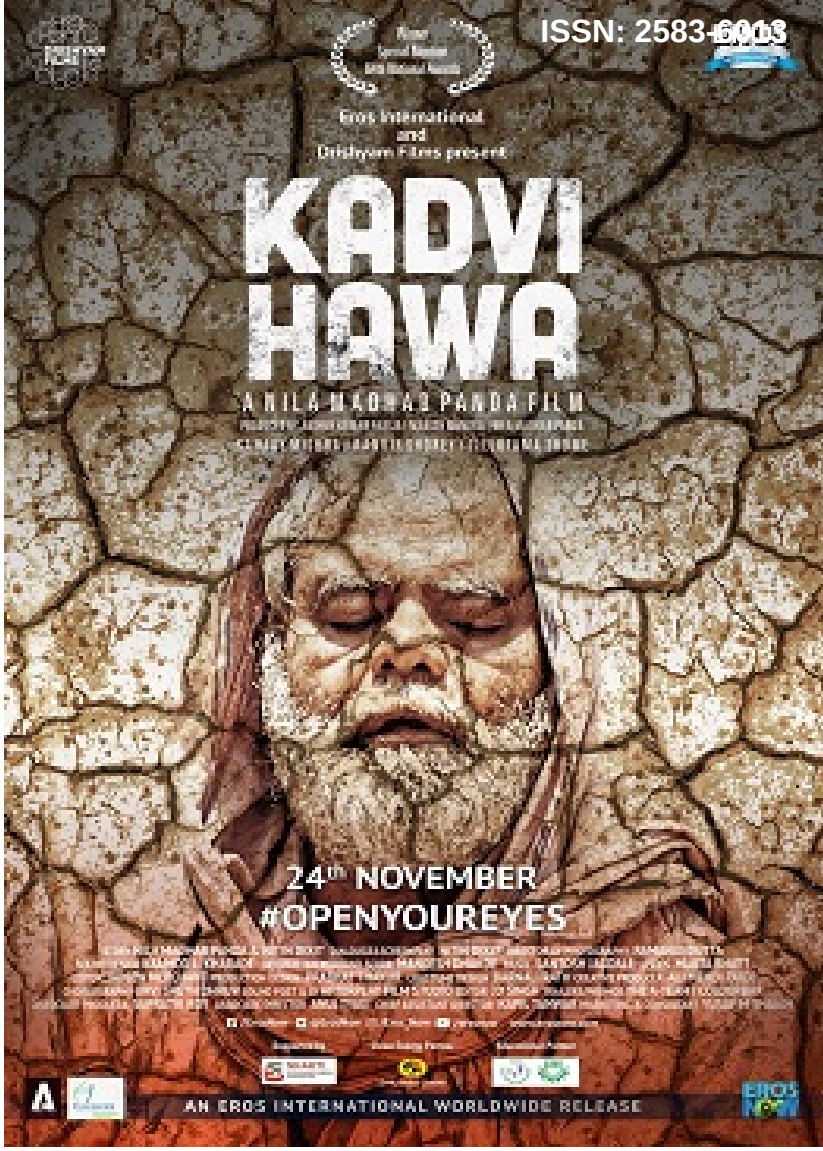
ISSN: 2583-6013

MOVIE
RECOMMENDATION

KADVI HAWA

- Movie Name: KADVI HAWA
- Director: Nila Madhab Panda
- Run Time: 1h 39m
- Year of Release: 2017

Kadvi Hawa Is A National Award Winning Bollywood Hindi Drama Movie Based On The Theme Of Climate Change, Directed By Nila Madhab Panda, Starring Sanjay Mishra, Ranvir Shorey and Tillotama Shome In The Lead Roles. In The Barren Village Of Mahua Where Farmer Suicides Are A Common Occurrence An Old Man Worried About His Son, An Impoverished Farmer And A Debt Collector Make A Pact For Their Survival.



PLOT SYNOPSIS

Kadvi Hawa (2017) is a poignant Hindi-language drama directed by Nila Madhab Panda that explores the devastating human cost of climate change.

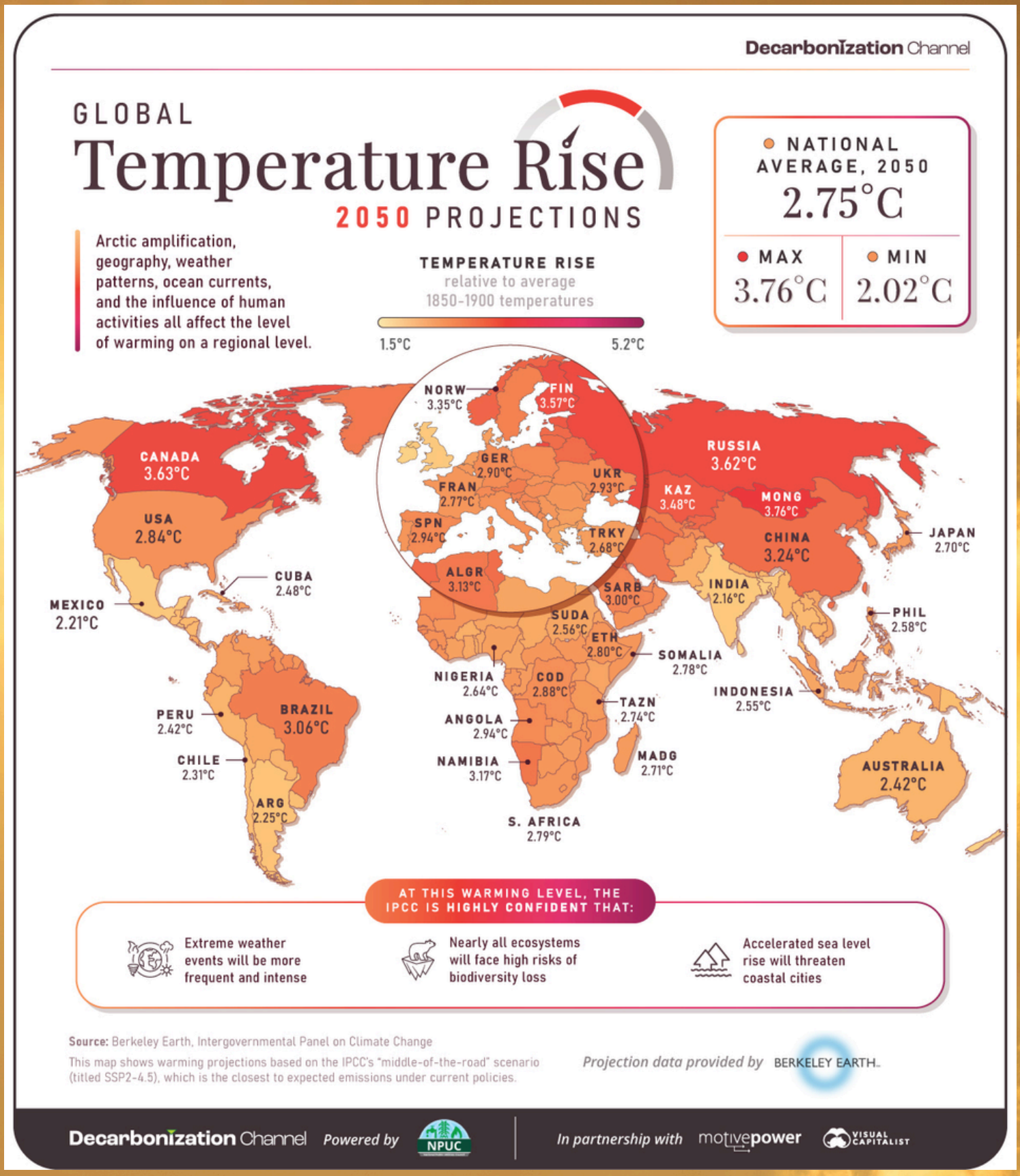
Set in the drought-stricken village of Mahua in Bundelkhand, the film follows Hedu, a blind, elderly farmer who fears his son Mukund may commit suicide due to mounting debt. The village hasn't seen rain in 15 years, and the harsh conditions have pushed many farmers to the brink.

Enter Gunu Babu, a loan recovery agent from Odisha, nicknamed the "God of Death" by locals for his role in triggering farmer suicides. Ironically, Gunu himself is desperate to escape the cyclone-prone coastal region where his own family suffers. He sees the dry village as a safer haven.

Despite their opposing roles, Hedu and Gunu form a morally complex alliance: Hedu helps Gunu identify indebted farmers, and in return, Gunu credits commissions to Mukund's account to ease his burden. But this uneasy pact leads to unexpected consequences, forcing both men to confront the ethical weight of their choices.

With powerful performances by Sanjay Mishra as Hedu and Ranvir Shorey as Gunu, the film avoids preachiness and instead delivers a haunting, emotionally charged narrative that highlights the intersection of poverty, climate crisis, and human resilience.

ISSN: 2583-6013



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