

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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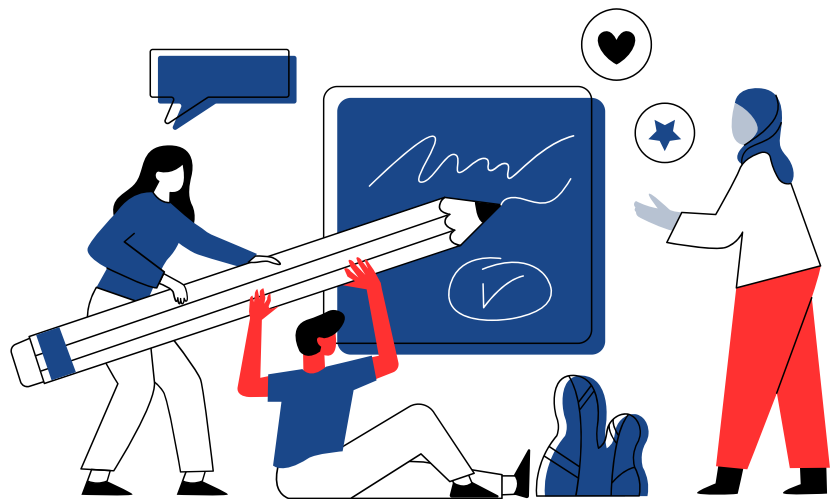
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YAMUNA: THE RIVER GASPING FOR LIFE

**-Dr. Chetan,
Assistant Professor, Department of Statistics,
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The evolution of mankind from hunter-gatherer societies to settled agricultural lives has consistently been linked to the presence of rivers, serving as the elementary mechanism for the emergence of human settlements. One such river is Yamuna or Jamna, which has been the 'cradle of civilizations' for centuries. The once-mighty Yamuna, which saw the rise and expansion of historic cities like Mathura, Baghpat, Delhi, Agra, Firozabad and Etawah, now lies gasping for life. Ironically, the lifeline of millions, Yamuna, also the twin sister of Yama, the god of death, now lies on the deathbed. The story of this 1,376 kilometer river mirrors humanity's profound negligence and ignorance towards the environment. As we stand at this critical crossroad, the transformation of the Yamuna from a life-giving force and a healer to an impending environmental catastrophe demands our immediate attention and action.

Originating from the Yamunotri Glaciers, the Yamuna transverses through some of the most crowded urban and peri-urban regions of India before merging with the Ganges at Prayagraj. Although the river enjoys a venerated status

and is regarded as a sacred apotheosis of divine purity, this hasn't prevented the people from throwing garbage, dumping sewage and disposing of construction and demolition debris into it, so much so that today many sections of the river are being either overrun by excess plant growth or construction-demolition materials. The ecological deterioration is significantly observable in National Capital Territory, where many sections of the river have been considered ecologically dead. The pollutant analysis of the waters along this 52 kilometer stretch reveals the existence of carcinogens, high levels of carbon compounds, potassium, nitrates, detergents, grease, heavy metals along with other organic and inorganic wastes. Further, the Biological Oxygen Demand (BOD) is alarmingly high, while the Dissolved Oxygen (DO) Levels have declined to zero. Under such circumstances no marine life can survive, neither is the water fit for bathing, drinking or agricultural purposes. The river, which once symbolized life and sustenance, now stands as a symbol of our incapacity to coexist in harmony with the natural world.

Despite decades of governmental programmes and efforts dedicated towards the cleaning and revitalization of the river, be it the “Yamuna Action Plan” or “Yamuna Purification Drive” or “I love Yamuna Campaign”, none of them have produced any meaningful results. Even the interventions by the courts of the country have failed to yield significant outcomes. In fact, over the years, the river has become more polluted and has witnessed a decline, both in its width as well as the size of its floodplains. Furthermore, its surface remains substantially covered with toxic foam and harmful algae bloom. While the effectiveness of the existing laws and policies remain uncertain; the reduced water flow in the river is a key factor propelling its continuous degradation. Thus, no cleaning projects are likely to achieve its objectives unless the floodplains are freed of encroachments and a significant percentage of water available at Hathni - Kund Barrage is released into the river from time to time for ensuring the ecological flows.

Furthermore, since a substantial portion of the pollutants comprise domestic and industrial waste, a combination of biological solutions along with traditional ones should be promoted for sustainable river restoration. For this purpose, bioremediation emerges as a promising intervention for mitigating such contamination, offering friendly ecological solutions. The use of microorganisms demonstrates significant potential in the reduction of pollution in the Yamuna River. Phycoremediation through Cyanobacteria (Blue-Green Algae), Scenedesmus, Klebsormidium, Nephrocytium, Oocystis, Monoraphidium, Chlorococcum, filamentous alga Hydrodictyon reticulatum etc. can play a critical role in the remediation process.

A number of verdicts given by the honorable courts of India and the National Green Tribunal have highlighted that illegal and excessive sand mining along the river has indeed become a significant environmental challenge. Over decades, the plundering of the sand by both legal miners operating under the disguise of leases as well as illegal sand mafias have

exploited the river's floodplains to satisfy the growing demands of the construction industry.

The excessive extraction of sand is unsustainable not only for the flow of the river but also severely disrupts the river's natural balance, triggering a domino effect in terms of ecological consequences. No doubt, sand is a crucial resource for the construction industry, but its unregulated extraction comes with severe consequences for the river ecosystems and surrounding communities. Additionally, the large-scale destruction of the riverbanks has made these areas vulnerable to large-scale encroachment, further compromising the river's fragile ecology. Hence, It is crucial that authorities and local governments take stricter actions to control sand mining and encourage the use of sustainable alternatives. Moreover, enhanced monitoring and enforcement measures are needed to ensure that the environment and local ecosystems are not sacrificed for short-term economic gains.

Lastly, history and culture have always aided in developing consciousness amongst the people, and in Indian society, rivers possess the highest regard. However, in the run up to modernity, we have forgotten to be grateful towards our rivers, and this is why Yamuna (Mata) has become a stream of discolored, stinky waters. Thus, reconciling the connection with the ‘sacred’ river, facilitated by historical, cultural, and ecological perspectives, through initiatives like “Nadi Utsav”, plays a cardinal role in creating awareness and sensitizing people not only about their ecology and environment but also their culture.

It's an reality that no river pollutes itself, it is we who pollute it. The Yamuna is an example of this – a sacred river now lying on the ventilator. The plight of the Yamuna River is a sobering reminder of our collective responsibility toward environmental conservation. The revival of the Yamuna is not just about restoring a river, it's about preserving our heritage, biodiversity, and future. Only through conscious efforts and sustainable practices can we bring the Yamuna back to life or else it will be we who would also be on the ventilator!



UNVEIL THE HIDDEN DANGER OF MOSQUITO COIL: A THREAT TO HEALTH AND ENVIRONMENT

-Himanshu Rajora,
USEM,

Guru Govind Singh Indraprastha University

What if, in our fight against mosquitoes, we unknowingly invite harm by bringing a silent killer into our homes? While mosquito coils promise to shield us from bites, their smoky embrace conceals a toxic reality polluting the air we breathe and silently harming our health and environment. The mosquito repellent coil is widely used in numerous parts of the world like in Asia, Africa and South America, especially during the winter season to repel the mosquitos to prevent diseases like- Malaria, Yellow Fever, Chikungunya and dengue. According to the WHO Report in 1996, the usage of Mosquito Repellent coils across the globe was around 29 billion units. This data shows how these chemical-based mosquito repellent coils are inherent in our practice. Epidemiologist says that "Burning a Single Mosquito coil in a closed room is equivalent to smoking roughly 100 cigarettes" Now you can imagine how badly we are torturing our bodies, moreover with long-term exposure will ultimately lead us to a very Chronic and severe lung diseases, even it can be fatal. The Mosquito Incense is often used

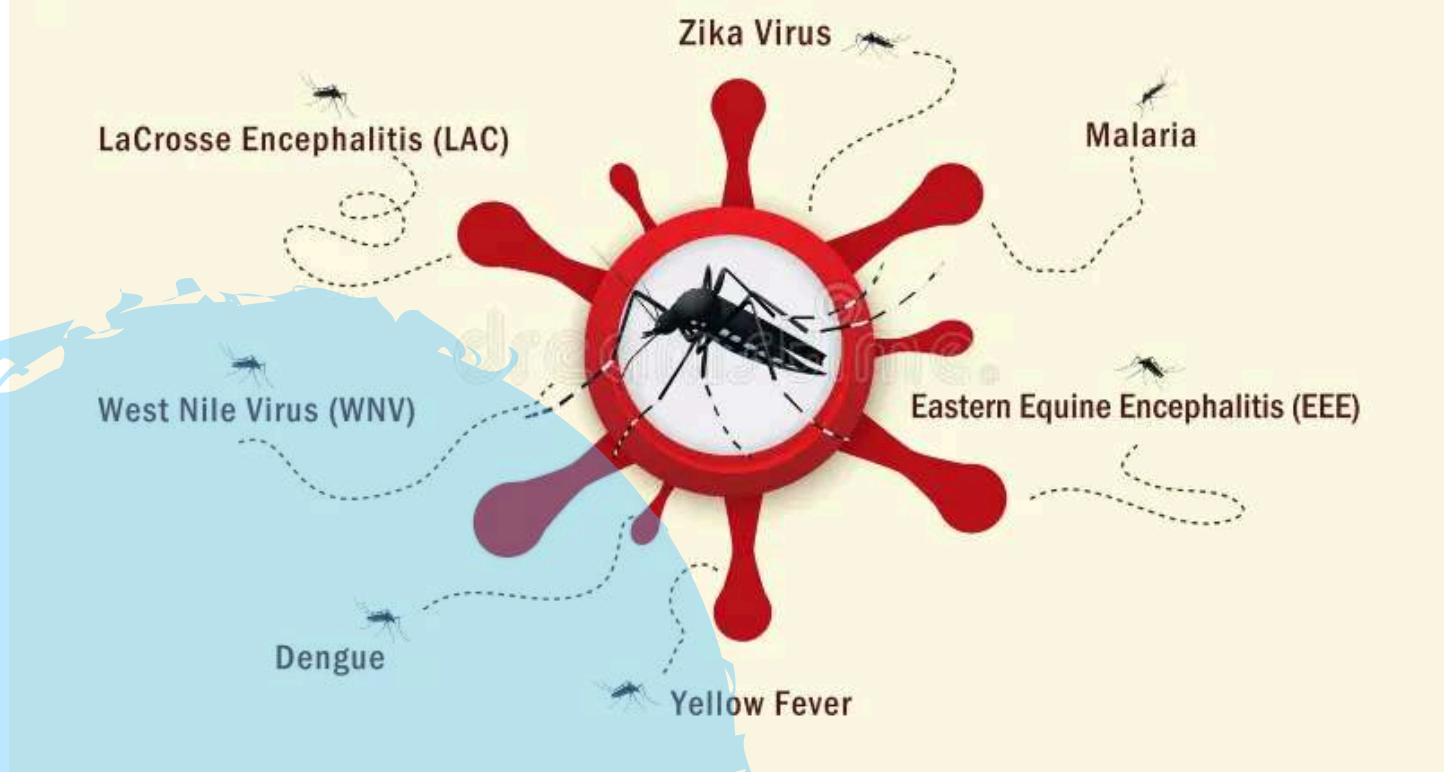
overnight in sleeping quarters, which ultimately increases indoor air pollution to above the threshold level. In the winter season, the particulate matter stays longer in the air due to the cold environment and fewer mosquito repellent coils are commonly utilized in India, However Long-term use of mosquito repellent incense causes neurotoxic and immunotoxin effects, skin allergies, seizures, eye irritation, insomnia, sneezing, dizziness, headache, asthma, and bronchial irritation. Burning the Mosquito coil produces toxic particulate matter (PM 2.5), metal fumes & Vapors which may reach the alveolar region of the lung and cause uncountable devastating respiratory disorders. The impact on most vulnerable groups is more chronic like children, pregnant women and persons who have already suffered from respiratory and cardiovascular Ailment. The leftover ash content is also a big concern because without proper disposal it will affect the soil health. Recent studies have also proven that the smoke of mosquito incense is carcinogenic.

In Taiwan, people frequently use mosquito coils in their households. A case study shows that the number of lung cancer patients who utilized the mosquito repellent coil in their homes is higher. This proves that now we must avoid using these synthetic mosquito's coils to sustain our good health and stop suffocating ourselves with this toxic smoke. Otherwise, it will become a very alarming issue and a serious health concern.

We required an eco-friendly approach to minimize the hazardous consequences on Health and indoor pollution by completely replacing the chemical-based mosquito coils with Herbal Coils. *Sphagneticola trilobate* is a native weed to the northern part of South America and the West Indies. It possesses excellent insecticidal property to protect us from mosquito bites. We can utilize a leaf of this weed to make herbal mosquito-repellent coils. We do need to adapt safer alternatives like: Mosquito nets.

Essential oil-based repellents (citronella, neem). Ultrasonic mosquito repellents. We must come up with new innovative ideas to resolve this Enigma. Meanwhile, it will become a very alarming issue in the coming years. It also opens the door for innovations and ideas to resolve this crisis. It gives an immense opportunity for new startups to grow with eco-friendly mindsets. Which obeys the ESG norms without harming the mother nature. This is the need for the hour to act before the danger of mosquito coils becomes an unmanageable crisis.

MOSQUITO-BORNE DISEASES





A WORLD WITHOUT THE BUZZ: WHAT IF MOSQUITOES WENT EXTINCT?

-ANIKAIT SRIVASTAVA,
USEM,

Guru Govind Singh Indraprastha University

Mosquitoes: Tiny tormentors that buzz in your ear and leave you scratching at itchy red welts. Imagine a world where these pests no longer exist; it may sound like a dream come true, but the ripple effects of their extinction would be more complex than you think.

Mosquitoes are notorious for spreading diseases, such as malaria, dengue, Zika, and yellow fever, claiming millions of lives every year. Mosquitoes are responsible for the death of more people than any other species worldwide. Nearly half of the world's population is at risk of contracting a disease from their bites, and the impact extends to livestock and other animals. Without mosquitoes, the immediate benefits to human health would be monumental, as global health systems would experience unprecedented relief, saving billions in health care costs and lives that might otherwise be lost. Eradication of mosquitoes would provide a long-term solution to the life-threatening diseases they carry, but mosquitoes are not the problem per se. The real issue lies in their role as vectors, unwitting hosts that transmit pathogens from one source to another.

Mosquitoes are integral to many ecosystems. More than 3,500 species of mosquitoes exist, and only 100 of them feed on human blood. Most play a role in pollination, especially in areas where they are among the few insects active during twilight hours. In the Arctic region, mosquitoes serve as a critical food source for migratory birds, whereas in tropical areas, they serve as prey for frogs and other insect-eating animals. However, is the mosquito's ecological role irreplaceable? Many scientists argue that the niche currently occupied by mosquitoes would be taken over by other organisms; for example, pollination might be taken over by bees, butterflies, or other flies, and predators, such as frogs and dragonflies, might adapt by prying on alternate species. While this adaptability is plausible, the process could take decades, if not centuries, and may still leave certain ecosystems destabilized.

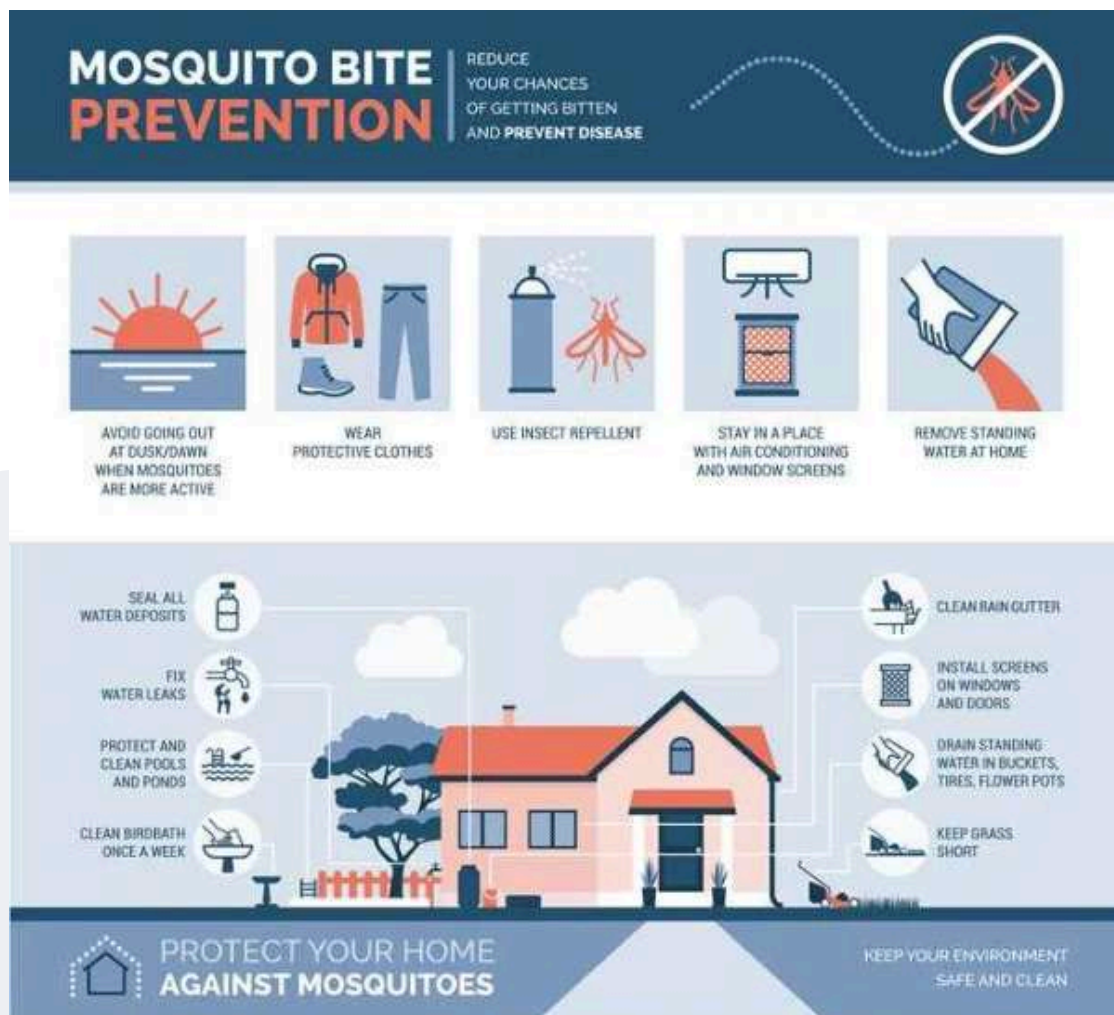
From a scientific standpoint, the eradication of mosquitoes has not been entirely theoretical. Researchers at Oxford University have developed a method involving genetic modification of the male mosquito species

(*Aedes aegypti*) responsible for carrying the gene for Zika virus. By introducing a self-limiting gene into male mosquitoes, they ensured that when these modified males mate with wild females, their offspring inherit the gene and die before reaching adulthood. This approach has led to significant reductions in mosquito populations during field trials, with decreases exceeding 90% in areas such as Brazil and the Cayman Islands. Genetically modified mosquitoes and their offspring carry a fluorescent marker, facilitating easy monitoring. As a significant step forward, Brazil's National Biosecurity Technical Commission approved the release of these mosquitoes nationwide.

Although the complete eradication of mosquitoes remains hypothetical, largely due to the infeasibility of deploying these methods on a global scale, millions of mosquitoes would be needed, even for a small area. Alternative technologies have also been developed.

For instance, a newly developed sensor can identify mosquito species, allowing individuals to wear the device and receive alerts regarding disease-carrying mosquitoes. This technology could play a significant role in monitoring and preventing future outbreaks. Additionally, researchers are investigating why mosquitoes are drawn towards specific body odors, a discovery that could lead to the creation of more effective mosquito repellents.

Ultimately, the question is not just about what we can do but what we should do. Mosquitoes, for all their notoriety, are a testament to the interconnectedness of life on Earth. Their extinction could alleviate immense suffering, but it also serves as a reminder of the intricate web relationships that sustain our planet. A world without mosquitoes might be quieter and more comfortable, but it would also be a world forever changed.





DEFORESTATION - A LOOMING CRISIS THREATENING OUR PLANET'S FUTURE

-Ankur Goel

Director, Copper Cross Solutions

Deforestation, the large-scale removal of trees and forests, is one of the most pressing environmental challenges faced by humanity. With forests covering about 31% of the Earth's land area, their role in maintaining ecological balance, supporting biodiversity, and regulating climate is irreplaceable. Yet, widespread deforestation continues at an alarming rate, driven by agricultural expansion, urbanization, infrastructure development, and commercial logging. The consequences of this relentless destruction extend far beyond just the loss of trees, impacting climate patterns, biodiversity, soil quality, and human livelihoods.

The destruction of forests disrupts the delicate equilibrium of the environment. Trees play a crucial role in absorbing carbon dioxide, acting as natural carbon sinks that mitigate the effects of climate change. When vast stretches of forests are cleared, the stored carbon is released back into the atmosphere, contributing significantly to global warming. The increased carbon emissions lead to rising temperatures, extreme weather events, and an imbalance in natural ecosystems. The Amazon rainforest, often referred to as the "lungs of the Earth,"

is a prime example of this phenomenon. In recent years, deforestation in the Amazon has reached unprecedented levels, turning parts of this critical ecosystem from carbon sinks into carbon sources.

Apart from climate implications, deforestation has devastating effects on biodiversity. Forests are home to about 80% of terrestrial species, providing shelter, food, and breeding grounds for countless organisms. The destruction of these habitats forces species into smaller areas, increasing competition for resources and driving many toward extinction. The loss of biodiversity has a cascading impact on entire ecosystems, affecting predator-prey relationships, pollination processes, and the overall stability of nature. Iconic species such as orangutans in Borneo, tigers in Southeast Asia, and jaguars in South America are among those severely threatened by habitat destruction. The delicate interconnections within ecosystems are disrupted, making it harder for species to adapt and survive.

Soil degradation is another major consequence of deforestation. Trees play a crucial role in maintaining soil structure by preventing erosion

and enhancing nutrient cycling. When forests are cleared, the exposed soil becomes vulnerable to wind and water erosion, leading to the loss of fertile topsoil. This degradation reduces agricultural productivity and increases the risk of landslides, particularly in hilly terrains. In regions like Madagascar and parts of the Indian subcontinent, unchecked deforestation has resulted in barren landscapes where the soil is no longer capable of supporting plant growth. Once the land loses its fertility, it becomes increasingly difficult to restore it, leading to long-term consequences for food security and livelihoods.

The impact of deforestation extends to hydrological cycles as well. Forests play a significant role in maintaining the water balance by absorbing and releasing moisture into the atmosphere. When trees are removed, the rate of evaporation decreases, leading to reduced rainfall and prolonged droughts in many regions. This, in turn, affects agricultural yields and the availability of freshwater resources for communities. The Amazon rainforest, for instance, generates its own rainfall through a complex process of transpiration, but as deforestation continues, the reduced moisture content contributes to a decline in precipitation. This has severe consequences for local populations who depend on consistent rainfall for farming and sustenance.

Deforestation is not merely an environmental issue; it is also a social and economic challenge that affects millions of people, particularly indigenous communities. Many of these communities rely on forests for their livelihoods, cultural heritage, and sustenance. When forests are destroyed, indigenous groups lose access to medicinal plants, traditional food sources, and sacred sites. Moreover, deforestation often leads to conflicts over land rights, as commercial interests encroach upon indigenous territories. In countries such as Brazil and Indonesia, disputes over forested land have escalated into violent confrontations between local communities and corporations seeking to exploit natural resources. The displacement of indigenous populations further exacerbates

social inequalities and undermines efforts to protect cultural diversity.

One of the primary drivers of deforestation is agricultural expansion. Large-scale farming operations, particularly for crops such as soy, palm oil, and cattle ranching, account for a significant proportion of forest loss. The demand for palm oil, used in a wide range of products from cosmetics to processed foods, has led to extensive deforestation in Southeast Asia. Similarly, the clearing of forests for cattle grazing in the Amazon has contributed to the loss of millions of hectares of forest cover. The irony of this expansion is that while it aims to boost food production, the long-term consequences include soil degradation, reduced agricultural yields, and increased vulnerability to climate change.

Urbanization and infrastructure development further contribute to deforestation. As cities expand to accommodate growing populations, forests are often cleared to make way for roads, residential areas, and industrial zones. Infrastructure projects, such as highways and dams, fragment forest landscapes, disrupting wildlife corridors and making it harder for species to migrate and adapt to changing environments. While economic development is essential, a balance must be struck between progress and environmental conservation to ensure that future generations do not bear the brunt of unchecked deforestation.

Illegal logging is another major contributor to forest loss. Despite regulations and conservation efforts, illegal logging continues to thrive, driven by high demand for timber and weak enforcement of environmental laws. The trade of illegally harvested wood not only leads to forest depletion but also fuels corruption and organized crime. Many forests in Africa, Southeast Asia, and the Amazon are particularly vulnerable to illegal logging, as enforcement agencies often lack the resources to combat this widespread issue. Strengthening legal frameworks, promoting sustainable forestry practices, and increasing global cooperation are crucial to addressing this challenge.

The good news is that efforts to combat

deforestation are gaining momentum worldwide. Governments, environmental organizations, and grassroots movements are working together to implement sustainable forestry practices, reforestation programs, and conservation initiatives. Several countries have committed to restoring degraded forests and increasing protected areas to safeguard biodiversity. Initiatives such as the Bonn Challenge and the Trillion Trees Campaign aim to restore millions of hectares of forested land, reversing some of the damage caused by deforestation.

Technological advancements are also playing a vital role in monitoring and preventing deforestation. Satellite imagery, artificial intelligence, and remote sensing technologies enable real-time tracking of forest cover changes, allowing authorities to detect illegal activities and take swift action. Community-led conservation efforts, where local populations are actively involved in protecting forests, have proven to be highly effective in regions such as the Amazon and Central Africa.

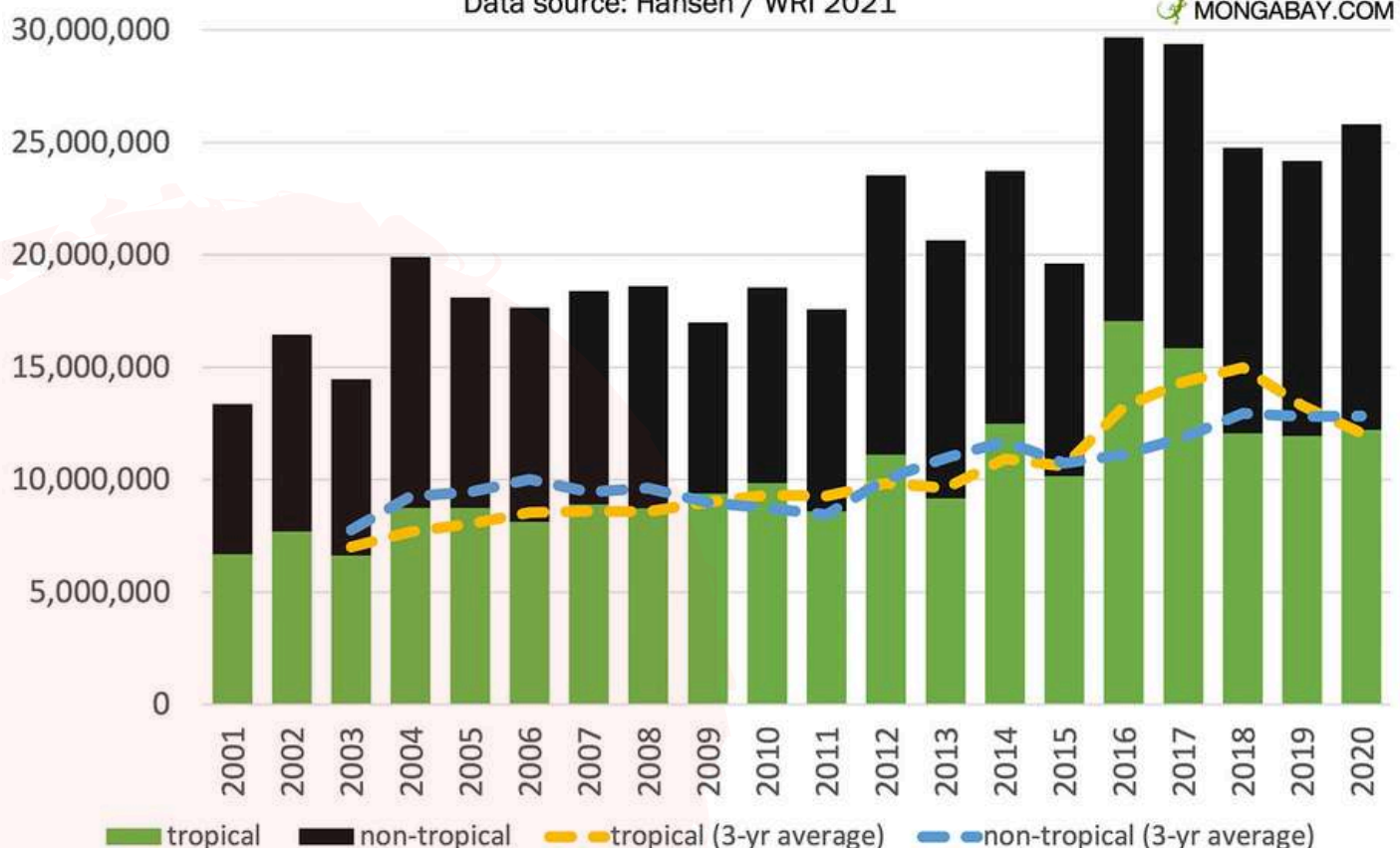
On an individual level, people can contribute to forest conservation by making conscious choices in their daily lives. Supporting sustainable products, reducing paper and wood consumption, and opting for eco-friendly alternatives can collectively make a difference. Consumers play a powerful role in shaping market demand, and by choosing sustainably sourced goods, they encourage companies to adopt responsible practices.

Deforestation is a multifaceted issue with far-reaching consequences for the planet and humanity. While the challenges remain significant, there is hope in the growing awareness and collective action being taken to address the problem. Protecting forests is not just about saving trees; it is about preserving biodiversity, maintaining climate stability, and ensuring a sustainable future for generations to come. The path forward requires collaboration between governments, businesses, and individuals to find a balance between development and conservation, ensuring that forests continue to thrive as vital components of the Earth's ecosystem.

Global tree cover loss, 2001-2020

Data source: Hansen / WRI 2021

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MOVIE

RECOMMENDATION

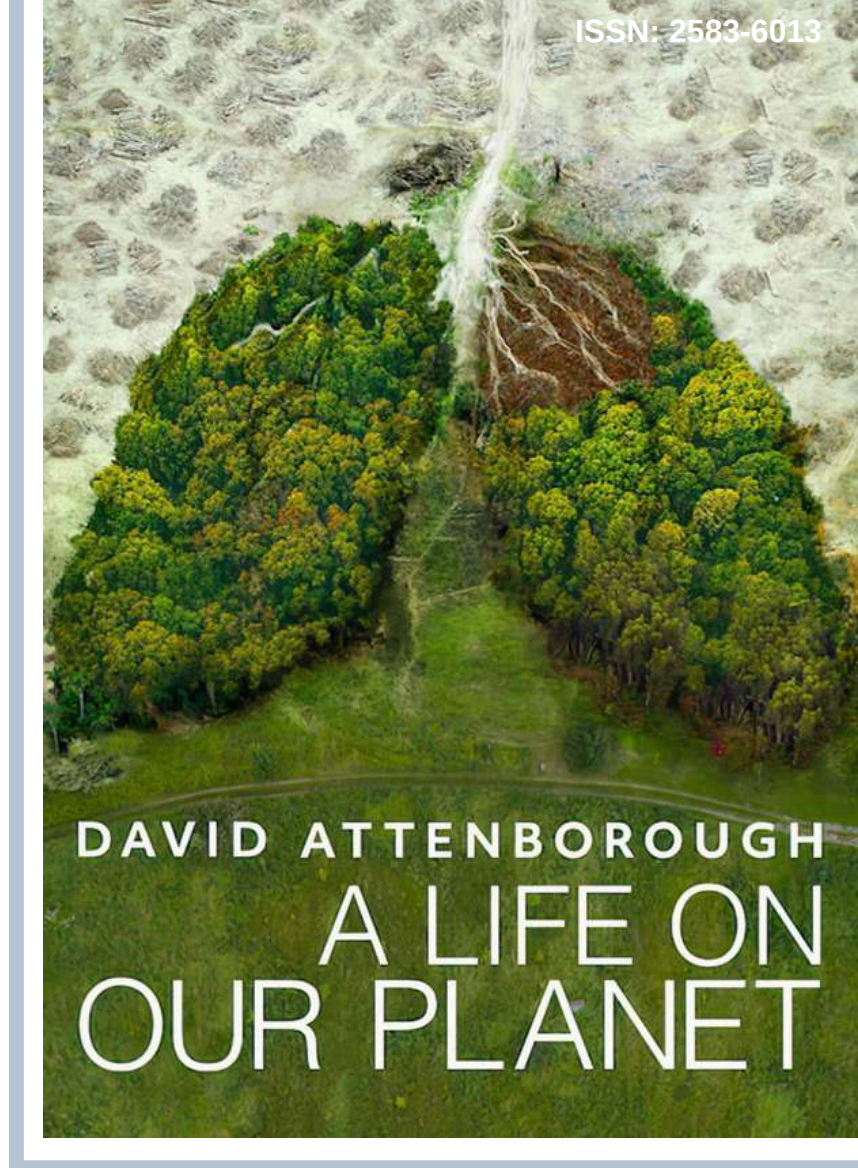
DAVID

ATTENBOROUGH:

A LIFE ON OUR

PLANET

David Attenborough: A Life on Our Planet is a 2020 British documentary film narrated by David Attenborough and produced and directed by Jonnie Hughes. The film acts as a "witness statement", through which Attenborough shares first-hand his concern for the current state of the planet due to humanity's impact on nature and his hopes for the future. It was released on Netflix on 4 October 2020, along with a companion book *A Life on Our Planet*.



PLOT SYNOPSIS

David Attenborough: A Life on Our Planet (2020) is a powerful documentary in which Sir David Attenborough reflects on the profound environmental changes that have taken place during his lifetime. Acting as both a witness statement and a call to action, the film juxtaposes the breathtaking beauty of the natural world with the devastating impact of human activities such as deforestation, climate change, and biodiversity loss. Attenborough takes viewers on a journey through time, illustrating how human expansion and industrialization have disrupted ecosystems and pushed the planet toward an uncertain future.

He warns that if current trends persist, the consequences will be catastrophic, leading to ecosystem collapse and global instability. However, the documentary also presents a message of hope, outlining practical solutions to restore balance. Attenborough advocates for renewable energy, sustainable food production, and rewilding, showing how nature can recover when given the chance. Through stunning archival footage and key historical moments, he demonstrates both the scale of environmental destruction and the resilience of the natural world.

Attenborough highlights successful conservation efforts and stresses the need for urgent, global cooperation. The documentary urges individuals, governments, and corporations to take action, reinforcing that the fate of the planet lies in our hands.

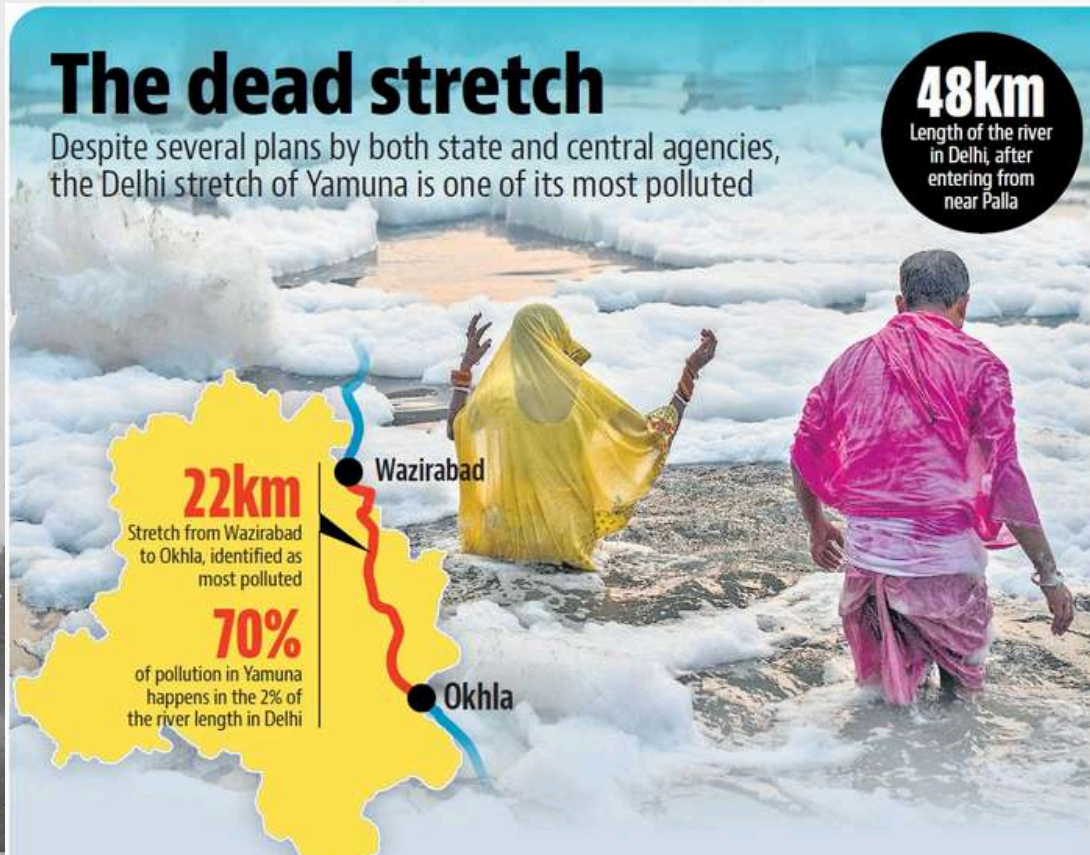
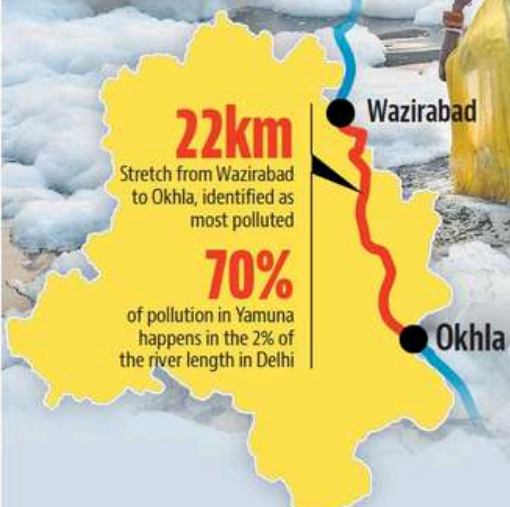
Ultimately, **David Attenborough: A Life on Our Planet** serves as both a stark warning and an inspiring vision for a sustainable future, leaving viewers with a deep sense of responsibility and hope.

SOURCE:-[HTTPS://EN.WIKIPEDIA.ORG/WIKI/DAVID_ATTENBOROUGH:_A_LIFE_ON_OUR_PLANET](https://en.wikipedia.org/wiki/David_Attenborough:_A_Life_on_Our_Planet)

The dead stretch

Despite several plans by both state and central agencies, the Delhi stretch of Yamuna is one of its most polluted

48km
Length of the river in Delhi, after entering from near Palla



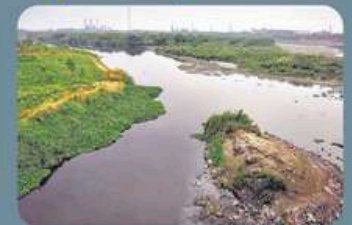
Agencies involved

- DJB - for sewage networks
- DSIIDC - for industrial effluents and CETPs
- Upper Yamuna River Board - for inter-state management and e-flow
- DDA - for flood plain maintenance
- MCDs - for solid waste and effluents in unplanned areas
- Neighbouring states: UP and Haryana

Previous restoration plans

- Yamuna Action Plan 1 (1993-2003)
- Yamuna Action Plan 2 (2003--continuing)
- Interceptor sewer project (2006)
- Nirmal Yamuna revitalisation project (2017)
- Key projects under Namami Gange (Yamuna is a tributary)
- Series of NGT judgments (2015-2019)

Experts speak



- Ecological flow should be restored
- Unplanned urbanisation should be checked
- Prioritise tackling industrial pollutants
- Formulate comprehensive plan involving neighbouring states

Delhi govt's 6-pt action plan

- Capacity of sewage treatment plants to be increased to 850MGD, upgrading of existing facilities
- In-situ treatment with new technology in 4 drains: Najafgarh, Badshahpur, Supplementary and Ghazipur
- CETP to be made functional/upgraded and violators units to be shut down
- Community toilets in JJ clusters, effluents to be linked to sewage system
- Increasing household sewage connections
- Desilting and rehabilitation of sewer system

Causes of pollution

- Solid waste dumping
- Raw sewage from unplanned areas
- Discharge from habitations and dhobi ghats
- Untreated industrial effluents
- Practices like idol immersion

Main polluting drains

Najafgarh, Supplementary, Shahdara



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