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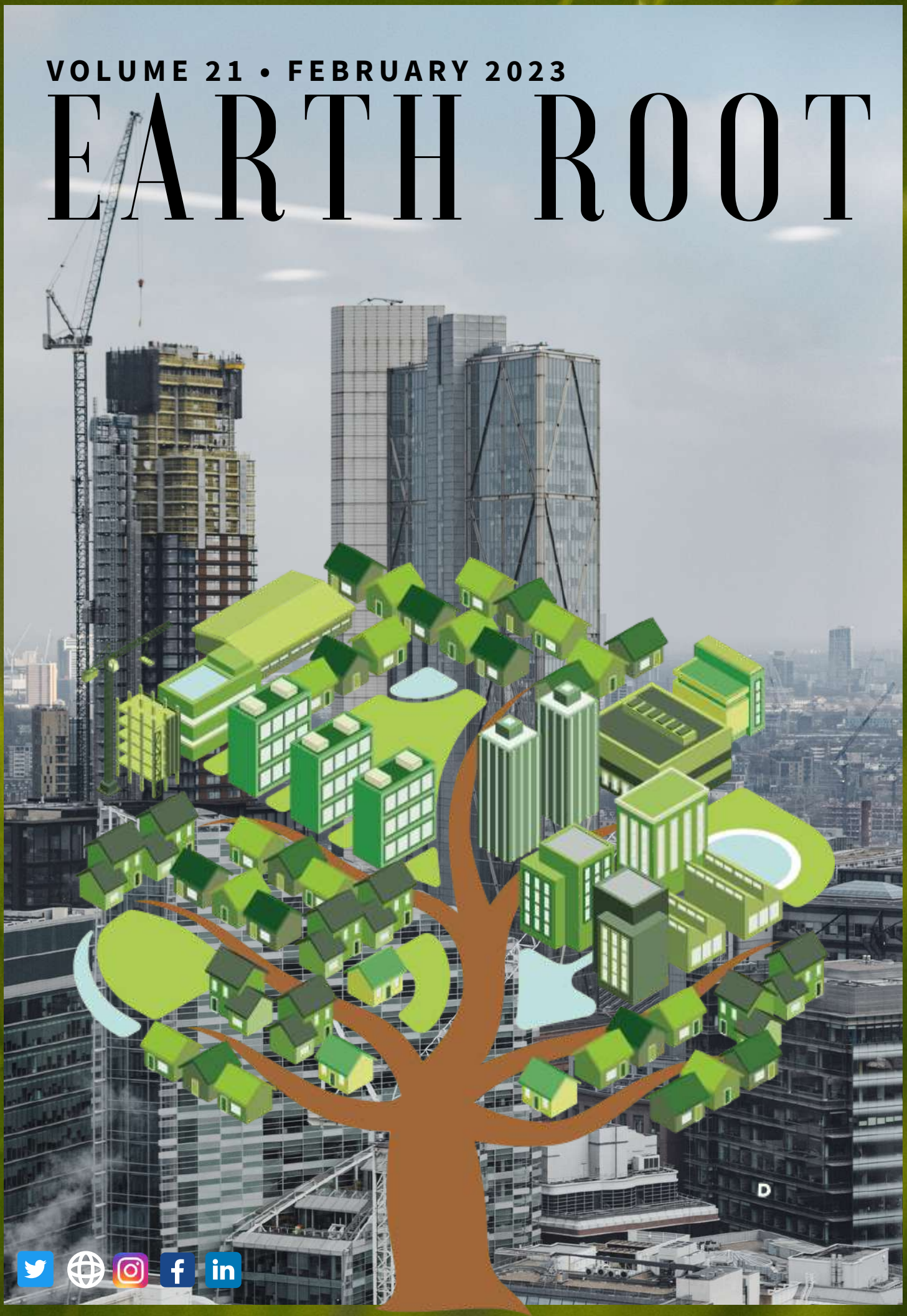
# EARTH ROOT



# 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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| **Phone No. -** | 011 49064364 |
| **Email ID -** | info@earthrootfoundation.org<br>vivekpanwar@earthrootfoundation.org |
| **Mobile No. -** | +91 876631774 +91 99990013202 |
| **Website -** | www.earthrootfoundation.org |
| **Address -** | 456, pocket B, Sector -13 Dwarka, New Delhi -110078 |

# Editorial Board


**Dr. Vivek Panwar**

**Editor-in-Chief**

Assistant Professor, Department of Physics & Electronics, Rajdhani College, University of Delhi, Ring Road, Raja Garden, New Delhi – 110015, India

Email: vivek.panwar@rajdhani.du.ac.in

Profile Link: https://www.rajdhanicollege.ac.in/Base/faculty/173



**Prof. Surendra Kumar Dhaka**

**Editor**

Professor, Department of Physics & Electronics, Rajdhani College, University of Delhi, Ring Road, Raja Garden, New Delhi – 110015, India

Email: skdhaka@rajdhani.du.ac.in

Profile Link: https://www.rajdhanicollege.ac.in/Base/faculty/159



**Dr. Narendra Singh**

**Editor**

Aryabhatta Research Institute of Observational Sciences (ARIES), Manora Peak, Nainital – 263001, Uttarakhand, India

Email: narendra@aries.res.in

Profile Link: https://www.aries.res.in/people/user-profile/sci/76



**Dr. Deeksha Katyal**

**Editor**

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Email: deekshakatyal@ipu.ac.in

Profile Link: http://www.ipu.ac.in/usem/Assistant_Professors.php



**Dr. Pawan kumar**

**Editor**

Assistant Professor, Department of Chemistry,
Rajdhani College, University of Delhi, Ring Road, Raja Garden, New Delhi – 110015, India

Email: drpkumar@rajdhani.du.ac.in

Profile Link: https://www.rajdhanicollege.ac.in/Base/faculty/248

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# Importance of Biological Processes for Pollution Control

*Gungun Mishra*
*Ramjas College, University of Delhi,*

Pollution is a major problem created mainly by overloading human population, rapid economic growth and anthropogenic activities. The multidimensional pollution caused by barely processed plastic waste are mainly Land Pollution (depletion of fertile land area), Water Pollution (dumping of wastes into water bodies), Air Pollution (accumulation of harmful gases into atmosphere), are all aggravating environmental pollution leading to severe issue worldwide. Such environmental degradation and pollution cause deterioration of the environment and natural resources including soil, water, and air; the loss of ecosystems; and the extinction of wildlife.

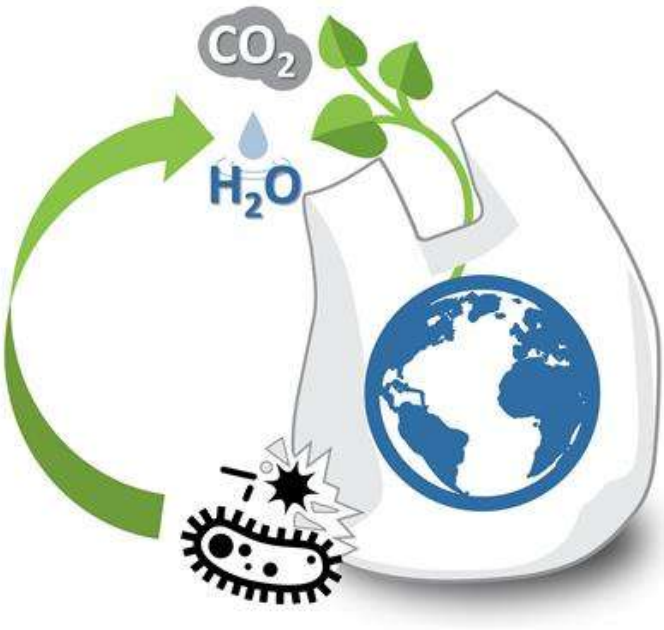


**Figure: Showing Microbial Degradation of Plastics**

Plastic products have become an integral part of our daily life such as packaging or wrapping materials, shopping/garbage bags, containers, toys, household items, industrial products, and building materials.

Plastic being cheap and versatile is a huge and unavoidable menace for the society. Easy availability and inexpensive nature of plastic has cost us a lot. Human activities with plastic further pollute or degrade the quality of soils and land utility. It negatively disturbs food production, livelihoods, climate changes, and marine ecosystem. As per Swachh Bharat Mission Plastic Wate Book Report (March 2019), production of plastic globally is around 150 million tonnes per year. According to the reports for year 2017-18, Central Pollution Control Board (CPCB), India has projected that India produces approximately 9.4 million tonnes per annum plastic waste, (that is 26,000 tonnes of waste per day). Around 5.6 million tonnes per annum of plastic waste is recycled (which is about 15,600 tonnes of plastic waste per day) and 3.8 million tonnes per annum of plastic waste is left uncollected or littered. Major share of these uncollected or littered plastic waste goes in open dump yards, water bodies and landfills hampering our planet's biodiversity and posing major risk to living. However, a lot of methods were taken up to solve the bulkiness and recycling of plastic waste but actions like 'Reuse, Reduce and Recycle' got beaten by the irresponsible consumption and exceeding demands of plastic use by the growing population and economic growths.

Pollution degradation by biological systems and reutilization of the by-products generated by its treatment is a highly effective measure to solve threats of plastic waste accumulation and enhance plastic waste management system.

Image Source: https://www.frontiersin.org/research-topics/8688/microbial-degradation-of-plastics

Some micro-organisms like algae or bacteria and worms have been found suitable to control such pollutions. For example, an environment-friendly solution includes use of the Wax Worm (Galleria mellonella) which helps to degrade polyethylene (PE) by oxidation and depolymerisation with its salivary enzymes.

Polyethylene (PE) is the most commonly produced and stable polyolefin derived plastics accounting for 30% of synthetic plastic production, hence contributing majorly to the plastic waste pollution. Further adding to the struggle, PE is also one of the most resistant polymers, and non-biodegradable waste with very long C-C chains making it hydrophobic in nature. Its crystalline form, and dense structure makes it tougher to undergo its biodegradation process. The high energetic cost of PE chemical treatment further creates problem for its Sustainable Plastic Waste Management Plan.

Biodegradation emerges out as a promising technique for treatment of Polyethylene Waste.

It refers to environmental degradation of long polymeric chains in presence of abiotic factors such as air, light to form smaller molecules which can be further metabolized easily by biological agents. The crucial step in degradation of PE by biological agents is the oxidation of polymeric chains within them, which can be a long process if Polyethylene (PE) polymers are not pre-treated (using heat or UV exposure methods). It takes years by abiotic factors to introduce oxygen atom into these chains which has to go further to be treated by micro-organisms. No enzyme from any micro-organisms have been identified that has the potential to degrade PE or plastics of other classes, if not pre-treated.

The insects mainly from the order: Lepidopterans and Coleopterans have been found out to be capable of biodegradation to certain extend. One such example is the larvae of Wax worms, Galleria mellonella, which has enzymes namely demetra, arylphorin and Ceres, hexamerin.

These enzymes are phylogenetically related to phenol-oxidases (enzymes targeting aromatic rings) and hemocyanin, an oxygen transporting protein that too shows phenoloxidase activity. These enzymes brings about the scission of the long polymeric hydrocarbon chains of Polyethylene into smaller molecules within few hours as observed under Gel Permeation chromatography (GPC) method. The confirmatory deterioration due to polymer oxidation was found by RAMAN spectroscopy.

The action of the salivary enzymes of wax worm larvae is equivalent to the abiotic pre-treatment of PE in shorter duration. It overcomes the problem of lingered-on mechanism of polymer oxidation which is the first and most important step of PE Degradation. These enzymes are referred to as, PEases (causing Lysis of Polyethylene) and are the first enzymes capable of producing such modifications on a PE film working at room temperature in a short duration. The identification of invertebrate enzymes capable of oxidizing PE in a few hours provides a parallel solution in the field of plastic degradation and opening up various possibilities which may help to solve the plastic waste pollution issue.

Several researches have implied the ability of enzymes Demetra and Ceres to break the Polyethylene polymer chain and their action against the C-C bonds, alkanes and plant phenolic, a constituent of Pollen and wax material present in the ecological niche. These enzymes in natural host provide storage, immunity and defence against plant phenolic extracts. Hence, such innate ability may help to deal with the toxic phenolic groups found out around them. Larvae of Galleria mellonella are armoured by similar enzymes. Utilizing the wax worms defence mechanism may turn out to be degradation mechanism for plastics or related non-biodegradable products around our ecological surroundings. How benevolent of Nature!

# URBAN PLANNING IN A SUSTAINABLE WAY

Semanthi Deb
University School of Environment Management, GGSIPU

The present human population is experiencing rapid urban sprawl. 68% of the world's population is projected to be urban by the year 2050. Megacities are emerging, and with the overall growth of the world's population, cities are facing challenges with their social systems, natural resource management, housing, transport, and infrastructure, to name a few.
Urban greening refers to public landscaping and urban forestry projects that create mutually beneficial relationships between city dwellers and their environments, in short, it means making urban areas green

Numerous benefits come with urban green planning. Residents get the opportunity of exposure to nature, urban biodiversity is well maintained and protected, environmental hazards like air and noise pollution are reduced in the residential areas, repercussions of extreme weather conditions like floods, heatwaves, and extreme rainfall are mitigated, quality and status of urban living is enhanced, health and well being of residents is improved.

Environmental awareness has led to sustainable area planning of cities. Cities are being built with features like LEED-certified buildings, carbon offsetting, urban forestry, reduced air pollutant output, open-space infrastructure, and green roofs.

Studies show that individuals prefer to pay more rent and live in buildings with a green cover or which are green-certified. Cities are now supporting growing urbanization with green buildings. These buildings take up a lesser land area compared to traditional grey infrastructure and depict the potential for the survival of plants and animal communities alongside humans.

Urban planning has evolved over the years, and tall buildings are being designed infused with vegetation. Such ideas are top-notch as they integrate ecosystem services with the urban planning of cities. The Bosco Verticale in Milan, Italy, is a prominent example of such a building.

**Figure 1 Green buildings, Source: ESA Business Applications: Online**

Urban ecology practiced rightly has led to species preservation. Trees are monitored, protected, and their habitats are mapped, which has resulted in increased transpiration rates and increased biomass production in the urban area.

**Here are some ways by which Urban Planning can be followed sustainably:**

1. **Promoting Urban agriculture**

By mapping out agricultural land in an urban area, we can combat the problems of long supply chains and high CO2 emissions while transporting food from rural to urban areas. Food distribution becomes easy, and people can access nutritious food in the cities.

**Figure 2 Urban green spaces, Source: Inhabitat Pinterest: Online**

2. **Reducing and managing food waste**

Urban areas solely; are responsible for 70% of the global food supply. Poor food planning, loose packaging, improper storage, and cultural practices have led to food waste piling up in city landfills. In the landfills, the waste decomposes and generates methane, which is a harmful Greenhouse gas.

3. **Building green spaces**

Green spaces improve air quality, mitigate city temperatures, reduce the heat island effect, reduce surface runoff, encourage physical activity and health, and also boost the aesthetic appeal of the city. Green urban spaces like large landscaped parks act as the “lungs of the city.” Green corridors, green roofs, green facades further strengthen the city’s green landscape.

4. **Connecting cities with nearby rural areas**

Cities are heavily dependent on their adjacent rural areas for the labor force, food transport, water, and food waste disposal. Urban planning can be done to incorporate urban and large rural areas and interconnect them to enjoy varied ecosystem services.

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2.https://www.ansgroupglobal.com/blog/importance-urban-greening

Many projects are being actively taken up by different organizations and nations to implement urban greening plans. One such initiative is taken up by London, called the “London urban greening plan.” The plan enunciates the aim to increase the amount of surface area greened in the Central Activities Zone by 5% by 2030, and a further 5% by 2050. The plan also highlights London’s aim to plant an extra two million trees in the city by 2025. These plans were introduced in hopes of reducing the local temperatures of the city after London faced a major heatwave in 2003 that led to the death of over 600 individuals in the city.

In recent times, various other urban green infrastructures like living walls and green roofs are being introduced. Urban greening has the potential to combat climate change and offer an eco-friendly lifestyle to urban citizens.

Urban ecology uses green infrastructures and green planning to embrace nature and design cities that are sustainable and made for the future. We must work with nature, inculcate the native ecosystems, enjoy the ecological productivity that nature has to offer, and see our cities change for the better.

# GREEN HYDROGEN: THE FUEL FOR A SUSTAINABLE FUTURE

*Geetika Singh*

*University School of Environment Management, GGSIPU*

Green hydrogen is a clean and sustainable energy source that has the potential to revolutionize the way we generate and use energy. Unlike traditional hydrogen, which is produced from fossil fuels and releases carbon emissions in the process, green hydrogen is produced through the electrolysis of water using renewable energy sources such as solar or wind power.

As global energy demand continues to increase, green hydrogen is being hailed as a sustainable, scalable energy source with high energy density to meet that demand while also reducing the environmental impact of the current non-renewable energy sources. The fact that green hydrogen can be produced from a wide variety of renewable energy sources is one of its primary benefits. This makes it a highly sustainable fuel source, as it does not rely on finite resources such as fossil fuels.

Additionally, the production of green hydrogen does not produce any greenhouse gas emissions, making it a key tool in the fight against climate change. The versatility of green hydrogen is yet another advantage. It can be used in a wide range of applications, including transportation, heating, and power generation. For example, hydrogen fuel cells can be used to power vehicles, boats, and trains, while hydrogen boilers can be used for heating buildings. Additionally, hydrogen can be used as a storage medium for renewable energy, allowing excess energy to be stored for later use. Despite the many advantages of green hydrogen, several challenges need to be addressed for it to become a major source of energy.


One of the main challenges is the high cost of producing hydrogen from renewable energy sources. Currently, the cost of producing hydrogen from renewable energy sources is significantly higher than the cost of producing hydrogen from fossil fuels. This makes it less competitive with other energy sources and limits its potential for widespread adoption. Another challenge is the lack of infrastructure for producing, storing, and transporting hydrogen and hence making it difficult to produce and transport hydrogen in large quantities and limiting its potential for widespread use.

However, many countries and organizations are investing in the development of green hydrogen technologies and infrastructure, and there are several pilot projects currently underway to demonstrate the feasibility of green hydrogen. Developing countries with superior renewable energy resources are also working towards the production of green hydrogen locally, creating new economic opportunities and increasing energy security by reducing the risk of oil price volatility and supply disruptions.

Image Source:- www.prescouter.com


One such step taken by India in that direction is the introduction of the National Green Hydrogen Mission. This mission aims to promote the deployment of the green hydrogen ecosystem and create new opportunities for innovation and investment across the green hydrogen value chain thus playing a key role in India's energy transition, especially in the decarbonization of the energy sector.

As a result, green hydrogen, which is produced by electrolysis and powered by renewable electricity, is emerging a popular energy source all over the world.

It can further contribute to the decarbonization of industry, transportation, and buildings by producing climate-adaptive power, providing zero-emission process heat, clean mobility options, and hence creating a new energy paradigm that is needed to achieve sustainable climate goals in this crucial phase of the energy transition.

It was during my Master's thesis. I did an internship in the Italian National Agency for Energy and Environment (ENEA), where I learnt about sustainable development and energy, and the nexus between the two. I wrote my thesis in management engineering about it and decided this was the area where I wanted to focus my working life. Fast forward almost 20 years of experience in energy and international cooperation, a PhD in Energy Technology and time spent in private sector, research and intergovernmental agencies, I currently lead the power sector transformation team at IRENA since 2017.

My work at IRENA is to contribute, with my team and in close cooperation with colleagues across the agency and external partners such as the World Economic Forum, in supporting our 166 Member Countries in the energy transition, with a focus on renewable electricity supply and its use to decarbonize the energy sector through green electrons as well as green molecules like hydrogen and its derivatives.

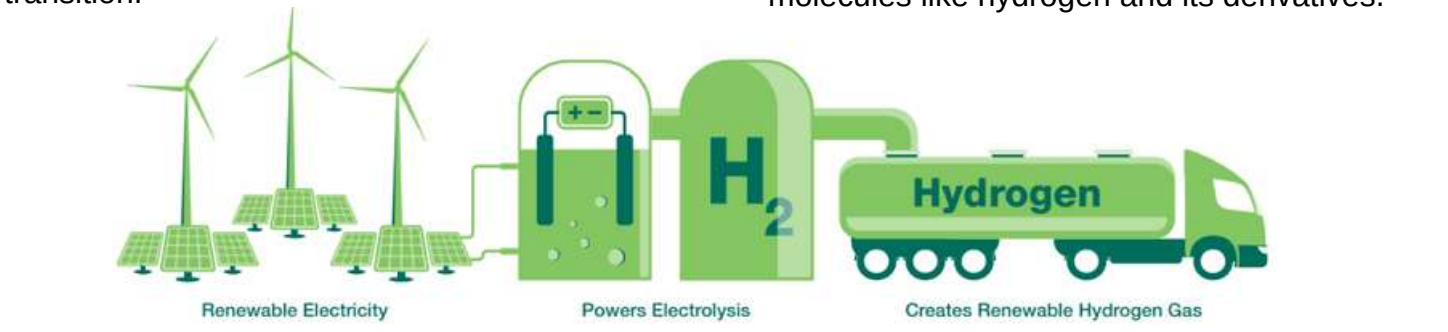



Image Source: -
hhttps://www.un.org/africarenewal/sites/www.un.org.africarenewal/files/images/hydrogen-electrolysis-concept.jpg

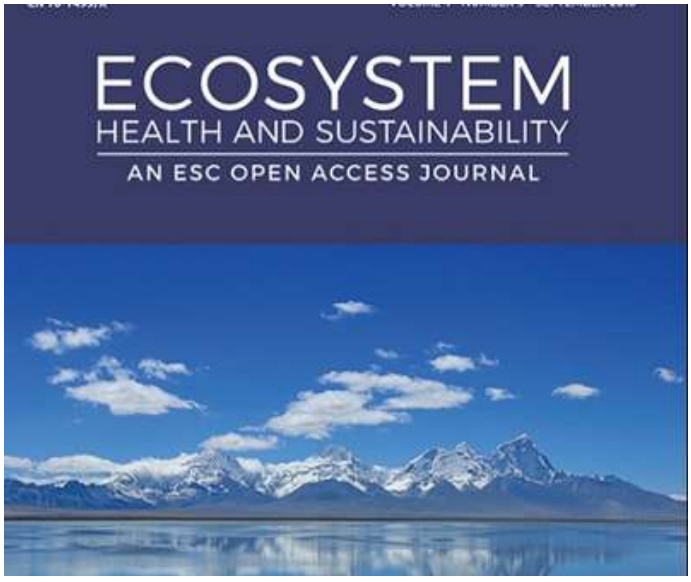
# Impact of global warming on biodiversity

Nimarpreet Kaur
Mata sundri college for Women, University of Delhi

Biological diversity is the variety of life on Earth, in all its forms as well as including all the things which come in environment, from genes and bacteria to entire ecosystems such as forests or coral reefs. The biodiversity we see today is the result of 4.5 billion years of evolution, increasingly influenced by humans.

Biodiversity forms the web of life that we depend on for so many things – food, water, medicine, a stable climate, economic growth, among others. Over half of global GDP is dependent on nature. More than 1 billion people rely on forest for their livelihoods. And land and the ocean absorb more than half of all carbon emissions.

But nature is in crisis. Up to one million species are threatened with extinction, many within decades. Irreplaceable ecosystems like parts of the Amazon Rainforest are turning from carbon sinks into carbon sources due to deforestation. And 85 per cent of wetlands, such as salt marshes and mangrove swamps which absorb large amounts of carbon, have disappeared.




**How is climate change affecting biodiversity?**

The main driver of biodiversity loss remains humans' use of lands – primarily for production. Human activity has already altered over 70 per cent of all ice-free land. When land is converted for agriculture, some animal and plant species may lose their habitat and face extinction.

But CLIMATE CHANGE is playing an increasingly important role in the decline of biodiversity. Climate change has altered marine, terrestrial, and freshwater ecosystems around the world. It has caused the loss of local species, increased diseases, and driven mass mortality of plants and animals, resulting in the first climate-driven extinctions.

On land, higher temperatures have forced animals and plants to move to higher elevations or higher latitudes, many moving towards the Earth's poles, with far-reaching consequences for ecosystems.

Overall, climate change affects thed health of ecosystem, influencing shifts in the distribution of plants, viruses, animals, and even human settlements. This can create increased opportunities for animals to spread diseases and for viruses to spill over to humans. Human health can also be affected by reduced ecosystem services, such as the loss of food, medicine and livelihoods provided.

There is already evidence to suggest that reductions in water vapour in the atmosphere since the 1990s has resulted in 59% of vegetated areas showing pronounced browning and reduced growth rates worldwide.



SOURCE- www.precouter.com

# COMBATING CLIMATE CHANGE SUSTAINABLY BLUE-GREEN INFRASTRUCTURE?

Gargi Rawat

*University School of Environment Management, GGSIPU*

Upon hearing the word "city," the imagery of a concrete jungle, high-rise buildings, urban housing blocks, roads, and grey-coloured hard surface structures springs to mind. Cities, however, can be more than just synonymous with the colour "grey."Globally, population in urban areas is expected to grow to 68% by 2050 and by then one in every two Indians is expected to live in cities (UN DESA,2018). Accounting for less than 2 % of Earth!s surface, cities consume 78% of the world!s energy and produce 60% of all greenhouse gas emissions (UN Habitat, 2011). These alarming facts highlight the increasing pressure put on land. Altering the natural landscapes to achieve urbanisation significantly impacts the hydrology and biodiversity of an area. Rapid urbanisation has made cities a major contributor to climate change, resulting in an increased occurrence of extreme weather events worldwide.Grey Infrastructure was adopted as an early approach to deal with climate change emergencies. It involves the use of concrete to construct manmade structures like dams, canals, seawalls, rainwater pump stations, etc.

The present-day demand is to build urban infrastructures that are climate resilient in multiple dimensions. Making headway for the transition from an isolated grey infrastructure approach to hybrid blue-green infrastructures as sustainable solutions to build climate-resilient urban spaces."Blue-Green Infrastructure" acronym "BGI! is a more suitable approach to address three critically interlinked aspects of sustainable development: economy, society, and environment.

BGI is a strategically planned network of hydrological (blue) and vegetation (green) components for countering urban and climatic challenges by building with nature.The goal of BGI is to emulate and create more natural hydrology for climate esilience while offering additional urban amenities such as recreation and quality of life. The early emphasis on simply the green component (land) of the green Infrastructure approach which got widespread attention from environmentalists during the 1990s "greenway movement" in the US excluded the hydrological (blue) component and was insufficient. But since land and water are inextricably linked, the term "blue-green infrastructure" comprehensively defines a wider range of these nature-based infrastructure solutions.

**A CASE TO STUY**

Singapore is an interesting case study for analysing blue-green infrastructure. Its Garden City moniker has earned it a worldwide reputation as a successful template for sustainable urban development.

**Bishan-Ang Mo Kio Park, Singapore**

In the early 1980s, a concrete canal (grey infrastructure) bisecting Bishan-Ang Mo Kio Park, was built for flood mitigation. Later, in 2009 in place of the canal, the landscape was designed to mimic a small, meandering stream, which provides natural cleansing of runoff through bio-retention and filtration. During periods of intense rainfall, the height of steam increases and floods up the banks of the adjacent green space, demonstrating the adaptability of BGI to extreme climate events.

BENEFITS OF BGI:

A typical blue-green infrastructure consists of elements like green roofs, blue roofs, bioswales, rain gardens, retention and detention reservoirs, infiltration systems etc.

BGI has a variety of benefits It increases the climate resilience of urban infrastructure by regulating rainfall variability, reducing the effects of urban heat islands, and increasing natural air ventilation. It helps mitigate the negative anthropogenic effects of land cover changes, such as the desiccation of urban soils and accompanying air pollution. Effective BGI design provides a variety of ecosystem services, including groundwater recharge, storm water runoff reduction, soil erosion and nutrient loss prevention etc. BGI management can provide secondary benefits by boosting biodiversity, allowing recreational activities that attract more people and thus contribute to the economy via tourism.

Image Source: -https://www.dreiseitlconsulting.com/bishan-ang-mo-kio-park

BLUE-GREEN INDIAN CITIES:

The concept of BGI, although new, is not entirely alien in the Indian context. India's smart cities mission aims to create urban spaces that can provide core infrastructure and a sustainable environment. To build these climate resilient cities blue-green components are being incorporated in the strategic master plans of Delhi and Bhopal (cities under the mission). Through a planned strategy, these "blue-green" initiatives seek to strengthen existing natural blue systems within the city and surrounding green spaces.

This includes measures to enhance the energy efficiency of buildings, waste management, recycling, and connecting land parcels to form a network of parks, bike paths, and green walkways. With six megacities of populations surpassing ten million predicted in India by 2030, it is vital to recognise that cities' socioeconomic stability is intrinsically related to the environment, and the only way ahead is to adopt BGI integrated development plans.

This includes measures to enhance the energy efficiency of buildings, waste management, recycling, and connecting land parcels to form a network of parks, bike paths, and green walkways.

## BGI ELEMENTS

| | ROOF ELEMENTS | SURFACE ELEMENTS | SUB-SURFACE ELEMENTS |
|---|---|---|---|
| LOCATION | Built above the ground | Built on the ground surface | Built under the ground |
| CLIMATE RESILIENCE | • Reduce runoff peak flows<br>• Alleviate urban heat island effect | • Control storm-water runoff<br>• Mitigate urban floods<br>• Adjust rainfall variability | • Work as catchment<br>• Mitigate urban floods |
| ECOSYSTEM SERVICES | • Enhance green areas in dense cities<br>• Improve air quality<br>• Improve natural air ventilation | • Infrastructural link between people, water and nature.<br>• Beautify landscapes<br>• Enhance biodiversity<br>• Recreational activities | • Collect rainwater for reuse.<br>• Groundwater recharge<br>• Filter and distribute clean rainwater. |
| EXAMPLES | • Green roofs<br>• Blue roofs<br>• Green facades<br>• Planter boxes | • Bioswales<br>• Roadside bio-basins<br>• Rain gardens<br>• Bike-walk path<br>• Cleansing biotopes | • Rainwater harvesters<br>• Retention detention systems<br>• Aquifers |

WAY FORWARD:

Despite its tremendous potential, BGI faces profound challenges for its widespread adoption. It has been successfully implemented in Singapore, the USA, and Europe, but due to a general lack of awareness and a paucity of specialists and decision makers familiar with the technique, this concept has not been generally adopted elsewhere. Global agreement on its underlying principles is still elusive. Another concern is that BGI planning, and implementation are costly and time consuming. Although these monetary costs can be justified by the numerous socioeconomic and ecosystem service gains that accrue, priorities are frequently given to other, more familiar technological solutions and the maintenance of existing grey infrastructure, both of which have long-term negative environmental consequences.

Another difficulty is that many of the benefits of BGI are tricky to quantify and projects may lack the capacity to collect data where they are quantifiable. Connectivity is an important aspect of BGI. Many of its advantages are only attainable via an interconnected network of its constituent elements. Once these challenges are effectively addressed, BGI can be fully utilised in the creation of truly climate-resilient, sustainable citiesUrban areas are facing increasing climate risks and threats to human comfort and environmental justice. Of the four major global risks projected to have a negative decadal consequence on countries through temperature increases, three are primarily environmental—natural disaster, extreme weather and biodiversity loss, with climate action failure as the fourth. In attempts to address these challenges, growing attention.

# MOVIE RECOMMENDATION: THE DAY AFTER TOMORROW(2004) CBFC: U

## 2004 · ACTION/ADVENTURE · 2H 4M

Plot Summary

In Independence Day, Roland Emmerich brought you the near destruction of the earth by aliens. Now, In The Day After Tomorrow, the enemy is an even more devastating force: nature itself. Tornadoes rip through Los Angeles; a massive snow storm pounds New Dehli; hail the size of grapefruit batters Tokyo; and in New York City, temperature swings from sweltering to freezing in one day. (from TheDayAfterTomorrow.com)

The Day After Tomorrow is a 2004 science fiction disaster film directed by Roland Emmerich and starring Dennis Quaid and Jake Gyllenhaal. It is a ridiculous, but fun disaster flick.

When a sudden worldwide storm begins to plunge the entire planet into a new ice age, paleoclimatologist Jack Hall undertakes a dangerous trek to New York City to save his son from the disaster. This is a film that I vividly remember seeing and loving as a kid, but watching it now as an adult, I find it to be absolutely preposterous in every regard, though its entertaining factor is still quite strong.

The world in this movie basically goes toward a full blown ice age in a matter of days, which obviously made it absolutely ludicrous. While we cannot really expect from a Hollywood blockbuster to be scientifically accurate, we can at least wish to see some sort of believability and a story being rooted in reality, which simply wasn't the case here. The whole thing about the ocean erupting into a worldwide flood was particularly foolish.


But those sequences where water flooded the city were extremely entertaining to watch. The film overall is fun throughout, but particularly so in its first half that was epic and glorious in VFX especially. These special effects were very much ahead of their time as the movie looks spectacular even today. It was shamelessly snubbed by the Academy in that category.

Source: -https://www.simbasible.com/

 ISSN: 2583-6013

# POEM

Jagriti Hinduja

Drove to Delhi yesterday
Excited to see the beautiful city
It welcomed me
With a huge mountain
A mountain of trash!
A mountain of despair
A mountain of guilt

With all the birds hovering
And picking up our mistakes
It made me regret
For not segregating waste
For using plastic bags
For wasting food
And for every little negligence

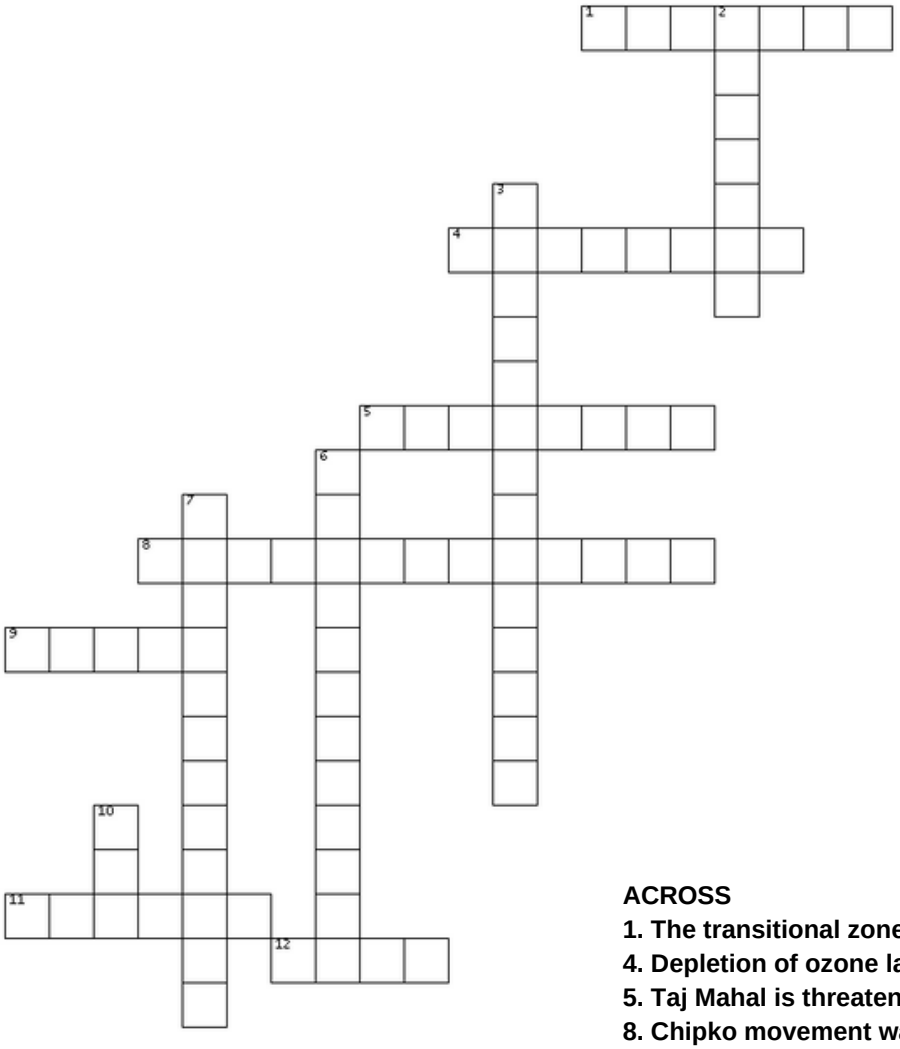
I drove in between Delhi's streets
Finding my way through smog
Watching the smokes from industries
Setting themselves free
And trapping us

I could only reproach
I am apologetic
To all the asthmatic patients
To the earth

I need to cure
We need to cure
The conditions of Delhi
The conditions of India
Making it the best place to live

Join Earth Root Foundation
To begin the therapy.

-Jagriti Hinduja

**ACROSS**

**1. The transitional zone between two distinct communities is known as.**
**4. Depletion of ozone layer is due to oxide.**
**5. Taj Mahal is threatened due to the effect of.**
**8. Chipko movement was basically against.**
**9. Green muffler is used against this type of pollution.**
**11. Formation of ozone is maximum over.**
**12. The most dangerous metal pollutant of automobile exhaust .**

**DOWN**

**2. An indicator species of polluted water is.**
**3. Sewage water can be purified for recycling with the action of.**
**6. 'Good Ozone' is found in.**
**7. What term denotes the organisms getting their food from others?**
**10. Photochemical smog is related to the pollution of.**

HINT...lead,nitrogen,europe,Tubifex,stratosphere,noise,microorganisms,air,chlorine,ecotone,Deforestation,Heterotrophs

# CREDITS



Publisher
Earth Root Foundation
456, Pocket B, Sector-13, Dwarka, New Delhi-110078
www.earthrootfoundation.org | info@earthrootfoundation.org | +91 8766317774

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