



# PARYAVARNAM

EDITION #2



UNRAVELLING THE AFTERMATH

EDITION #2 JUNE, 2022

# LETTER FROM HON'BLE V.C



As we step into the next year of the post-covid era, life gradually returns to how it was previously, giving a semblance of normality. But this normality also brings the conventional problems of our environment to the fore actualising the famous saying, "the major problems in the world are the result of the difference between how nature works and the way people think". To synchronise this thinking and get a deeper understanding of the present situation, our University has fostered a spirit of research and undertaken several practical initiatives ranging from the food waste processing plant to the wastewater treatment facility within the campus itself.

With an impressive improvement in the rankings of DTU, the University has become the harbinger in providing the latest research acumen to various institutions, and the students under the able guidance of faculty members have published several papers in reputed scientific journals on topics most concerning the environment.

Now, it is also our moral responsibility to apprise the general public of the results of our research for the betterment of society as a whole.

I extend my best wishes to the editorial team of PARYAVARNAM for their endeavor for spreading environmental awareness at the most important stage of human life. I am happy that my students are doing such great work for the environment, and I'm sure this newsletter will contain all the necessary information to spread much-needed awareness about nature.

**PROF. J.P SAINI**

VICE-CHANCELLOR

DELHI TECHNOLOGICAL UNIVERSITY

# LETTER FROM HOD



It's been almost two years since the arrival of the deadly pandemic, disrupting lives livelihood and forcing many to think about their existence. But it has also presented a golden opportunity for researchers in particular and academia, in general, to rethink the way of life. As humans use natural resources endlessly day by day, the population explosion has caused overexploitation of natural resources with little or no care to conserve them. Now even renewable resources are not being given enough time to replenish.

Despite all odds, it gives me immense pleasure when I see the youth interested in improving the environment - ranging from staging protests in various countries for drawing the attention of governments to actively participating in debates for resolving the environmental crisis - they've led the way.

To encourage budding engineers, we've fostered an environment of research at DTU. In addition to this, it's equally important to provide them with a platform to disseminate their gathered acumen and stimulate the growth of intellectual prowess. In this direction, a group of enthusiastic students started this newsletter a year ago, gaining much popularity.

It also served to spread information to the general masses and inform them of current events related to the environment that profoundly impact their lives.

I would like to congratulate the entire team of Paryavarnam for brainstorming and putting in deep thoughts on issues that require the public's attention at large and paying attention to minute details that are often missed by many.

## PROF. SK SINGH

Head of Department  
Environmental Engineering

# LETTER FROM FACULTY INCHARGE



The significant and sudden changes in the climate have shown how alarming the situation has become; research and studies are going on worldwide to prevent climate change.

From being just a buzzword around a decade, it has now started affecting all life forms, be it delayed migration of birds or the movement of oceanic currents. Despite this, a majority of the population remain silent or unacquainted with this concern, primarily because of ignorance or inability to comprehend jargon used by climate activists.

To overcome such challenges, we at DTU are putting our best minds towards discussing and solving the problems caused by climate change and explaining them in terms much known to a layperson. 'PARYAVARANAM' is one such initiative where we aim to educate people about national and international news related to the environment. Such initiatives boost the morale of people working for it and draw the attention of those unaware of their surroundings.

The authors' contributions in this edition focus on dealing with environmental issues holistically and forecasting their geopolitical implications. Moreover, they have also jotted down facts drawn from trusted media houses coherently in an endeavour to perfect each article.

Finally, it gives me pleasure to be an adviser to such an initiative of the Department of Environmental Engineering. I would also like to wish them immense success for their second edition and advise them to stay motivated to strive and achieve the best.

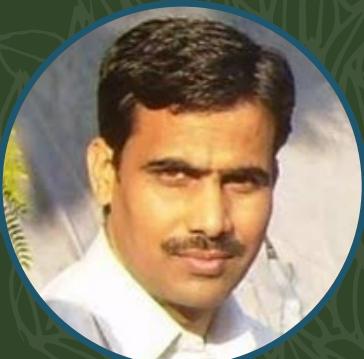
**ANUNAY GOUR**

Faculty In-charge  
PARYAVARANAM

# Our Faculty



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HOD, ENE Dept.



**DR. ANIL KUMAR HARITASH**  
Professor



**DR. GEETA SINGH**  
Assistant Professor



**MRS. LOVLEEN GUPTA**  
Assistant Professor



**DR. RAJEEV KUMAR MISHRA**  
Assistant Professor



**MR. ANUNAY GAUR**  
Assistant Professor

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## WISDOM TALKS

PROF. S K SINGH  
HOD, ENE DEPT.

With



**Q.1 Winning the prestigious Hiyoshi Environmental Award adds another feather to your cap. How do you think this will motivate students and other faculty members to work towards the environment actively.**

**Ans:** The Hiyoshi Environmental Award is given in recognition of one's pioneering spirit, dedication, and outstanding research in environmental conservation and protection in India and recognises those working towards addressing the ecological concern. Such awards boost the person's morale taking the initiative and motivating others to push their limits and do more for nature and society.

**Q.2 Since the Hiyoshi Environmental Award also bears testimony to the Indo-Japan friendship, how do you think a partnership like this helps take steps to resolve the environmental crisis of the hour.**

**Ans:** The entire world is family in crises related to the environment. It is always beneficial to have the world's best brains work together for issues like these that are not limited to a specific geographical area. There have been multiple instances where the brainstorming sessions by experts from India and Japan have helped bring out innovative solutions to some challenging problems of the environment, and I do hope it continues in the future.

**Q.3 In the course of time, how has DTU as an educational institution evolved from just imparting academic knowledge to implementing practical solutions for the betterment of the environment.**

**Ans:** DTU has always been at the forefront of implementing sustainable solutions to all activities undertaken within the premises, from having a wastewater treatment facility within the campus to converting energy from leftover food from hostels and canteens to usable forms of energy, it has always been for the nature and environment.

**Q.4 How would you explain the importance of research to the budding environmental engineers at DTU?**

**Ans:** Research plays a vital role in upgrading existing systems for dealing with new and upcoming challenges related to any domain. With changing times, students need to move from theoretical knowledge to gaining practical knowledge and keep themselves abreast with the latest information of their field. Therefore, budding engineers must focus more on research as it would lead to a positive and long-lasting impact on society.



## ACHIEVEMENTS AND PUBLICATIONS OF FACULTY AND STUDENTS

**Dr A.K Haritash, Assoc. Prof., Dept. Of Environmental Engineering**

- Awardee, Prominent Alumnus Award (Citation), Guru Jambheshwar University of Science and Technology, Hisar
- 'Catabolic enzyme activities during biodegradation of three-ring PAHs by novel DTU-1Y and DTU-7P strains isolated from petroleum-contaminated soil', Archives of Microbiology
- 'Hydrogeochemical Assessment of Groundwater for Drinking and Agricultural Use: A Case Study of Rural Areas of Alwar, Rajasthan', Environmental Management

**Dr Rajeev Kumar Mishra, Asst. Prof., Dept. Of Environmental Engineering**

- 'Evaluation of urban transport-environment sustainable indicators during Odd-Even scheme in India', Environment, Development and Sustainability

**Dr Geeta Singh, Asst. Prof., Dept. Of Environmental Engineering**

- Critically Polluted Area Analysis using Comprehensive Environmental Pollution Index, Journal of the University of Shanghai for Science and Technology
- Analysis of Sewage Treatment Plant at Rai, Sonipat Haryana, Journal of the University of Shanghai for Science and Technology
- Stubble Burning and its Impact on Air Quality in Delhi NCT: A Case Study, Journal of the University of Shanghai for Science and Technology
- Comparative study on air quality status in Golden Quadrilateral cities before and during the COVID-19 lockdown period, Journal of the University of Shanghai for Science and Technology

**Dr. Lovleen Gupta, Asst. Prof., Dept. Of Environmental Engineering**

- Assessment of PM10 and PM2. 5 over Ghaziabad, an industrial city in the Indo-Gangetic Plain: Spatio-temporal variability and associated health effects Springer International Publishing
- Forest Fires in India: A Review, Journal of the University of Shanghai for Science and Technology

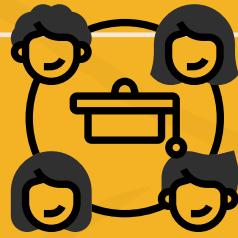
**Anunay Gour, Asst. Prof., Dept. Of Environmental Engineering, Anoushka Raj, B.Tech., ENE, 4th Year & Nimisha Singla, B.Tech., ENE, 4th Year**

- Outcomes of a Gendered Approach to Integrated Water Resources Management, International Research Conference of Science, Technology, Engineering and Management, Gurgaon.





ABHISHEK SHARMA (CLASS OF 2021 ENVIRONMENTAL ENGINEERING)



- 1) Where are you currently working, and how's the work-life balance?
- 2) How has DTU as an educational institution evolved your personality and helped you tackle the day-to-day challenges at work.

I'm currently working with Boston Consulting Group (BCG)! as a Research Associate in Energy, Sustainability & Climate change practice area. It's been around 3 months working with BCG where I work on daily requests from Global BCG offices related to distinguished companies plans for Energy transition (Clean energy including Biofuels/Solar/Wind), Carbon capture/sequestration, GHG & Non GHG Emissions followed by climate change technologies. Working at BCG is very chill and people are very supportive. Additionally, a good learning environment for a person to start professional career.

Prior to joining BCG, I worked with TATA Power co. Ltd. For 10 months, Posted in Mumbai at Corporate Environment & Climate change division. This was an on campus Placement offer. My various tasks at TATA Power included-

- Leading the team for successful implementation of ISO-14001 followed by ISO-140064 for company level & Internal audits in Maithon & Prayagraj Division
- Analyzed significant ideas for ensuring 'Carbon Neutrality' targets by organization & created roadmap for achieving the 'Water Neutrality' target by 2035.
  - Ensuring Compliance with applicable Environment related legal requirements as per CPCB/State PCB/MoEFCC & NGT or any other statuary board.
  - In charge for Environment & Sustainability issues like CDP reporting for Climate change and Water, GRI reporting & BRSR reporting followed by Due Diligence for New Renewables & Business expansion projects across India, Ensuring implementation process & program along with Operations Team.

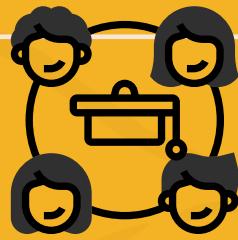
If I talk about how DTU as an educational institution evolved my personality, so for me DTU has changed the complete path of my life as I got immense opportunities to explore what I love to do as I was Placement coordinator of my batch and President of SCEE and of course one of the founder and Editor in chief of this great initiative which current council of Paryavarnam are leading in a great way. The teachers who showed me path I'm always Greatful to them and with immense gratitude would like to thank them for what all opportunities they gave and what all path they showed to me.



## CATCH UP WITH ALUMNI



RAGHAV SHARMA (CLASS OF 2021 ENVIRONMENTAL ENGINEERING)



1) Where are you currently studying, and how conducive is the academic environment?

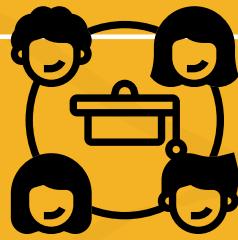
I am studying MS in Environmental Engineering at the School of Engineering, Stanford University. The academic environment is unparalleled. The amount of resources you get to thrive as a student is incredible. The professors who are possibly world leaders in their fields make you feel welcome and love to answer any questions you have. They are extremely responsive. However, the workload is not at all comparable to undergraduate education. You need to be on your A-game 24x7. I would say that the academic environment couldn't be more conducive because every day you grow as a person, you learn something new, which in the long run would translate into compound returns.

DTU has been vital in my journey. My professors at DTU have always encouraged me to think beyond my capabilities. I would like to mention Lovleen ma'am, RKM sir, and SK Singh sir for their constant support. The courses taught at DTU coupled with challenging exams definitely primed the surface for my time here at Stanford.

2) How has DTU as an educational institution evolved your personality and helps you tackle day-to-day challenges.

I'd suggest first deciding what course to pursue, making sure it genuinely interests you and aligns well with your profile. Second I'd suggest talking to your family about their financial considerations and your long-term goals to deciding on the country. I personally chose the US and Canada. Then comes the real task, look at what the university of that country offers the best courses in that particular field and research the heck out of their coursework, research, weather, career opportunities, etc. Then look at the admission requirements so that you are on top of the required tests and protocols. Download Yocket, it's a super helpful resource. You'll get to know about other students who got into some university for a course of choice with their profiles. This will help you get a better sense of where you stand and what you should do next to become a competitive candidate. But don't go on the face value of the profile, you can achieve anything if you put the right amount of effort into your application.





TARUN SHOKEEN DTU (M.TECH IN ENVIRONMENTAL ENGINEERING)

1) Where are you currently studying, and how conducive is the academic environment?

Currently, I am working as a Junior Engineer at Delhi Jal Board.

I would like to give the major credit of my current job to all my faculty of environmental engineering during my M.Tech and especially to Prof. SK Singh for selecting me for carrying out a performance audit of major STPs of Delhi city under the aegis of the monitoring committee for rejuvenation of Yamuna river appointed by the Hon'ble National Green Tribunal. It was changing point for me to think like my mentor and got interested in projects for cleaning the Yamuna and diverting all untreated discharge from drains through STPs to make Yamuna water clean and got the motivation to join Delhi Jal Board only to further increase my knowledge in this field. Both of my theses were also on the STPs and got published in renowned journals Springer and Elsevier through the help of my mentors Prof. SK Singh & Dr Geeta Singh.

2) How has DTU as an educational institution evolved your personality and helps you tackle day-to-day challenges.

Delhi Technological University has helped me evolve as a great human being. Will like to keep it very simple regarding the contribution of DTU to my personality as the institute has helped me to get more acquainted with the current situation of pollution in Delhi. It aided me to become more eco-friendly. In DJB I have been assigned the project of making the first vertical STP of Delhi in the Bijwasan constituency which will help out greatly in improving the water quality of the river Yamuna. Thereby controlling the water pollution of river Yamuna.

## **PARTICIPATION IN EXTENSION ACTIVITIES**

<b>NAME</b>	<b>EVENT</b>
Arshad Iqbal	Health and fitness awareness
Mausam Raj	Volunteering for the project KALAM KO SALAM initiated by NSS-DTU, teaching over 60 children of Shubhakshika Educational Society NGO, nearby slums and construction workers at DTU.
Krish Shokeen	Voice Of Animals
Deepanshu sharma	Unnat bharat
Shubh Mittal	Volunteer for Blood Donation and poor kids study programme through rakt and NSS-dtu
Pratham	Working in project of nss named kalam ko salam where we teach students of workers who are working in hostel construction of dtu apart from this also worked as a intern in delhi government project lab on wheel where we teach basic computer skill to student of govt school

## **AWARDS/ MEDALS FOR OUTSTANDING PERFORMANCE IN SPORTS**

Yuvraj Rajak	Powerlifting
Satyam Dubey	Agastya'22 bronze in cricket
Dushyant Yadav	Agastya 2022 bronze in cricket

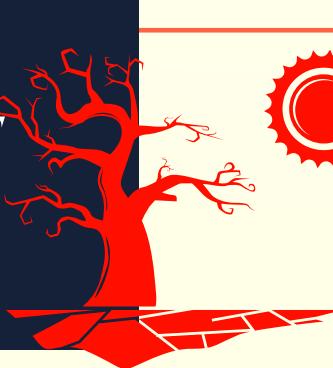
Cue to your annual  
dose of eco-news

## BLOGS



IT'S TIME TO CATCH UP ON WHAT YOU  
HAVE BEEN MISSING ON

# DROUGHT WHILE IT RAINS?



A study published in a reputed journal provides evidence that most of the flash drought events in India have occurred during the monsoon season. The key findings published in 'Nature Communications' identified rapid drought intensification in various parts across the globe. The frequency of flash drought was high within the tropics and subtropics, including a large portion of Brazil, the Sahel, the Great Rift Valley and India. But before we get to know what a flash drought is, let's see the categorisation of droughts. They are classified into three categories:

- Meteorological drought occurs when seasonal rainfall over an area is less than a quarter of its long-term average. If the deficit lies between 26-50%, it is a moderate drought, and over 50% is severe.
- Hydrological drought occurs when there are very low levels of surface water supplies causing disruption in regular and specific needs.
- Agricultural drought occurs when the rainfall and soil moisture are not present in the right amount during the crop growing season. Both meteorological and hydrological droughts usually trigger it.  
**Drivers of Flash drought:**
- It is caused by lower precipitation rates, high temperatures, winds, and radiation. Together, these weather changes can rapidly alter the local climate.

Precipitation deficit is when precipitation deficit occurs over an extended period, e.g. several weeks, soil moisture is depleted by evapotranspiration, which desiccates the land surface. Evapotranspiration occurs when water is transferred from the land to the atmosphere through soil evaporation and plants' transpiration.

- Teleconnection can cause an increase in flash droughts. For example, El Niño-Southern Oscillation (ENSO) is a teleconnection phase that promotes drier and warmer conditions, increasing flash drought frequency.
- Amplification of evaporative demand: Persistent atmospheric conditions can amplify evaporative demand (the extent to which the environment 'tries' to evaporate water) at the surface via increased solar insolation and global warming.
- High precipitation variability: Tropics and SubTropics have a high potential for drought development due to increased precipitation variability and evaporative demand.
- Oscillation of the Inter-Tropical Convergence Zone (ITCZ): Flash drought development is more likely to occur in the May-June (period associated with increasing rainfall) if the onset of ITCZ-induced rain is delayed/reduced, in combination with increased evaporative demand.
- Anticyclones suppress rainfall, which limits soil moisture replenishment, and anticyclones also indicate less cloud coverage and high surface temperatures that increase the evaporative demand for moisture.

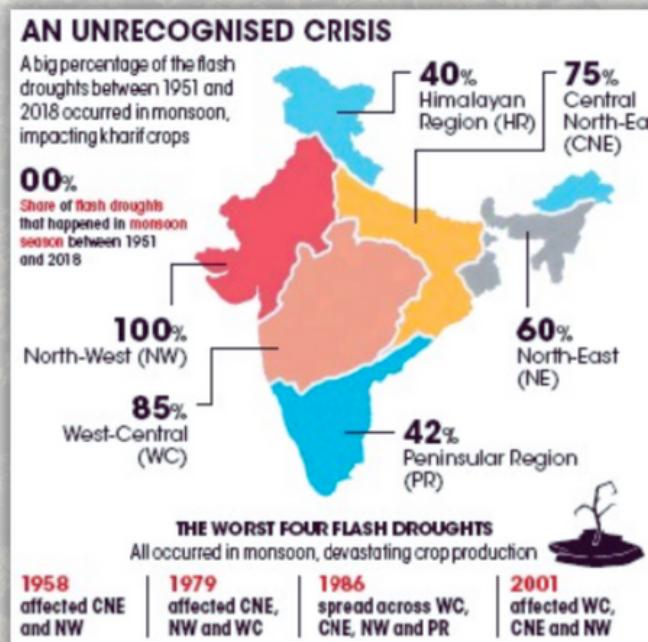
## Effects of Flash drought:

- Around 15% area under rice and maize cultivation was affected by flash droughts during the monsoon season in India between 1951- 2018. Flash droughts have adversely impacted the Kharif crops multiple times during the monsoon seasons in India.

- Since the agriculture sector comes under the primary sector, many industries depend on it for raw materials and suffer losses due to reduced supply and increased prices. This proves that flash drought has a 'multiplier effect' on the economy. As per the UN Office for Disaster Risk Reduction (UNDRR) report, the impact of severe droughts is estimated to be about 2-5% of India's GDP per annum.
- Low water levels in water bodies (lakes, ponds, reservoirs etc.) will reduce the availability of drinking water and adversely affect flora and fauna. It causes deforestation, wildfires and increased desertification. Frequent flash droughts can increase stress on endangered species and cause biodiversity loss.
- People in affected areas usually withdraw their children from schools, postpone marriages and force them to sell their assets, e.g., cattle, land. This behaviour further pushes people into poverty. A decrease in food intake due to reduced crop yield can cause malnutrition.

But there are some techniques that'll help us get past these flash droughts:

- Early-warning systems (EWS) can identify the emergence of flash droughts by observing the climate and water sources. E.g., IMD monitors agricultural drought every two weeks on a real-time basis during Kharif and rabi crop seasons.
- Drought Monitoring Centres (DMCs) staffed by a multi-disciplinary team of meteorologists, hydrologists, and agriculture scientists should be set up to analyse drought parameters from National and State level agencies.
- Relevant agencies can access satellite imagery from ISRO to check for anomalies. E.g., delayed sowing indicates rainfall deficiency and wilting of crops signifies soil moisture stress - both are indicators of flash drought.
- Multiple agencies monitor various parameters for flash drought, and their efforts need to be synergised to disseminate information and activate contingency measures efficiently.



Source: Mahto, S. S., & Mishra, V. (2020). The dominance of summer monsoon flash droughts in India. *Environmental Research Letters*, 15(10), 104061.

# Biomimicry

Biomimicry isn't just about copying nature; it's about imbibing a change. This picture puts this thought into perspective and exemplifies how mother nature has the solutions to the complex problems faced by humans.



Source: Indian architecture photo created by wirestock, www.freepik.com



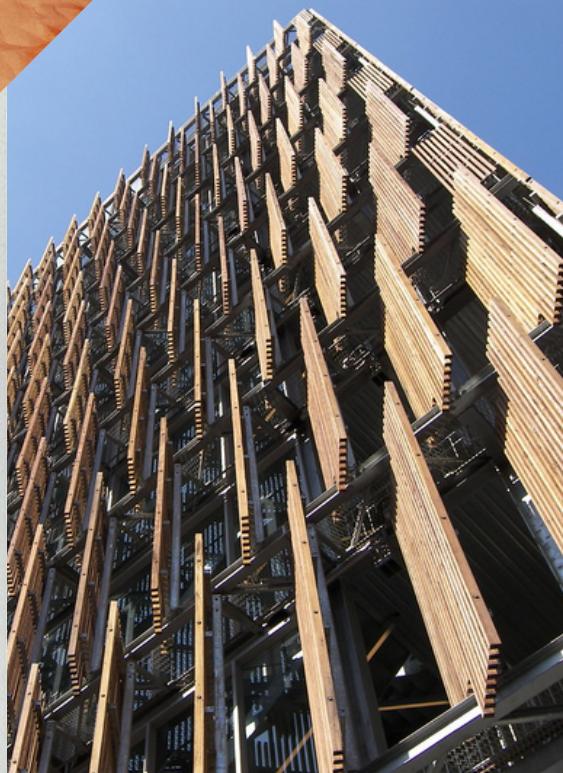
Source: Paris photo created by rwallakte - www.freepik.com

The iron structure of the Eiffel Tower in Paris derives its inspiration from the femur. Such an arrangement provides structural stability and strength to withstand shear winds.

# micro

The Gherkin, London, is inspired by the shape and lattice structure of the Venus Flower Basket Sponge.

This structure provides much needed structural stability without compromising on the aesthetics.



Source: [www.flickr.com](http://www.flickr.com)

Council House 2, Melbourne, was inspired by a termite mound that controls and effectively maintains a comfortable temperature all year round for humans inside.

# COP26: EVERYTHING YOU NEED TO KNOW



UN CLIMATE  
CHANGE  
CONFERENCE  
UK 2021

IN PARTNERSHIP WITH ITALY

The much-awaited COP26 climate summit in Glasgow ended with significant progress in several areas – but not nearly enough. The world is still on the wrong road to reversing the climate problem. The gravity of the situation was felt when ministers from around the globe agreed that countries should submit higher 2030 emissions reduction targets next year to close the gap and keep global warming below 1.5 °C.

Ministers also agreed that rich countries should provide more significant resources immediately to assist climate-vulnerable countries in adapting to the harmful and costly repercussions of climate change that they are currently experiencing, such as decreased crop yields and devastating storms.

One hundred fifty-one nations have filed new climate plans (known as nationally determined contributions, or NDCs) to reduce their emissions by 2030 by the end of COP26. To stay on track to limit global warming to 1.5 degrees Celsius, we must reduce global emissions by half by the end of this decade. The United Nations, on the other hand, estimates that these policies, as they stand, will lead to global warming of 2.5 degrees Celsius by the end of the century. That's a lot better than the 4 degrees Celsius trajectory the world was on before the Paris Agreement, but it's still perilous.

According to the assessment, when countries' intentions to achieve net-zero emissions by the middle of the century are considered, the temperature rise might be limited to 1.8 or 1.9 °C. However, several significant emitters' 2030 plans (particularly those from Australia, China, Saudi Arabia, Brazil, and Russia) are so bad that they don't give realistic avenues to meeting their net-

goals. This exposes a huge "credibility gap" between the 2030 targets matched with 2.5°C and countries' net-zero aspirations.

To solve this problem, countries' 2030 emissions reduction goals must be improved to match their net-zero commitments. This is where the COP26 pact comes into play. By the end of 2022, governments must "revisit and reinforce" their 2030 plans to line them with the Paris Agreement's temperature goals, according to the Glasgow decision. It also requests that those countries that have not yet done so submit long-term policies by 2050 to achieve a just transition to net-zero emissions by the middle of the century.

## India's Commitments for reversing the Climate Change:

- According to the Emissions Gap report of UNEP, India is the fourth-largest emitter of greenhouse gases; coupled with the tag of being a developing country; it was imperative to have the right strategy that balanced development with care for the environment. Keeping this in mind, India made announcements based on the 'five elixirs', which many praised for appearing aggressive and ambitious.

India's five commitments at COP26 are as follows:

- To increase the country's non-fossil fuel-based energy capacity to 500 GW by 2030.
- By 2030, sustainable energy sources will be 50% of the country's energy needs.

- Between now and 2030, the lower the total estimated carbon emissions by one billion tonnes.
- To reduce carbon intensity by 45 per cent till 2030, and
- By 2070, become carbon neutral and have zero emissions.

What else are the possibilities?

- India is currently moving towards renewable energy to reduce carbon emissions, but we must also consider other green energy ideas, such as nuclear energy. Most developed nations also serve many of their power needs through nuclear power.
- And in this direction, India has been pitching to get a place in NSG (nuclear suppliers group) because uranium isn't found in India in adequate quantities. On the contrary, India has an enormous reserve of thorium, and a lot of research has been undergoing to make the reactors work on thorium. We'll be marching past quickly in the 'NO CARBON' race if we achieve this milestone.
- Another exciting possibility is the energy trade in the one sun one grid plan. This idea sports planting lots of solar panels worldwide and then trading them with the partners as per their respective use. Initially, this was overlooked as a futuristic idea, but of late, nations have joined hands to experiment with this plan; countries like Australia and some indo-pacific islands have connected the routes for this energy trade.



Source: wordforest.org

# LOOP THE SINGLE-USE PLASTICS

Plastic Waste Management Amendment Rules, 2021, prohibits single-use plastic items with low utility and high littering potential by next year. It will also ban the manufacture, import, stocking, distribution, sale and use of single-use plastic from 1st July 2022. But why is it essential for us to know about single-use plastics (SUP), and why are they a threat?

Single-use plastics are generally used once before being discarded and range from various plastic bags, straws, water bottles and food packaging. Plastic has brought about a sea change in our lives, from saving countless lives in the health sector to supporting the growth of clean energy from wind turbines and solar panels.

On the flip side, its low production cost has caused almost 50% of the total plastic manufactured to be used only once before being discarded. All such plastic falls under the 'single-use plastic' category. It has, in fact, more of an addiction than convenience, with just 1% of the plastic bags making it to the recycling plants.

Plastic requires fossil fuel for its production, which makes it non-biodegradable. Although plastic will not biodegrade, it will break down into tiny particles after many years, forming microplastics and will release toxic chemicals. These poisonous chemicals disrupt the endocrine system, cause congenital disabilities and many other ailments.

## Plastic Waste Management Amendment Rules,

Plastic waste can clog waterways and worsen natural disasters, and they are often ingested by various marine species causing it to enter the food chain. Moreover, burning plastic waste in the open releases toxic gases into the atmosphere.

India generates about 9.46 MT of plastic waste per year, and of this, nearly 60 per cent is collected and recycled, and the rest remains uncollected and littered.

Other initiatives to tackle Single-Use Plastics (SUP) are:

- India Plastic Challenge - Hackathon 2021
- India Plastic Pact (IPP)
- Un-Plastic Collective (UPC): It is a voluntary initiative launched by the UN-Environment Program-India, Confederation of Indian Industry and WWF-India to drive corporate action toward solutions on plastic leakage.
- GloLitter Partnerships Project aims to reduce marine plastic litter.

Challenges associated with the ban of SUP:

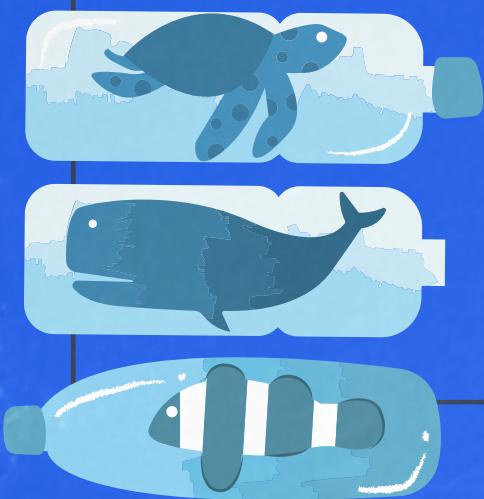
- Plastic carry-bags are robust, lightweight, and valuable and can be saved, cleaned, and reused many times, but this is mostly not practised because they are cheap and therefore not valued. They then become, effectively, single-use plastics. Statistics suggest that India consumes close to 16.5 million tonnes of plastic, which nearly 30% constitute SUP and transitioning in a short period may turn out to be complicated.
- Various commercial associations have requested the pushing of the deadline for phasing out SUP products by one year to 2023 due to the economic distress faced by manufacturing units to the pandemic.

- Inadequate infrastructure for segregation and collection is the critical reason for inefficient plastic waste disposal. Municipal corporations lack an appropriate collection and segregation system, making separating plastics from other wastes challenging.
- Effective enforcement of the ban would depend on the users' behavioural change and the suppliers' economies. Strict and rapid enforcement could lead to non-compliance and circumvention of the rules.

4Rs (Reduce, Rejuvenate, Reuse, and Recycle) principle to conserve the environment from plastic waste disposal. Plastic isn't a 'waste' per se. Instead, it's a resource that must be appropriately discarded. This will require a change in society's mentality and businesses that ease the effective disposal of waste. Punishing for inappropriate disposal of plastic is difficult in a democracy. Therefore, to ensure better plastic waste collection, it is necessary to ensure that the used plastic holds some redeemable monetary value. A shift to khadi bags and promoting biodegradable plastics can do wonders for the environment.



Source: Recycle vector created by studiogstock - www.freepik.com





Source: Bizmanualz

An agreement by 22 countries for the establishment of green corridors led to the signing of 'Clydebank Declaration for Green Shipping Corridors', which shall materialise six such corridors by 2025. But, India is yet to sign the declaration. A green corridor is a shipping route between two major port hubs on which the technological, economic and regulatory feasibility of zero-emissions ships is made possible through public and private action. The strategy for going carbon neutral will include using vessels that run on zero-carbon fuels and updating port infrastructure.

#### Indian Scenario in shipping

India is a member of the International Maritime Organisation (IMO) and a signatory to the International Convention on Prevention of Marine Pollution (MARPOL) and recently signed an agreement under IMO to cut the shipping industry's greenhouse gas emissions 50% by 2050.

India's coastline of about 7500 km consisting of 12 primary and 200 minor ports, India is the 16th largest maritime country globally. A major proportion of the country's trade is possible because of the sea. India's geographical position on the international trade route makes it an apt destination for ship repair and maintenance services for ships plying west to east.

But everything is not as it seems; quite a few challenges impede the speed of development of green shipping in India:

**Inadequate infrastructure:** this includes railways, waterways connectivity with highways leading to more cargo handling by shipping which causes emissions.

**Lack of financing:** the shipping industry faces difficulty securing investment funds to replace existing ships with eco-friendly ones.

## PAVE THE WAY FOR 'GREEN CORRIDORS'

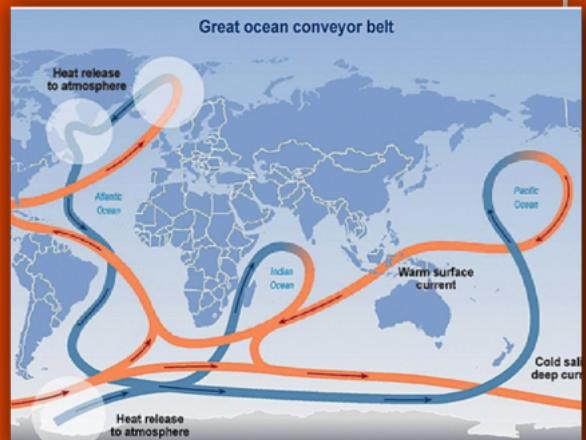
**Use of polluting fuel:** these contain high amounts of sulphur and release sulphur dioxide on burning. This causes environmental damage through emissions.

**Unfavourable weather conditions:** Geographically, India faces a seasonal reversal of winds along with localised weather conditions which change frequently. This causes more deviation in shipping routes, fuel consumption and hence more emissions.

But experts suggest some solutions for dealing with the problems mentioned above.

- **Using crude oil with low sulphur:** The limit for sulphur in fuel has been reduced from 3.5% to 0.5% in India.
- **Retrofitting existing ships:** Retrofitting ship engines to run on biofuels and fitting them with scrubbers can help reduce emissions.
- **Route planning:** Taking the shortest possible route and running ships at optimum speed can effectively reduce fuel consumption and emissions.
- **Green ship recycling:** National Green Tribunal (NGT) has approved the 'Beaching' method of ship recycling in Alang, Gujarat. This will help reduce emissions from ship breaking, which is highly polluting in nature.
- **Green port construction:** Green ports have a small ecological footprint and balance out almost all dimensions of development. India also has plans to increase the share of renewable energy in the power demand by a huge 50% for a cleaner and greener environment.

# THE ATLANTIC MERIDIONAL OVERTURNING CIRCULATION



Source: *TheScientist Magazine*

AMOC seems intimidating at first sight, but it isn't. In fact, it is because of these ocean currents that we discover impressive fishing grounds around the globe. But what exactly is AMOC, and what disturbs it?

Well, AMOC is the Atlantic branch of the ocean transporter belt that spreads heat and nutrients throughout the ocean basins of the world. A prominent feature of the AMOC is the warm, salty water flow in the ocean's upper layers northwards from the Gulf of Mexico, comprising the Gulf Stream and North Atlantic Current. Lower water temperatures in the high latitudes of the Atlantic make it denser, which then sinks and returns to the south towards the tropics and the South Atlantic as a bottom current and spreads to all ocean basins through the Antarctic circumpolar current.

But it's in the news because the sixth assessment report of IPCC suggests that a decline in the AMOC is imminent. So without further ado, let's know the causes for the recent decline in the AMOC:

- Global warming is the most significant contributor to the weakening of the major ocean systems of the world.
- Freshwater inflow from the melting of the Greenland ice sheet and a part of the Arctic's ice called "Last Ice Area" caused a decrease in water salinity, leading to a lowering of the density of water. This water doesn't sink, causing a debilitating effect on the AMOC.

- By generating additional precipitation and drawing more air from other parts of the world (including the Atlantic), the Indian Ocean also plays a minor role in slowing down AMOC.

All the discussion about AMOC might intrigue one to know about the impacts of the decline of AMOC. They can be summarised as follows:

- It affects the regional climate because the Gulf Stream is responsible for mild climate and rainfall at the Eastern coast of North America and Europe.
- A cooling effect sets in along with a decreased rainfall around the North Atlantic region.
- It will cause an increase in winter storms over Europe and stronger hurricanes in the US.
- AMOC's drift towards the north causes a deflection of water towards the right, causing an increase in sea level near the east coast of the U.S.A.
- The North Atlantic ecosystem related to the fish populations and marine life would be disrupted due to changes in these conditions.





## ALCOHOL FOR THE ECONOMY

Source: iStock

The Methanol Economy envisages a reduction in the dependence on oil and coal with methanol. It provides much-needed energy security. Despite its lower energy content than conventional fuels, methanol can virtually replace them in almost all the sectors ranging from transport to energy and retail cooking. Dimethyl ether can be blended with LPG and substituted for diesel in heavy motor vehicles.

And it's especially beneficial for India because methanol & DME are cheaper than petrol and diesel. Some calculations also suggest that India can reduce its fuel bill by 30%. The Methanol blending program with gasoline will further reduce India's fuel bill by approximately 5000 Crores in the next three years.

Methanol's high octane number and improved efficiency can make it the most preferred fuel by the next decade. The methanol economy can also boost the Make in India programme by producing fuel indigenously and associated growth in the automobile sector. Adding engineering jobs and investments in Methanol-based industries will create close to 5 million jobs through methanol production/application and distribution services. Methanol burns efficiently in almost all engines with no particulate matter or soot, and there is minimal emission of oxides of sulphur and nitrogen.

Blending 15% methanol in petrol will reduce pollution by around 30% & diesel replacement by methanol will reduce pollution by more than 50%. It is the best pathway for meeting India's commitment to COP 21.

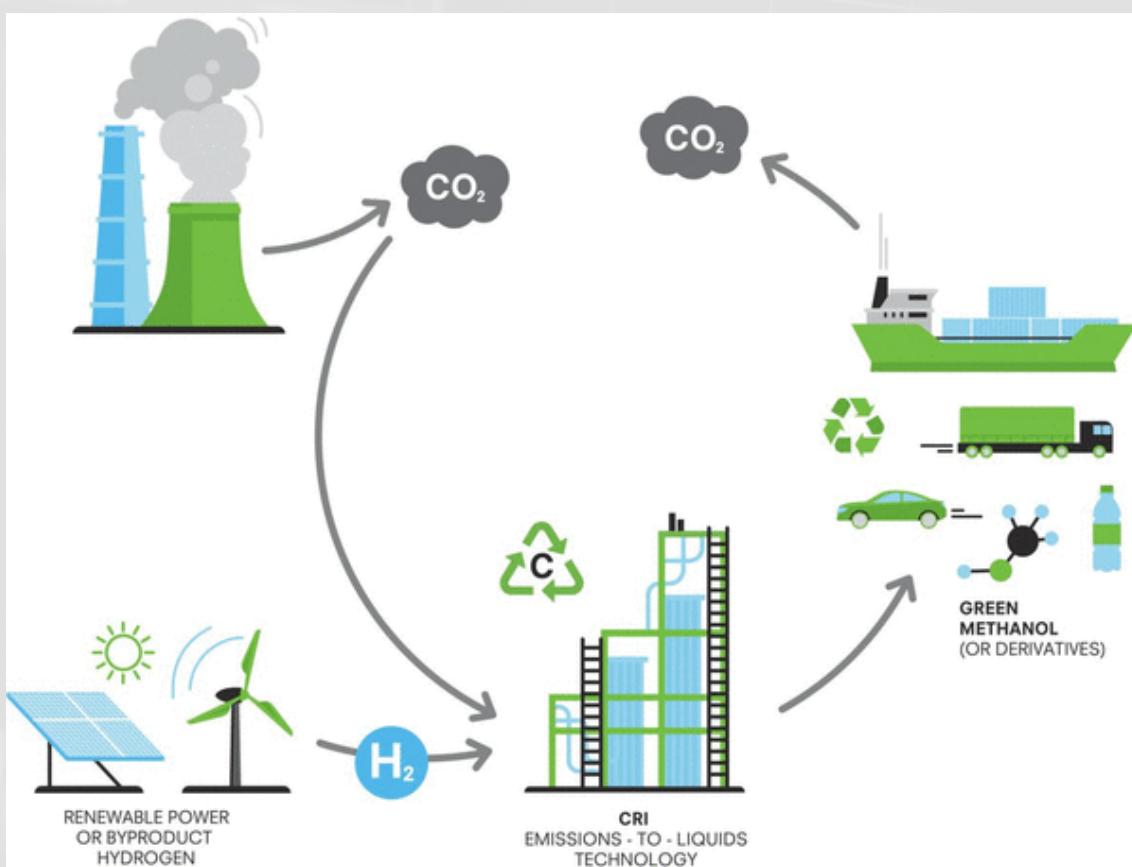
### Challenges to a methanol economy

- The high ash percentage of Indian coal will not be adequate for our demands. The presence of Natural gas in insufficient quantities makes it difficult for India to rely entirely on domestic sources, and importing will cause an increase in the fiscal deficit.
- Some researchers also suggest that methanol shouldn't be used as a transportation fuel because it can lead to corrosivity, fire risks, and toxicity. It is especially criticised for its low energy content.
- As with Ethanol, methanol also gets less gas mileage, which would require more frequent fueling.
- Methanol production will require substantial greenfield investments because it cannot be produced in the same way as conventional energy sources, which might make it infeasible for many nations. etc.

### Initiatives that to be taken in India (designed by NITI Aayog):

- Around 10% of crude imports to be substituted by Methanol till 2030
- Methanol Economy Research Programme, by Department of Science and Technology, for production of Methanol from various sources including Indian coal and CO<sub>2</sub> from thermal plants, steel plants.
- Now, the LPG can also be blended by 20% DME. The railways are also pondering over mixing methanol in 5-20% through direct fuel injection in locomotives.

Threats posed by climate change has united academia, governments and various industries with a common goal to find a clean fuel that 'hurts' the environment less and pushes everyone to a sustainable lifestyle. Methanol has been the best answer to the problems posed by traditional fuels. When put in perspective with 125 billion tonnes of proven coal reserves and 500 million tons of biomass generation every year along with the enormous quantities of stranded & flared gases, it promises India a great potential for ensuring energy security based on Methanol.



Source: Liu, WC., Baek, J. & Somorjai, G.A. *The Methanol Economy: Methane and Carbon Dioxide Conversion*.





*Source: Freepik*

By developing a plastics pact for building a circular economy, India becomes the first country to do so. It was launched as a collective effort of WWF India and the Confederation of Indian Industry (CII). In this pact, all the stakeholders across the value chain have to commit themselves to transform the current linear plastics system into a circular plastics economy in a time-bound manner. This initiative has also been implemented successfully across several countries. It is supported by UKRI and WRAP (Worldwide Responsible Accredited Production) in providing new technologies endorsed by the British High Commission in India.

#### **Challenges in plastic recycling in India:**

- Lack of awareness makes it challenging for people to segregate wastes.
- Plastic density doubles the space and transportation costs.
- Myths and lack of acceptance of recycled plastic products lead to more plastic waste in landfills.
- Plastic requires manual segregation before recycling. There is a lack of infrastructure and government policies concerning this.
- Lack of R&D investments limit technological innovation: For instance, recycling Multi-Layered Packaging (MLPs) is expensive as separating various layers of this packaging is difficult due to multiple layers' adhesive nature.

## **WHAT GOES AROUND COMES AROUND**

At the same time, single-use plastics are a low-value input for plastic recyclers to produce quality outputs.

- Enhanced complexities due to COVID like the increased demand for plastic-packaged food and the use of disposable utensils.

Steps that the government took to promote a circular plastic economy:

- Plastic Waste Management Rules, 2016 state that every local body must set up infrastructure for segregation, collection, processing, and disposal of plastic waste.
- The recent introduction of Extended Producer Responsibility (EPR) makes a manufacturer responsible for managing plastic waste after a consumer has used their product.
- Plastic carry bags' thickness to be increased from 50 to 75 microns by December 2022.
- India Plastic Challenge – Hackathon 2021 was organised for students of Higher Educational Institutions and startups recognised under the Startup India Initiative to find alternatives to single-use plastic.

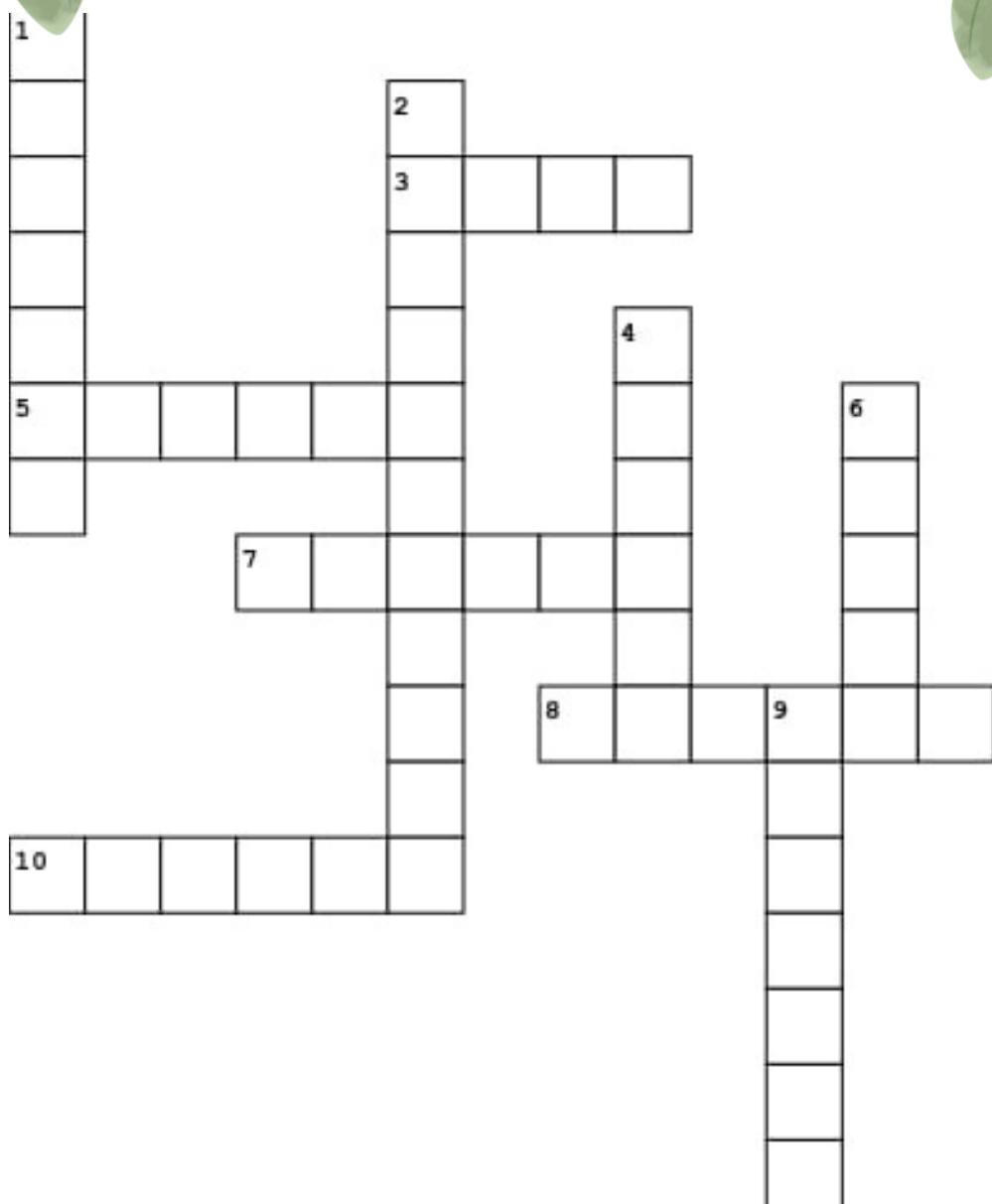
Other ways to strengthen the implementation of a circular plastic economy:

- Sustainable choices are based on the principle of 4Rs (Reduce, Reuse, Recycle, and Recover). For example, agriculture residues as alternate packaging that target the reduction of stubble burning and plastics in the environment.
- Putting forth statutory regulations mandating biodegradable alternatives and making them affordable for large-scale adoption and use.
- Strengthening waste management practices, i.e. segregated collection and processing waste through city material recovery facilities. Material Recovery Facilities (dry waste collection centres) have been set up by Bangalore Municipalities, where recyclable plastic waste can be sold at pre-decided rates.
- Upcycling the plastic waste: Using non-recyclable plastics to make roads or recover energy from them, using them as alternative fuels to replace fossil fuel.
- Design benchmark to be developed by the Bureau of Indian Standards for quality control and creating a market for products produced from the recycled feedstock.



Source: Glasco J. *The Circular Economy: Vision, Problems and Smart City Solutions*

# QUIZ TIME



## ACROSS

- 3. teleconnection that causes flash droughts
- 5. This number is a measure of the performance of the fuel.
- 7. crops most affected by flash droughts
- 8. This region of the earth contains the last ice area.
- 10. This ocean can have a profound effect on AMOC

## DOWN

- 1. Where did the COP26 take place?
- 2. This action can be used to separate single-use plastics from other wastes.
- 4. Oxide of this element form a part of vehicular emissions.
- 6. Bags made out of this material are biodegradable and can replace single-use plastics.
- 9. This element is present in abundant quantities but requires research to make it useful for nuclear energy production.



# PARYAVARANAM

EDITION #2



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