

Gist of **DOWN TO EARTH** MAGAZINE

APRIL 2022 EDITION

PART-II



**Important Articles
Simplified!**

World Set To Cross 3.2 Degree Celsius

Nuclear Fusion Energy Code

Minamata Convention

Climate Change & Human Trafficking

Road to River Management Through

Waste Management



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1. "World Set To Cross 3.2 Degree Celsius"

Relevance

"GS 3: Environmental Pollution & Degradation, Conservation"

Context

- The third instalment of the **Sixth Assessment Report**, released by the **Intergovernmental Panel on Climate Change (IPCC)**, on **April 4, 2022** shows that the time is running out and the world, despite having worthy clean alternatives, is not doing enough.
- According to the report, if current policies implemented by the end of **2020** are not strengthened, the world is on track to warm by **3.2 Degree C by 2100**.

Key Findings

- The report says that in **2019**, global net **anthropogenic greenhouse gas (GHG) emissions**, at 59 gigatonnes of carbon dioxide equivalent were 54 per cent higher than that in 1990.
- This growth was driven by **CO2** emissions from the burning of fossil fuels for energy and industries, as well as methane emissions.

How did Paris Agreement Pledges Fall Short?

- Upon adding up **NDCs** announced by countries till **October 2021**, IPCC finds that warming could hit **2.8 Degree C by 2100**.
- **CO2** emissions from existing and planned fossil fuel infrastructure—**coal, oil and gas**— contribute to this projected failure.

About IPCC

- The **Intergovernmental Panel on Climate Change (IPCC)** is the United Nations body for assessing the science related to climate change.
- The IPCC prepares comprehensive **Assessment Reports** about the state of **scientific, technical and socio-economic knowledge on climate change**, its impacts and future risks, and options for reducing the rate at which climate change is taking place.
- It also produces Special Reports on topics agreed to by its member governments, as well as Methodology Reports that provide guidelines for the preparation of greenhouse gas inventories.

What is C1 Pathway?

- In its best-case scenario, known as the **C1 pathway**, IPCC outlines what the world needs to do to limit temperatures to 1.5 Degree C with limited or no “overshoot” (this refers to global temperatures crossing the 1.5o C threshold temporarily, but then being brought back down using technologies that suck CO2 out of the atmosphere).
- To achieve the C1 pathway, global GHG emissions must fall by **43 per cent by 2030**, compared to **2019 levels**, amounting to **31 GtCO2 emissions in 2030**.
- More importantly, the use of coal, oil and gas must decline by **95 per cent, 60 per cent, and 45 per cent respectively by 2050, compared to 2019**.

What does the World need to do?

- The report states with high confidence that several mitigation options, such as solar energy, wind energy, urban green infrastructure, improved forest- and crop/grassland management, and reduced food waste and loss are technically viable, becoming cost-effective, and are supported by the public.
- Low-cost mitigation options, **costing US \$100 per ton CO₂** or less, can halve global GHG emissions by 2030.
- In fact, the long-term benefits of limiting warming far outweigh the costs.
- Investing in decarbonisation would also have a minimal impact on the global **Gross Domestic Product (GDP)**.
- Demand-side mitigation measures, such as adopting plant-based diets, or shifting to walking and cycling, can reduce global GHG emissions in end-use sectors by **40-70 per cent by 2050**.

Key Challenges

- Most of the potential for demand-side mitigation currently lies in developed countries only.
- Finance flows for fossil fuels are still greater than those for climate adaptation and mitigation.
- Climate policies can encounter resistance from corporations and associations who “**often lobby against measures they deem detrimental**”.

Conclusion

Building out massive solar and wind facilities, electrifying transportation, protecting fragile eco-systems, and creating infrastructure that will push low-carbon personal choices are all possible today. Any delay will prove costly; every additional year of inaction depletes the carbon budget and pushes the planet closer to dangerous extremes.



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2. "Nuclear Fusion Energy Code"

Context

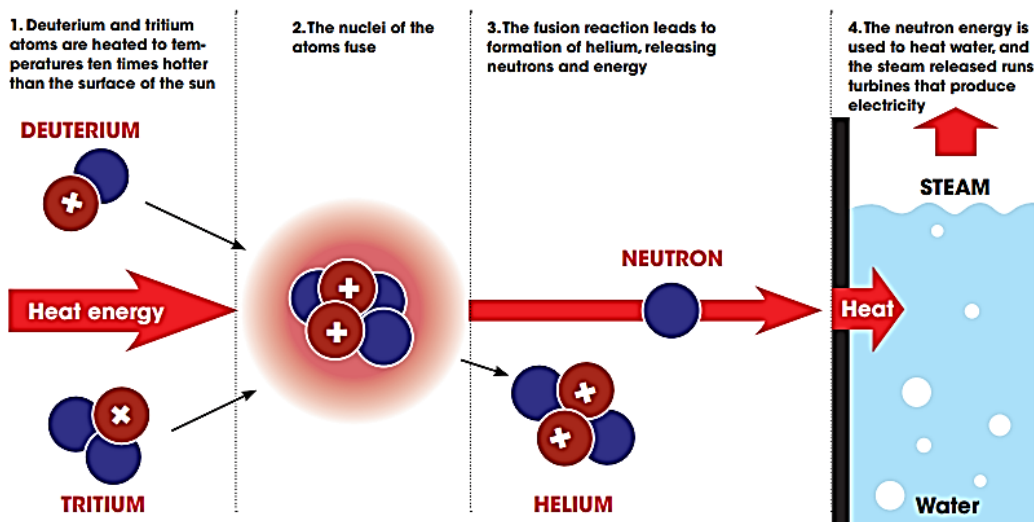
- The world is close to cracking the nuclear fusion energy code, a **source of virtually endless clean energy**.
- On **December 21** last year, the world moved a step closer to mastering this energy process that powers our sun and stars.
- A laboratory in the **UK generated 12 MW** over five seconds through fusion, more than doubling its own record of **1997**. The energy is enough to power **35 homes** for five seconds.

Fusion vs Fission

The fusion of atoms of two heavier isotopes of hydrogen—deuterium and tritium — for example, to form a helium nucleus produces four times as much energy as is released during the fission of a uranium atom, the kind of which we see in our nuclear reactors.

FUSION MECHANICS

Atomic fusion releases heat which is used for electricity generation. But there is a problem: the energy required to trigger a fusion reaction is much more than the energy generated from it, making the process energy-inefficient. Scientists are trying to overcome this at the International Thermonuclear Experimental Reactor under construction in France, which will use a 50 MW heating input to provide 500 MW of output



Key Challenges

- Despite being known for some **70 years** Nuclear fusion as a source of energy has never become viable.
- Scientists have been making efforts to build a fusion nuclear reactor for several decades, but the challenges are high.
- Fusion is possible only at **very high temperatures**, of the order of a **few hundred million degrees Celsius**, the kind of temperature that exists at the core of the **Sun and the stars**.
- In the sun, massive **gravitational pressure** enables nuclear fusion at around **10 million degrees Celsius**.
- On Earth, where the pressure is much lower, the temperature required is above **100 million degrees Celsius**. No material can survive such heat.
- Recreating such extreme temperatures is no easy task.
- The materials that will make up the reactor, too, need to be able to withstand such huge amounts of heat. There are several other complications.

About ITER Project

- **ITER is a bigger and advanced version of the Joint European Torus reactor (JET)** being built in France with the participation of **35 countries, including China, the EU, India, Japan, South Korea, Russia and the US.**
- The ITER project began in **1985** and the deadline for its first experimental run has been extended several times.
- According to the current timeline, it is expected to become operational only in **2035.**
- Right now, the reactor is in the machine assembly phase.
- Over ten million parts, being manufactured and tested in the seven-member countries, have to be transported, assembled and integrated.
- Still, ITER is only an **experimental project.**
- The energy it will produce — about **500 MW** — would not be in the form of electricity that can be used.
- It will be a **technology demonstration machine** that will enable the building of futuristic fusion devices that can be run as normally as the fission reactors today.
- The deployment of fusion energy for electricity generation for our everyday needs might take another few decades after ITER becomes operational.

India and ITER

- India joined the ITER project in **2005.**
- The Institute for **Plasma Research in Ahmedabad**, a laboratory under the **Department of Atomic Energy**, is the lead institution from the Indian side participating in the project.
- As a member country, India is building several components of the ITER reactor, while also carrying out a number of experiments and R&D activities related to the project.

Key Benefits Of Nuclear Fusion Energy

- Nuclear fusion can be a source of virtually endless energy and is considered comparatively green.
- The fuel **deuterium** is freely available in seawater, while **tritium** is a byproduct of nuclear fission, already happening in power plants across the world.
- Per unit of fuel, fusion releases four million times more energy than the combustion of coal, oil or gas, and the only waste is helium— an inert gas with no global warming potential.
- In comparison, fossil fuels would have required **10 million times more** fuel to generate the same amount of energy, that is about **1.06 kg of natural gas or 3.9 kg of lignite coal.**
- So, with tiny amounts of readily available fuels, we could meet humanity's energy needs for a long time.

3. "Minamata Convention"

Relevance

"GS 3: Environmental Pollution & Degradation"

Context

- On **March 25, 2022**, world leaders from **137 countries** agreed to stop the illegal use of mercury at the **fourth Conference of the Parties to Minamata Convention**, in **Bali, Indonesia**.
- Though **non-binding**, the countries pledged for the first time to reduce the use of mercury in artisanal and small-scale gold mining, which is the largest source of mercury pollution in the world.

About Minamata Convention

- The Minamata Convention draws attention to a global and ubiquitous **metal(Mercury)** that, while naturally occurring, has broad uses in everyday objects and is released into the atmosphere, soil and water from a variety of sources.
- Controlling the **anthropogenic releases of mercury** throughout its lifecycle has been a key factor in shaping the obligations under the Convention.

When was the convention entered into force?

- The Convention was agreed at the fifth session of the **Intergovernmental Negotiating Committee on mercury** in Geneva, Switzerland on **19 January 2013** and adopted later that year on **10 October 2013** at a Diplomatic Conference (Conference of Plenipotentiaries), held in Kumamoto, Japan.
- The Minamata Convention entered into force on **16 August 2017**, on the 90th day after the date of deposit of the 50th instrument of ratification, acceptance, approval or accession.

Timeline of Minamata Convention



Dangers Of Mercury

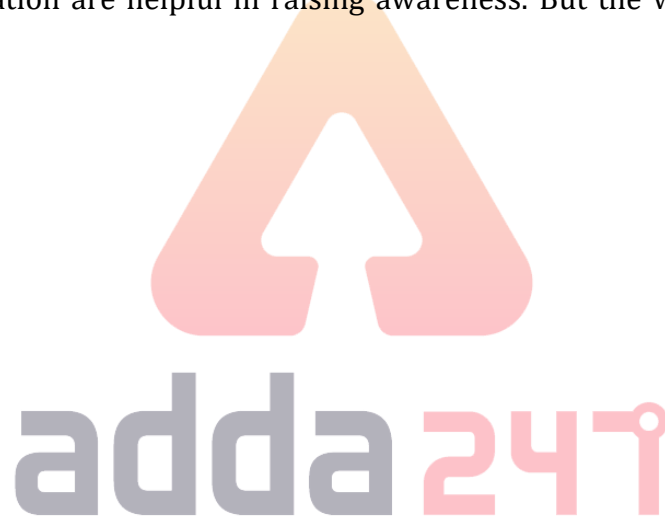
- The element is so toxic that there is no safe level of exposure to it.
- It damages the nervous, digestive and immune systems, and is particularly harmful to children.
- Artisanal gold miners usually combine the toxic heavy metal with gold ore and then burn it to extract pure gold.
- The method accounts for **38 per cent of the world's total emissions** and releases of mercury, as per the **United Nations Environment Programme (UNEP)**.

Major highlights of the Minamata Convention

- Ban on new mercury mines.
- The phase-out of existing Mines.
- The phase-out and phase-down of mercury use in a number of products and processes.
- Control measures on emissions to air and on releases to land and water.
- The regulation of the informal sector of artisanal and small-scale gold mining.
- The Convention also addresses interim storage of mercury and its disposal once it becomes waste, sites contaminated by mercury as well as health issues.

Conclusion

Efforts like the Bali Declaration are helpful in raising awareness. But the willingness and ability of the countries is what matters.



4. "Climate Change & Human Trafficking"

Relevance

"GS 3: Conservation, Environmental Pollution & Degradation"

Introduction

- **International Organization for Migration**, found that more people are now displaced due to **climate-induced disasters** than due to conflicts, reversing a historical trend.
- Disasters and poverty fuel **human trafficking**.
- An increase in extreme weather events makes millions more vulnerable to this trap.

Relation between climate change & human trafficking

- Disasters lead to a breakdown of social institutions, making food securing and humanitarian supplies 'difficult'.
- This leaves women and children 'vulnerable to kidnapping, sexual exploitation and trafficking.'
- The **UN Environment Programme** estimates that globally, human trafficking rises by **20-30 per cent** during a disaster.
- Under the **UN's 2030 Agenda for Sustainable Development**, human trafficking has been identified as a development challenge that should be eradicated by **2030**.

What does the data say?

- Total internal displacement due to disasters, conflicts and violence increased from **31.5 million in 2019 to 40.5 million in 2020**, despite containment measures to curb the covid-19 pandemic.
- But some **30.7 million** displacements in 2020 were triggered by disasters in 145 countries and territories.
- While storms accounted for **14.6 million displacements** and floods for 14.1 million, extreme temperatures displaced **46,000 people and droughts 32,000 people**.
- India reported nearly 4 million new displacements due to climate-induced disasters in 2020.

What does Climate Vulnerability Index(2019-20) say about India?

- While coastal states of India are seeing a rapid increase in floods and cyclones brought on by the impacts of climate change, interior regions see slower effects such as droughts.
- As a whole, the country is at severe risk to climate change. Even Maharashtra, which is marked least at risk, has a high score of **0.42 out of 1**.
- The growing threat of climate change impacts also increases the instances of displacement and migration, making people more vulnerable to trafficking.

Some worst affected areas of the country

Sundarbans

- South 24 Parganas district, which comprises the Sundarbans, is frequently affected by cyclones.
- Some 37.2 per cent of the people live below the poverty line.
- In the aftermath of a disaster, traffickers target those who have lost their houses and livelihoods.

Gorakhpur

- Surrounded by Kushinagar in Uttar Pradesh and West Champaran in Bihar, which are prone to floods.
- The Rapti and Rohini rivers flood annually during monsoon, making rural residents vulnerable to displacement and trafficking.

Sitamarhi and Gaya

- Sitamarhi sees floods on the Bagmati river after the monsoon every year, which impacts livelihood.
- Gaya district is drought-prone due to rocky terrain.
- People go to Uttar Pradesh and central India to work in brick kilns, leaving their children as targets for traffickers.

Marathwada

- It is a severely drought-prone region whose major crops—sugarcane and cotton—increase water scarcity.
- Poverty-ridden Beed, Osmanabad, Latur and Parbhani districts are major source points from where young girls are trafficked when parents migrate in search of work.

5. "Road to River Management through Waste Management"

Relevance

"GS 3: Environmental Pollution & Degradation"

Context

- In these climate-risked times, we need to recognise the urgency of treating the sewage of our cities so our rivers are not polluted.
- We need to manage this stress, not only by capturing the rain in millions of water bodies but also by making sure that not a single drop of water gets polluted.
- **The National Water Policy (2012)** recommends that recycle and reuse of water should become the general norm.

How poor urban sanitation pollutes rivers?

- The **excreta sums** of different cities, or what we call the city's "**shit-flow**" diagram, show that the situation is grim.
- Our cities do not treat or safely dispose of the bulk of the human excreta. This is because we often confuse toilets with sanitation.
- The fact is, toilets are mere receptacles to receive waste; when we flush or pour water, the waste flows into a piped drain, which could be either connected— or more likely not—to a **sewage treatment plant (STP)**.
- This **STP** could be working, or not. This means, human excreta (and our household waste) is mostly not disposed of safely.
- It is just discharged untreated into the nearest river, lake or drain.

How to reverse the global nitrogen cycle?

- The global nitrogen cycle is being disrupted because we dispose of the nutrient-rich human excreta into water bodies.
- We can return the human excreta back to land, use it as a fertiliser and reverse the nitrogen cycle.
- The faecal sludge, after treatment, can be given to farmers and be used as organic compost.
- It can be treated and mixed with other organic waste, like kitchen waste, and used for biogas, or for manufacturing fuel pellets or ethanol.

About Swachh Bharat Mission-Urban 2.0

- **Swachh Bharat Mission-Urban 2.0**, launched on **1st October 2021**, aims to achieve the vision of '**Garbage Free Cities**' over the next five years through remediation of legacy dumpsites, construction and demolition waste and plastic waste management.
- Additionally, sustainable sanitation through faecal sludge and used water management will be a key focus under **SBM-U 2.0**.

Existing Laws

- As per Rules, toxic wastes are not allowed to be discharged into rivers.
- As per the Provisions of **Environment (Protection) Act, 1986** and **Water (Prevention & Control of Pollution), Act 1974**, industrial units are required to install **effluent treatment plants (ETPs)** and treat their effluents to comply with stipulated environmental standards before discharging into river and water bodies.
- Provisions of Hazardous and Other **Waste (Management & Transboundary Movement) Rules, 2016 and amendment made thereof under the Environment (Protection) Rules, 1986**.
- Accordingly, **Central Pollution Control Board (CPCB), State Pollution Control Boards (SPCBs) and Pollution Control Committees (PCCs)** monitor industries with respect to effluent discharge standards and take action for non-compliance under the provisions of these Acts.

What needs to be done?

- Toxic waste or hazardous waste generated from hazardous waste industries is required to be disposed off in an environmentally sound manner.
- It is the responsibility of the States/Union Territories (UTs), Local Bodies and Industrial Units to ensure required treatment of sewage and industrial effluents to the prescribed norms before discharging into rivers and other water bodies, coastal waters or land to prevent and control of pollution therein.
- Setting up of sewage treatment plants (STPs) for treatment of waste water should be an integral and major component of river conservation /rejuvenation programmes.
- Sewerage infrastructure including STP should continuously be created under programs like **Atal Mission for Rejuvenation & Urban Transformation (AMRUT)** and **Smart Cities Mission** of the Ministry of Housing & Urban Affairs.

Conclusion

The bottom line is that we cannot manage our rivers sustainably unless we fix our system of waste management. Our water future depends not only on our water wisdom but also on our waste wisdom.

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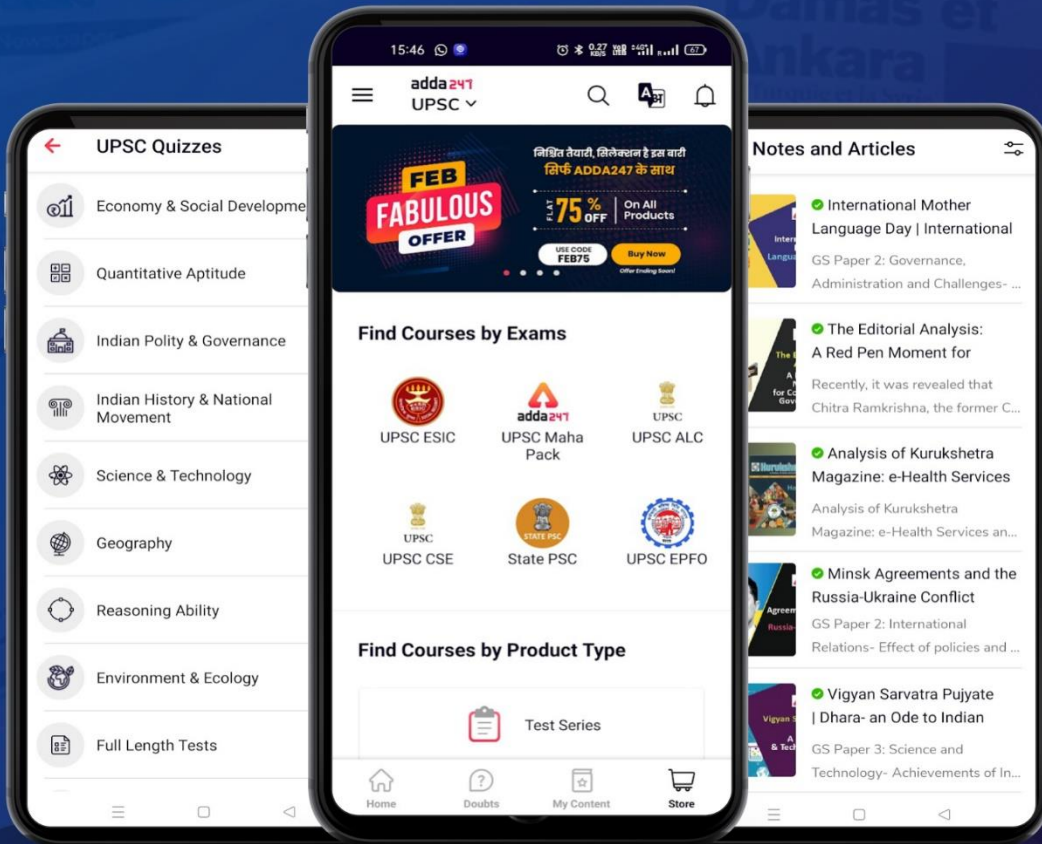
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