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## 1 Bhutan's Tax Inspectors without Borders (TIWB) programme

### CONTEXT:

Bhutan's TIWB programme launched in partnership with India.

### ABOUT:

- TIWB is a joint initiative of the **United Nations Development Programme (UNDP)** and the **Organisation for Economic Cooperation and Development (OECD)**.
- India was chosen as the Partner Jurisdiction and has provided the Tax Expert for this programme.
- This programme is expected to be of about 24 months' duration through which India in collaboration with the UNDP and the TIWB Secretariat aims to aid Bhutan in strengthening its tax administration by transferring technical know-how and skills to its tax auditors, and through sharing of best audit practices.
- The focus of the programme will be in the area of **International Taxation and Transfer Pricing**.
- This programme is another milestone in the continued cooperation between India and Bhutan and India's continued and active support for **South-South cooperation**.

## 2 Revamped Distribution Sector Scheme

### CONTEXT:

Cabinet approves Revamped Distribution Sector Scheme: A Reforms based and Results linked Scheme".

### ABOUT:

- **What is Revamped Distribution Sector Scheme?**
  - The Scheme seeks to improve the operational efficiencies and financial sustainability of all DISCOMs/ Power Departments excluding Private Sector DISCOMs by providing conditional financial assistance to DISCOMs for strengthening of supply infrastructure.
  - The assistance will be based on meeting pre-qualifying criteria as well as upon achievement of basic minimum benchmarks by the DISCOM evaluated on the basis of agreed evaluation framework tied to financial improvements.
  - Implementation of the Scheme would be based on the action plan worked out for each state rather than a "one-size-fits-all" approach.
  - The Revamped Distribution Sector Scheme aims to improve operational efficiencies and financial sustainability, by providing result-linked financial assistance to DISCOMs for strengthening of supply infrastructure based on meeting pre-qualifying criteria and achieving basic minimum benchmarks.
  - The Scheme would be available till the year 2025-26.

**Ujjwal DISCOM Assurance Yojana (UDAY):**

- ▶ It is the financial turnaround and revival package for electricity distribution companies of India (DISCOMs) initiated by the Government of India with the intent to find a permanent solution to the financial mess that the power distribution is in.
- ▶ It allows state governments, which own the DISCOMs, to take over 75 percent of their debt as of September 30, 2015, and pay back lenders by selling bonds.
- ▶ DISCOMs are expected to issue bonds for the remaining 25 percent of their debt.

**3****Committee for development of avenues for Ship Financing and Leasing****CONTEXT:**

IFSCA constitutes a committee for development of avenues for Ship Financing and Leasing, identify opportunities and devise a roadmap to enable such activities from **GIFT IFSC**.

**ABOUT:**

- **Mandate of the Committee**

- The committee is mandated to:
  - examine the existing legal, regulatory, tax and other applicable frameworks
  - identify the bottlenecks pertaining to ship financing & leasing
  - recommend specific measures required which shall enable ship financing & leasing from IFSC at par with best international practices

**The Committee**

- ▶ This committee, to be chaired by Vandana Aggarwal, former Senior Economic Advisor, Government of India.
- ▶ It will include representatives from the Government of India, **Gujarat Maritime Board** and industry experts possessing domain knowledge.

**The need**

- India is strategically located on the world's shipping routes and has a large coastline of approximately 7,500 km.
- India also has 12 major and over 200 minor ports.
- Data from the **Ministry of Shipping** suggests that 95% of India's trading by volume and 70% by value is done via maritime transport.
- In spite of significant exposure to Shipping, India is yet to develop as an international shipping hub.

### International Financial Services Centres Authority (IFSCA):

- ▶ The International Financial Services Centres Authority (IFSCA) has been established on April 27, 2020 under the International Financial Services Centres Authority Act, 2019.
- ▶ It is headquartered at **Gujarat International Finance Tec (GIFT) City, Gandhinagar in Gujarat.**
  - GIFT City is a business district near Ahmedabad in Gujarat. It is country's first operational greenfield smart city and international financial services centre.

### Role of IFSCA

- ▶ The IFSCA is a unified authority for the development and regulation of financial products, financial services and financial institutions in the International Financial Services Centre (IFSC) in India.
- ▶ At present, the GIFT IFSC is the maiden international financial services centre in India.
- ▶ Prior to the establishment of IFSCA, the domestic financial regulators, namely, RBI, SEBI, PFRDA and IRDAI regulated the business in IFSC.
- ▶ As the dynamic nature of business in the IFSCs requires a high degree of inter-regulatory coordination within the financial sector, the IFSCA has been established as a unified regulator with a holistic vision in order to promote ease of doing business in IFSC and provide world class regulatory environment.
- ▶ The main objective of the IFSCA is to develop a strong global connect and focus on the needs of the Indian economy as well as to serve as an international financial platform for the entire region and the global economy as a whole.

## 4 India's cereals exports footprint

### CONTEXT:

India expands its cereals exports footprints through shipping rice, wheat and other cereals to newer destinations.

### ABOUT:

#### • Key-highlights

- India's overall exports of cereals have seen a sharp spike in 2020-21 with the export of
  - **non-basmati rice** growing by 136.04 per cent to USD 4,794.54 million
  - **wheat** by 774.17 per cent to USD 549.16 million
  - **other cereals** (Millets, Maize and other coarse grains) by 238.28 per cent to USD 694.14 million

Export (2020-21)	
<b>Rice</b>	In terms of rice (basmati as well as non-basmati) exports, India shipped non-basmati rice to nine countries - Timor-Leste, Puerto Rico, Brazil, Papua New Guinea, Zimbabwe, Burundi, Eswatini, Myanmar and Nicaragua

<b>Wheat</b>	In case of wheat, India exported substantial quantity of grain to seven new countries - Yemen, Indonesia, Bhutan, Philippines, Iran, Cambodia and Myanmar
<b>Others</b>	In case of exports of other cereals excluding rice and wheat, India shipped cereals of substantial quantity to newer destinations or countries - Sudan, Poland, Bolivia, Colombia, Congo D. Rep. and Ghana

### Reasons responsible for growth

- The sharp spike in exports of mainly rice (basmati and non-basmati), wheat and other cereals in 2020-21 is attributed to synergy and collaboration between various stakeholders – farmers, millers, exporters and government agencies in boosting exports.
- **APEDA** in collaboration with stakeholders have been exploring new opportunities through ensuring market access, adherence to products qualities and phytosanitary measures for cereal products.
- The government had set up the **Rice Export Promotion Forum (REPF)**, under the aegis of the APEDA.

### Phytosanitary measures:

- Sanitary (human and animal health) and phytosanitary (plant health) measures apply to domestically produced food or local animal and plant diseases, as well as to products coming from other countries.
- Sanitary and phytosanitary measures, by their very nature, may result in restrictions on trade.
- All governments accept the fact that some trade restrictions may be necessary to ensure food safety and animal and plant health protection.
- However, governments are sometimes pressured to go beyond what is needed for health protection and to use sanitary and phytosanitary restrictions to shield domestic producers from economic competition.
- Such pressure is likely to increase as other trade barriers are reduced as a result of the Uruguay Round agreements.

### CONTEXT:

To protect the interests of consumers and encourage free and fair competition in the market, Government shared a draft of the proposed amendments to the **Consumer Protection (E-commerce) Rules, 2020**.

### ABOUT

- **The proposed amendments:**
  - **Chief Compliance Officer:** To ensure compliance of the Consumer Protection Act, 2019 and Rules, appointment of Chief Compliance Officer is proposed.
    - He/she will be a nodal contact person for 24x7 coordination with law enforcement agencies, officers to ensure compliance to their orders and Resident Grievance Officer for redressing of the grievances of the consumers on the e-commerce platform.



- **Framework for registration:** Putting in place a framework for registration of every e-commerce entity with the **Department for Promotion of Industry and Internal Trade (DPIIT)** for allotment of registration number which shall be displayed prominently on website as well as invoice of every order placed the e-commerce entity.
- **Prohibited mis-selling:** To protect the interests of consumers, mis-selling has been prohibited.
  - Mis-selling refers to selling goods and services entities selling goods or services by deliberate misrepresentation of information by such entities about such goods or services.

## Objectives

- **Awareness:** To ensure that consumers are aware about the expiry date of the products they are buying on the e-commerce platform.
- **Fair & equal treatment:** To ensure that the domestic manufacturers and suppliers get a fair and equal treatment on the e-commerce platform.
- **Reducing adverse affect:** To ensure that consumers are not adversely affected in the event where a seller fails to deliver the goods or services due to negligent conduct by such seller in fulfilling the duties and liabilities in the manner as prescribed by the marketplace e-commerce entity, provisions of Fall-back liability for every marketplace e-commerce entity have been provided.

### E-commerce:

- ▶ E-commerce (electronic commerce) is the activity of electronically buying or selling of products on online services or over the Internet.
- ▶ E-commerce draws on technologies such as mobile commerce, electronic funds transfer, supply chain management, Internet marketing, online transaction processing, electronic data interchange (EDI), inventory management systems, and automated data collection systems.
- ▶ E-commerce is in turn driven by the technological advances of the semiconductor industry, and is the largest sector of the electronics industry.
- ▶ E-commerce typically uses the web for at least a part of a transaction's life cycle although it may also use other technologies such as e-mail.
- ▶ Typical e-commerce transactions include the purchase of products (such as books from Amazon) or services (such as music downloads in the form of digital distribution such as iTunes Store).
- ▶ There are three areas of e-commerce: online retailing, electronic markets, and online auctions. E-commerce is supported by electronic business.

6

## Amendment in Food security (Assistance to State Government Rules) 2015

### CONTEXT:

Department of Food & Public Distribution notified amendment in **Food security (Assistance to State Government Rules) 2015**.

### ABOUT:

- Food security (Assistance to State Government Rules) 2015 was notified in August 2015.

- It provides for additional margin to Fair Price Shop (FPS) Dealers for sale through **electronic point of sale devices (ePoS)** as an incentive to ensure transparent recording of transactions at all levels.

### Key-highlights of the new Amendments

- The new amendments aim to ensure right quantity to beneficiaries in distribution of subsidized foodgrains as per their entitlement under the **National Food Security Act (NFSA), 2013**.
- This would encourage other States to generate savings through judicious use of ePoS devices.
- This amendment is an attempt to take forward the reform process envisaged under **Section 12** of the Act, through improving transparency of operations of the **Targeted Public Distribution System** under **NFSA**.
- While distribution through ePoS devices ensures that subsidised foodgrains are provided to the rightful beneficiary through biometric authentication, integration of ePoS devices with electronic weighing scales would ensure that the beneficiary is given the right quantity of foodgrains by the **Fair Price Shop** dealer as per his entitlement.

#### Department of Food & Public Distribution:

**Primary policy objective:** To ensure food security for the country through timely and efficient procurement and distribution of Food grains.

► This involves

- procurement of various Food grains
- building up and maintenance of food stocks, their storage, movement and delivery to the distributing agencies
- monitoring of production, stock and price levels of Food grains

## 7

### Expert Group on fixation of Minimum Wages and National Floor Wages

#### CONTEXT:

The Central Government has constituted an **Expert Group** under the **Chairmanship of Professor Ajit Mishra** to provide technical inputs and recommendations on fixation of Minimum Wages and National Floor Wages to the Government.

#### ABOUT:

- This is the second expert committee on minimum wages formed by the government within the last two years.
- To arrive at the wage rates, the group will look into international best practices on the wages and evolve a scientific criteria and methodology for fixation of wages.
- Under the Code on Wages, which is yet to be enforced, a National Floor Level Minimum Wage will be set by the Centre to be revised every five years, while states will fix minimum wages for their regions, which cannot be lower than the floor wage.
- The current floor wage, which was fixed in 2017, is at Rs 176 a day, but some states have minimum wages lower than it.

### India National Floor Level Minimum Wage

- ▶ In India, National Floor Level Minimum Wage (NFLMW) is the minimum wage below which no state government can fix the minimum wage.
- ▶ This is a **non-statutory** measure to ensure upward revision of minimum wages in different states. The central government introduced the NFLMW in 1996.

### The earlier panel

- The earlier panel, headed by **Anoop Satpathy, Fellow, VV Giri National Labour Institute**, was set up by the ministry on January 17, 2018, to undertake an evidence-based analysis to determine methodology for fixing national minimum wage.
- The recommendations, which were not accepted by the Centre, included setting the **national floor wage** at Rs 375 per day (Rs 9,750 per month) as per July 2018 prices.

8

## Draft National Strategy and Roadmap for development of Rural Tourism in India

### CONTEXT:

The Ministry of Tourism has formulated a **Draft National Strategy and Roadmap for Development of Rural Tourism in India** - An initiative towards Atmanirbhar Bharat.

### ABOUT:

- The Draft National Strategy and Roadmap for Development of Rural Tourism in India seeks to develop and promote local products through tourism to generate income and jobs in rural areas and empower local communities.
- This will help in reducing the migration from rural areas, poverty alleviation and sustainable development.

### How Ministry of Tourism is promoting rural tourism?

- The Ministry of Tourism has the main objective of promoting and facilitating tourism both inbound and domestic in India.
- Augmenting tourism infrastructure, ensuring ease of travel, promoting tourism products and destinations is one of the focus area.
- Ministry of Tourism has recognized the immense potential of Rural Tourism and has been actively working on promotion and development of this niche area of tourism.
- Identification, diversification, development, and promotion of niche tourism products in the country is the initiative of the Ministry to overcome the aspect of 'seasonality' and to promote India as a 365 days' destination, to attract tourists with specific interest, and to ensure repeat visits for the unique products in which India has a comparative advantage.
- Driven by the spirit of "**Vocal for Local**", rural tourism can contribute significantly to the mission of **Aatmanirbhar Bharat**.

**Atmanirbhar Bharat:**

- Atmanirbhar Bharat which translates to 'self-reliant India', is a Hindi phrase used and popularized by the Prime Minister of India Narendra Modi and the Government of India in relation to economic development in the country during and after the COVID-19 pandemic.
- In this context, the term is used as an umbrella concept in relation to making India "a bigger and more important part of the global economy", pursuing policies that are efficient, competitive and resilient, and being self-sustaining and self-generating.

**9****Deep Ocean Mission****CONTEXT:**

The Cabinet Committee on Economic Affairs has approved the proposal of Ministry of Earth Sciences (MoES) on "Deep Ocean Mission", with a view to explore deep ocean for resources and develop deep sea technologies for sustainable use of ocean resources.

**ABOUT:**

- Deep Ocean Mission will be a mission mode project to support the **Blue Economy Initiatives** of the Government of India.
- Ministry of Earth Sciences (MoES) will be the nodal Ministry implementing this multi-institutional ambitious mission.

**Six Components of Deep Ocean Mission:**

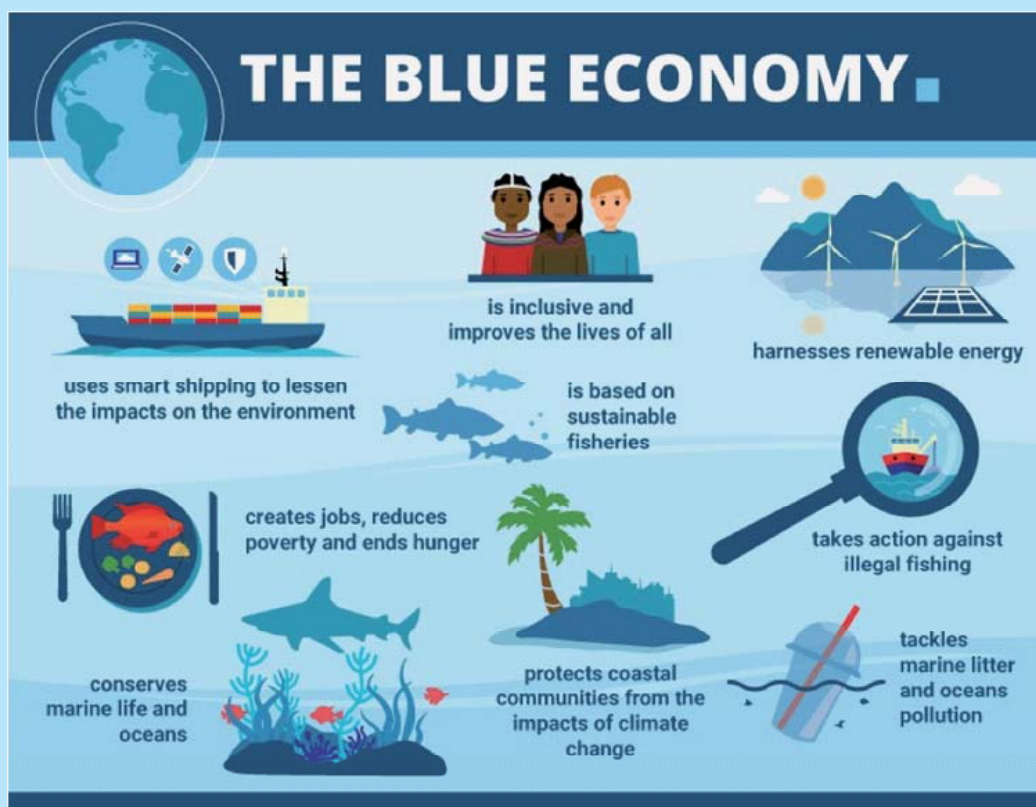
- **Development of Technologies for Deep Sea Mining, and Manned Submersible:** A manned submersible will be developed to carry three people to a depth of 6000 metres in the ocean with suite of scientific sensors and tools. Only a very few countries have acquired this capability.
- **Development of Ocean Climate Change Advisory Services:** A suite of observations and models will be developed to understand and provide future projections of important climate variables on seasonal to decadal time scales under this proof of concept component. This component will support the Blue Economy priority area of coastal tourism.
- **Technological innovations for exploration and conservation of deep-sea biodiversity:** Bio-prospecting of deep sea flora and fauna including microbes and studies on sustainable utilization of deep sea bio-resources will be the main focus. This component will support the Blue Economy priority area of Marine Fisheries and allied services.
- **Deep Ocean Survey and Exploration:** The primary objective of this component is to explore and identify potential sites of multi-metal Hydrothermal Sulphides mineralization along the Indian Ocean mid-oceanic ridges. This component will additionally support the Blue Economy priority area of deep sea exploration of ocean resources.
- **Energy and freshwater from the Ocean:** Studies and detailed engineering design for offshore Ocean Thermal Energy Conversion (OTEC) powered desalination plant are envisaged in this proof of concept proposal. This component will support the Blue Economy priority area of off-shore energy development.
- **Advanced Marine Station for Ocean Biology:** This component is aimed at development of human capacity and enterprise in ocean biology and engineering. This component will translate research into industrial application and product development through on-site business incubator facilities. This component will support the Blue Economy priority area of Marine Biology, Blue trade and Blue manufacturing.

## Importance of Deep Ocean Mission for India

- Oceans, which cover 70 per cent of the globe, remain a key part of our life. About 95 percent of Deep Ocean remains unexplored.
- For India, with its three sides surrounded by the oceans and around 30 per cent of the country's population living in coastal areas, ocean is a major economic factor supporting fisheries and aquaculture, tourism, livelihoods and blue trade.
- Oceans are also storehouse of food, energy, minerals, medicines, modulator of weather and climate and underpin life on Earth.
- Considering importance of the oceans on sustainability, the United Nations (UN) has declared the decade, 2021-2030 as the Decade of Ocean Science for Sustainable Development.
- India has a unique maritime position. Its 7517 km long coastline is home to nine coastal states and 1382 islands.
- The Government of India's Vision of New India by 2030 enunciated in February 2019 highlighted the Blue Economy as one of the ten core dimensions of growth.

### Blue Economy Initiatives:

- Blue economy is a term in economics relating to the exploitation, preservation and regeneration of the marine environment.
- Its scope of interpretation varies among organizations. However, the term is generally used in the scope of International development when describing a sustainable development approach to coastal resources.
- This can include a wide range of economic sectors, from the more conventional fisheries, aquaculture, maritime transport, Coastal, marine and maritime tourism, or other traditional uses, to more emergent spaces such as coastal renewable energy, marine ecosystem services (i.e. blue carbon), seabed mining, and bioprospecting.



## 10

## Climate change to increase sea level in Lakshadweep Islands

**CONTEXT:**

A team of scientists from the **Department of Architecture & Regional Planning** and **Department of Ocean Engineering & Naval Architecture**, under the **Climate Change Programme (CCP)**, studied the Climate projections of sea level rise and associated coastal inundation in **atoll islands**, a **ring-shaped coral reef or island**.

**ABOUT:**

- **Key-projections made in the study**

- Sea-level will rise around the Lakshadweep Islands in the range between 0.4 mm/year to 0.9 mm/year.
- The study highlights that the worst possible inundation scenarios projected for **Lakshadweep Islands** are almost similar under different emission scenarios projected and all the islands in the archipelago would be vulnerable to impact from sea-level rise.
- The study estimated that smaller islands **Chetlat** and **Amini** are expected to have major land-loss.
  - Projection mapping indicated that about 60%-70% of existing shoreline would experience land-loss in Amini and about 70%-80% in Chetlat.
- The present work highlights that, larger islands **Minicoy** and the capital **Kavaratti** are also vulnerable to sea-level rise, and expected to experience land-loss along 60% of the existing shoreline.
- Sea-level rise effects are seen to have the least impact on **Androth Island** under all emission scenarios.
- This study also opens up a new outlook and dimension on future research to assess the directional nature of wave energy, impact of storminess in the **Arabian Sea region**, islands that are exposed and sheltered and amenities such as potable water, sanitation and so on.

**Lakshadweep:**

- The name Lakshadweep in Malayalam and Sanskrit means 'a hundred thousand islands'.
- India's smallest Union Territory Lakshadweep is an archipelago consisting of 36 islands with an area of 32 sq km.
- It is a **uni-district Union Territory** and comprises of
  - 12 atolls
  - three reefs
  - five submerged banks
  - ten inhabited islands
- The capital is Kavaratti and it is also the principal town of the UT.
- All Islands are 220 to 440 km away from the coastal city of Kochi in Kerala, in the emerald **Arabian Sea**.





## 11 Summit on Green Hydrogen

### CONTEXT:

India organised summit on **Green Hydrogen Initiatives** involving **BRICS nations**.

### ABOUT:

#### • Key-highlights of the Summit

- India pitched for common international standards for green hydrogen at the BRICS Green Hydrogen Summit, to ensure safe transportation and storage of the new age.
- As the world rapidly moves to decarbonise the entire energy system, hydrogen is poised to play a vital role and build on the rapid scale-up of renewable resources across the world.
- Hydrogen when produced by electrolysis using renewable energy is known as Green Hydrogen which has no carbon footprint.
- This gives Hydrogen the edge over other fuels to unlock various avenues of green usage. However, challenges lie in terms of technology, efficiency, financial viability and scaling up which the summit will aim to address.
- Green hydrogen has innumerable applications. Green Chemicals like ammonia and methanol can directly be utilized in existing applications like fertilizers, mobility, power, chemicals, shipping etc.
- Green Hydrogen blending up to 10% may be adopted in CGD networks to gain widespread acceptance.
- Further scaling up with greening of hard to abate sectors (like steel and cement) through hydrogen is to be explored.

- Many countries have brought out their strategies and defined targets and roadmaps based on their resources and strengths.

### Green hydrogen:

- Green hydrogen is hydrogen produced by splitting water by electrolysis. This produces only hydrogen and oxygen.
- We can use the hydrogen and vent the oxygen to the atmosphere with no negative impact.
- To achieve the electrolysis we need electricity, we need power. This process to make green hydrogen is powered by renewable energy sources, such as wind or solar. That makes green hydrogen the cleanest option – hydrogen from renewable energy sources without CO<sub>2</sub> as a by-product.

Leveraging India's landmass and green energy sources for exporting green hydrogen is one of the steps for achieving energy sufficiency for the country, according to a draft proposal circulated by the **ministry of new and renewable energy (MNRE)**, for the planned **National Hydrogen Energy Mission**.

### Blue hydrogen

- Blue hydrogen is when natural gas is split into hydrogen and CO<sub>2</sub> either by Steam Methane Reforming (SMR) or Auto Thermal Reforming (ATR), but the CO<sub>2</sub> is captured and then stored. As the greenhouse gases are captured, this mitigates the environmental impacts on the planet. The 'capturing' is done through a process called Carbon Capture Usage and Storage (CCUS).

### Grey hydrogen

- Grey hydrogen has been produced for many years. It is a similar process to blue hydrogen – SMR or ATR are used to split natural gas into Hydrogen and CO<sub>2</sub>. But the CO<sub>2</sub> is not being captured and is released into the atmosphere.

### Pink hydrogen

- Similar to green hydrogen, pink hydrogen is made via electrolysis, but using nuclear energy as its source of power.

### Yellow hydrogen

- Another type of hydrogen made by electrolysis is yellow, where electrolysis is achieved solely through solar power (unlike green which could use a combination of renewable energy sources such as wind or solar).

### CONTEXT:

- River runoff, glacier melt and seasonality of flow in rivers projected to increase in future.

### ABOUT:

- Snow and glaciers are melting rapidly in the Himalayan range due to climate change, altering water supplies in the rivers like **Indus, Ganga and Brahmaputra in the Himalaya-Karakoram (HK) ranges**.



- The HK region in South Asia, often called the water tower of Asia or the **Third Pole** is one of the most heavily glacierized mountain regions on Earth.
- Understanding the response of HK rivers to climate change is crucial for almost 1 billion people who partly depend on these water resources.
- Total river runoff, glacier melt, and seasonality of flow in these rivers are projected to increase until the 2050s, with some exceptions and large uncertainties, according to a study "**Glacio-hydrology of the Himalaya-Karakoram**".
- The study shows that glacier and snow melt are important components of HK rivers with greater hydrological importance for the Indus than Ganga and Brahmaputra basins.
- The melting glaciers fulfils the water requirements of more than a billion people of the region who will be affected when much of the glacier ice mass melts throughout this century and gradually stops supplying the required amount of water.
- Glacier meltwater, and climate change impacts on glaciers, are more crucial for the Indus basin in comparison to the Ganga and Brahmaputra basins which are predominantly fed by monsoon rains and are affected mainly due to the changing rainfall patterns.

### Third Pole

- ▶ The region that encompasses the Hindu Kush Himalayas mountain range and the Tibetan Plateau is widely known as the Third Pole because its ice fields contain the largest reserve of freshwater outside the Polar Regions.
- ▶ This region is the source of the 10 major river systems that provide irrigation, power and drinking water to over 1.9 billion people in Asia – over 24% of the world's population.
- ▶ The Third Pole works on the principle that sustainable development is possible only with the active cooperation of those most affected by policies.



**13****Association of cloud bursts with forest fires****CONTEXT:**

A recent study has found a connection between the formation of the tiny particles, the size of a cloud droplet on which water vapor condenses leading to the formation of clouds and forest fires.

**ABOUT:****Key-highlights of the Study**

- The quantity of such particles called the cloud condensation nuclei (CCNs) were found to have peaks associated with forest fire events.
- Cloud condensation nuclei (CCN), which can activate and grow into fog or cloud droplets in the presence of super saturation (SS) was measured by a droplet measurement technology's (DMT).
- Cloud burst, weather prediction and climate change condition over this region of Himalayas.
- This research will be helpful in source allocation of pollutants reaching the high-altitude regions of Garhwal Himalaya.
- Also, it will provide the better understanding for the cloud formation mechanism and weather extremities over this region.

**14****Adverse effects of Black carbon****CONTEXT:**

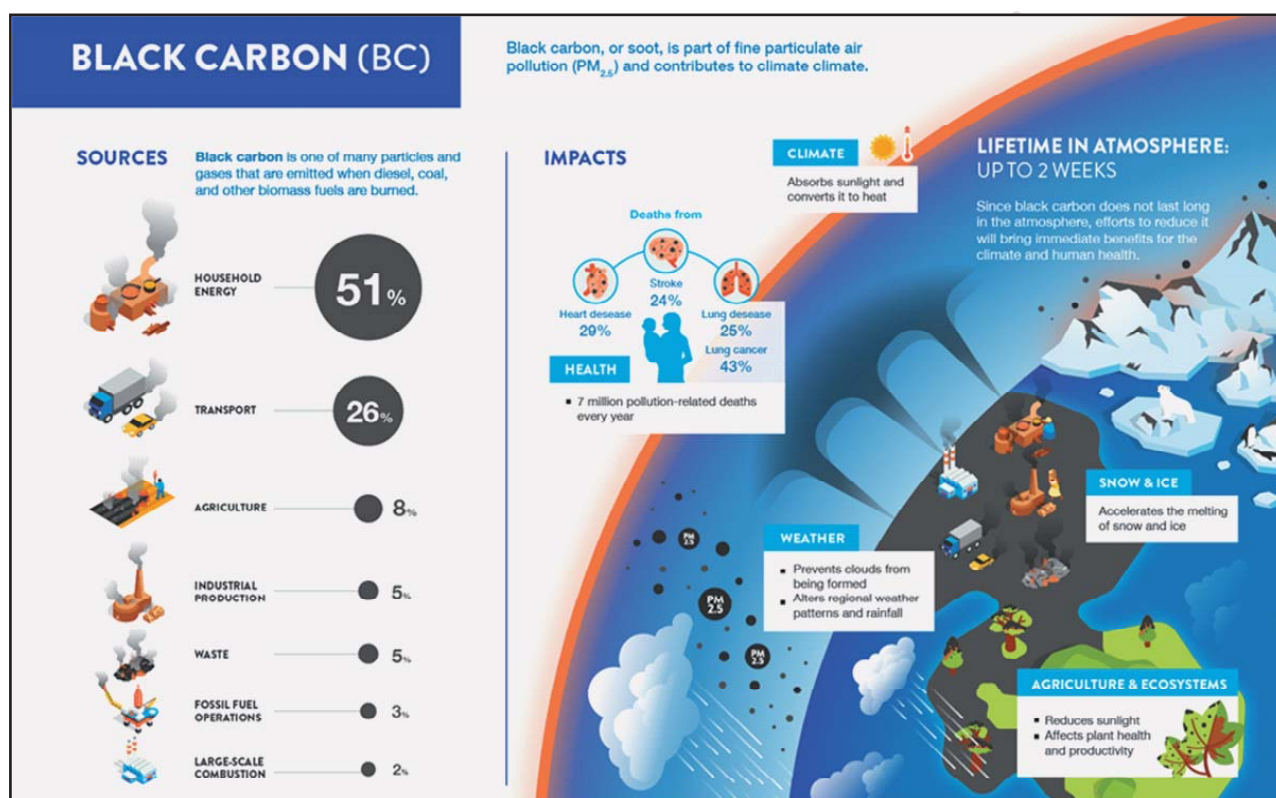
Black Carbon has a significant adverse effect on human health and leads to premature mortality, says a new study.

**ABOUT:****• Key-highlights of the Study**

- The Indo-Gangetic plain is exposed to black carbon (BC) with serious implications on regional climate and human health.
- However, most of the pollutions-based epidemiological studies essentially relate exposure to particulate mass concentration (PM 10 and/-or PM 2.5) that invariably generalize all particulates with equal toxicity without distinguishing individuals by its source and composition, which genuinely have different health consequences.
- Importantly, the health effects in terms of mortality due to BC aerosol exposure have never been evaluated in India.
- The study could also help estimate the future burden of mortality associated with air pollutants considering the present association and incorporating a growing population rate.
- This will help government and policy-makers for better planning to mitigate the adversity associated with changing climate-air pollution-health nexus.

### Black carbon (BC):

- Chemically, black carbon (BC) is a component of fine particulate matter ( $PM \leq 2.5 \mu m$  in aerodynamic diameter).
- Black carbon consists of pure carbon in several linked forms.
- It is formed through the incomplete combustion of fossil fuels, biofuel, and biomass, and is one of the main types of particle in both anthropogenic and naturally occurring soot.
- Black carbon causes human morbidity and premature mortality.
- Because of these human health impacts, many countries have worked to reduce their emissions, making it an easy pollutant to abate in anthropogenic sources.



15

## Drone Survey for All National Highways Projects

### CONTEXT:

In order to enhance transparency, uniformity and leverage latest technology, the National Highways Authority of India, under Ministry of Road Transport & Highways has made mandatory use of drones for monthly video recording of National Highway projects during all stages of development, construction, operation and maintenance.

### ABOUT:

- These videos will be permanently stored on the 'Data Lake'.

- They can also be used as evidence during the **dispute resolution process** before **Arbitral Tribunals and Courts**.
- Apart from this, mandatory deployment of **Network Survey Vehicle (NSV)** to carry out road condition survey on the National Highways to enhance quality will enhance the overall quality of the highways as NSV uses latest survey techniques such as high-resolution digital camera for 360 degree imagery, Laser Road Profilometer and other latest technology for measurement of distress in road surface.
- Additionally, Project Directors of NHAI shall undertake monthly drone survey from the date of signing of contract agreement till start of construction of the project at site and also on completion of the project.
- NHAI will also undertake monthly drone survey in all developed projects where NHAI is responsible for operation and maintenance.

#### **National Highways Authority of India (NHAI):**

- ▶ It is an autonomous agency of the Government of India, set up in 1995 (Act 1988).
- ▶ It is responsible for management of a network of over 50,000 km of National Highways out of 1,32,499 km in India.
- ▶ It is a nodal agency of the Ministry of Road Transport and Highways.

## **16**

### **Neutrino oscillations**

#### **CONTEXT:**

- Scientists have shown that the **geometry of space-time** can cause neutrinos to oscillate.

#### **ABOUT:**

##### **• What are Neutrinos?**

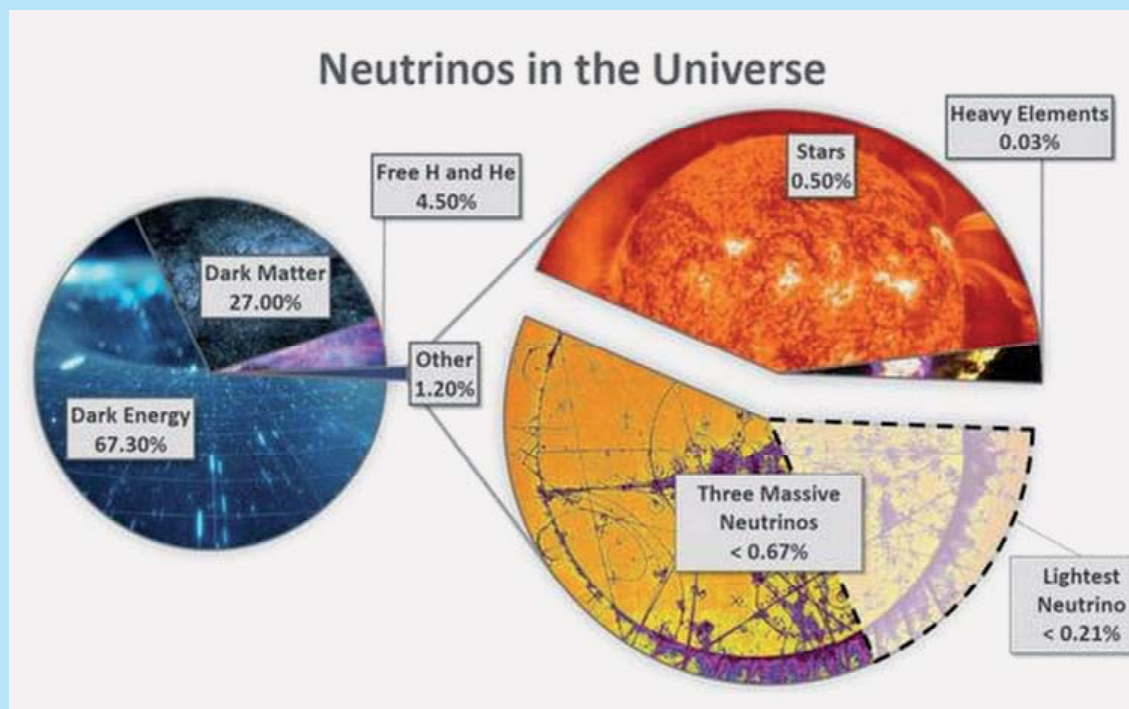
- Neutrinos are mysterious particles, produced copiously in nuclear reactions in the Sun, stars, and elsewhere.
- They also “oscillate”-meaning that different types of neutrinos change into one another – as has been found in many experiments.

#### **Quick facts**

- ▶ A neutrino is a fermion (an elementary particle with spin of  $\frac{1}{2}$ ) that interacts only via the weak interaction and gravity.
- ▶ Trillions of the harmless particle stream through you every second, night or day.
- ▶ They are the second most abundant particle in the universe (after particles of light called photons).
- ▶ Neutrinos rarely interact with anything—a lightyear of lead would stop only about half of the neutrinos coming from the sun.
- ▶ About 15 billion neutrinos from the Big Bang are in the average room.
- ▶ Neutrinos interact only through two of the four known forces: the weak force and gravity.



- ▶ So far, scientists have discovered three flavors of neutrinos: electron ( $\nu_e$ ), muon ( $\nu_\mu$ ), and tau ( $\nu_\tau$ ).
- ▶ They oscillate, or change flavor, as they travel.
- ▶ Their masses are very tiny, but not yet known.
- ▶ Their speed is very close to the speed of light, but also not known exactly.
- ▶ They could be the reason that matter exists in the universe.



### Probing of oscillations

- Probing of oscillations of neutrinos and their relations with mass are crucial in studying the origin of the universe.
- Neutrinos interact very weakly with everything else – trillions of them pass through every human being every second without anyone noticing; a neutrino's spin always points in the opposite direction of its motion, and until a few years ago, neutrinos were believed to be massless.
- It is now generally believed that the phenomenon of neutrino oscillations require neutrinos to have tiny masses.

### What does the new research say?

- Professor of S N Bose National Centre for Basic Sciences (SNBNCBS), an autonomous institute under the Department of Science & Technology (DST), showed in a paper published that the geometry of space-time can cause neutrino oscillations through quantum effects even if neutrinos are massless.
- Einstein's theory of general relativity says that gravitation is the manifestation of space-time curvature.
- According to the SNBNCBS team, neutrinos, electrons, protons and other particles which are in the category of fermions show a certain peculiarity when they move in presence of gravity.

- Space-time induces a quantum force in addition to gravity between every two fermions. This force can depend on the spin of the particles, and causes massless neutrinos to appear massive when they pass through matter, like the Sun's corona or the Earth's atmosphere.
- Something similar happens for electroweak interactions, and together with the geometrically induced mass it is enough to cause oscillation of neutrinos.

## 17 Sickle Cell Disease

### CONTEXT:

- The Minister of Tribal Affairs, virtually inaugurated the Second National Sickle Cell Conclave on 'Sickle Cell Disease'. The Conclave is being held to mark the World Sickle Cell Day observed on 19<sup>th</sup> June 2021 every year.

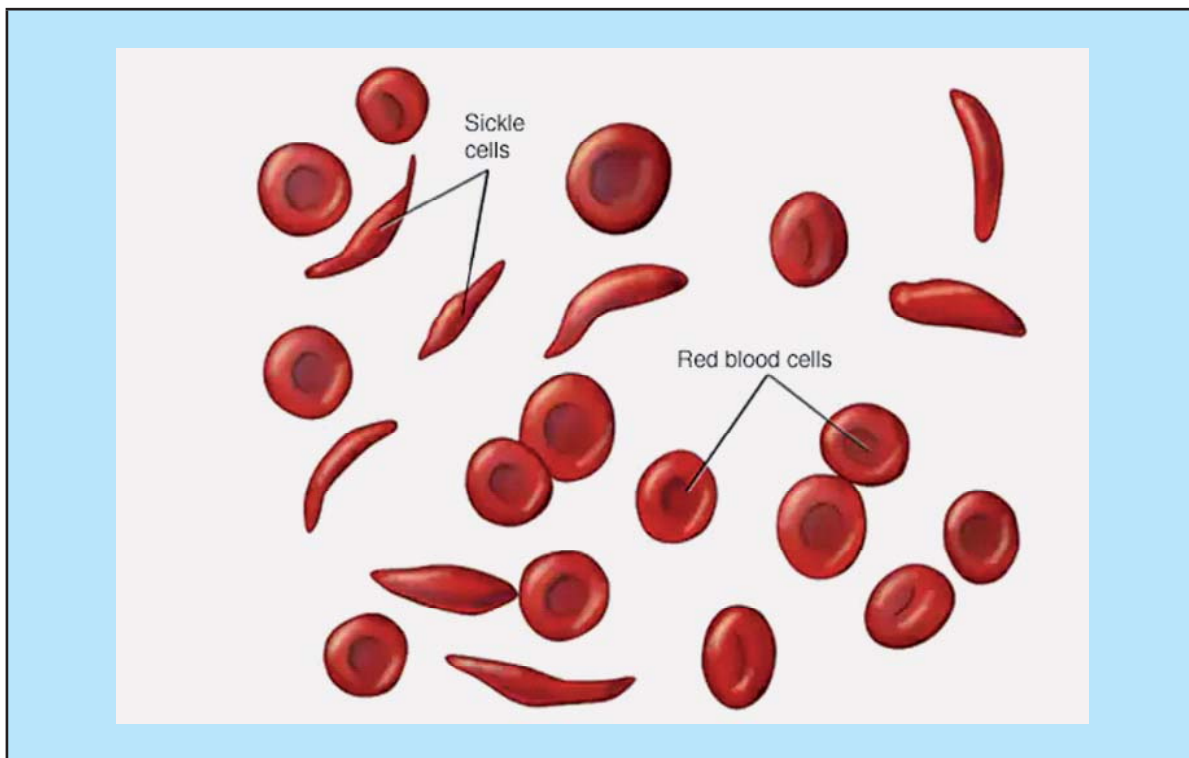
### ABOUT:

#### • What is Sickle Cell Disease (SCD)?

- Sickle cell disease (SCD) is the most prevalent inherited blood disorder.
- It is widespread amongst many tribal population groups in India, posing a considerable health burden in several states.
- While there are several cost-effective interventions, which have dramatically reduced morbidity and mortality from SCD in India, the access to care for SCD in the tribal regions of India is limited.
- The disease in India is prevalent predominantly in Jharkhand, Maharashtra, Madhya Pradesh, Chhattisgarh, western Odisha, eastern Gujarat and in pockets of the Nilgiri Hills in north Tamil Nadu and Kerala.

#### **Sickle cell anemia:**

- Sickle cell anemia is one of a group of disorders known as sickle cell disease.
- Sickle cell anemia is an inherited red blood cell disorder in which there are not enough healthy red blood cells to carry oxygen throughout your body.
- Normally, the flexible, round red blood cells move easily through blood vessels. In sickle cell anemia, the red blood cells are shaped like sickles or crescent moons.
- These rigid, sticky cells can get stuck in small blood vessels, which can slow or block blood flow and oxygen to parts of the body.
- There's no cure for most people with sickle cell anemia. But treatments can relieve pain and help prevent complications associated with the disease.
  - Normal red blood cells are rounded and disk-shaped.
  - In sickle cell anemia, some red blood cells become deformed, so they look like sickles used to cut wheat. These unusually shaped cells give the disease its name.



18

## Mystery behind abundance of heavy metals in oldest metal-poor stars

### CONTEXT:

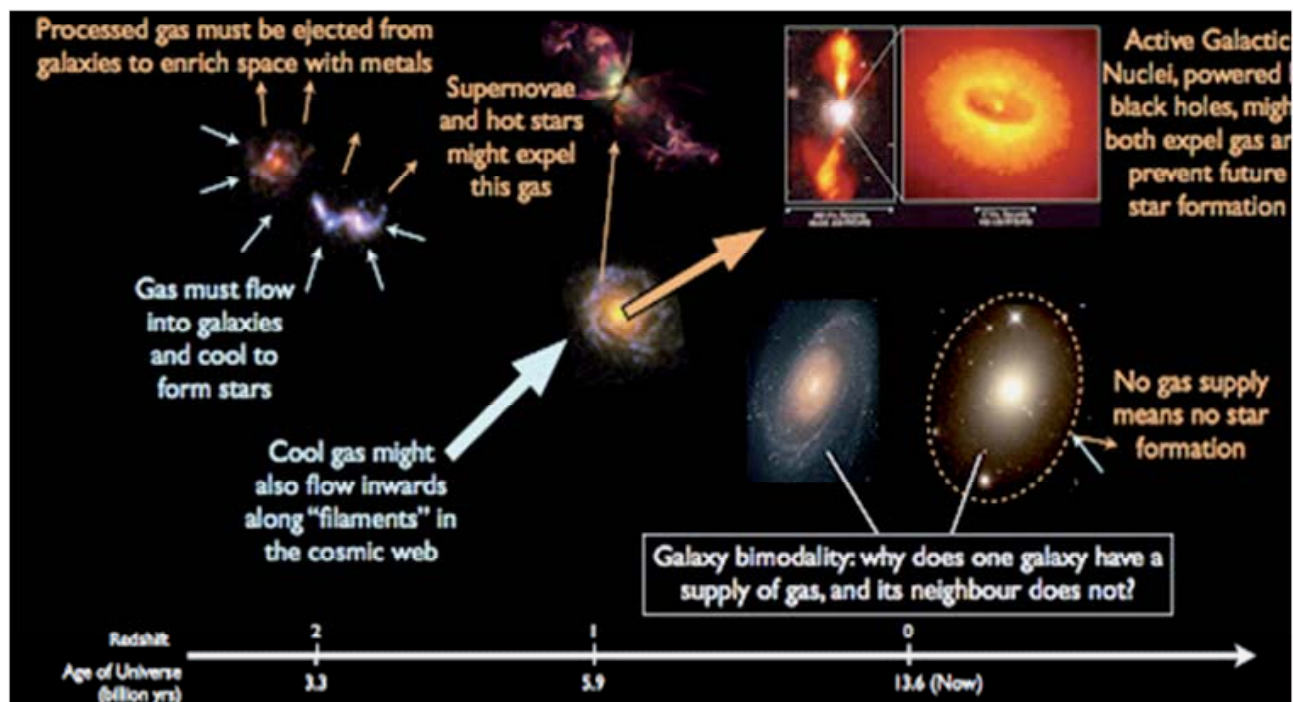
- The abundance of heavy metals in oldest metal-poor stars that are born from the ejecta of first stars has intrigued astronomers for long as already known processes of reaction of chemical elements by nuclear fusion within stars (nucleosynthesis) could not explain it.
- Scientists have now found a clue to this abundance in a **nucleosynthesis process** called the **i-process**.

### ABOUT:

- Metal-poor stars that show enhancement of carbon, technically called **Carbon Enhanced Metal Poor (CEMP) stars** which were formed from the ejected material of the first stars that formed after the Big Bang, carry the chemical imprints of early **Galactic chemical evolution**.
- Probing into the formation of these metal-poor stars that exhibit enhancement in carbon as well as the specified heavy elements can help trace the origin and evolution of the elements in the Universe.

### Galactic chemical evolution:

- The term "chemical evolution of galaxies" refers to the evolution of abundances of chemical species in galaxies, which is due to nuclear processes occurring in stars and to gas flows into and out of galaxies.



## 19 Caliber Rocket

### CONTEXT:

India successfully test-fired an advanced version of **Pinaka rocket system** and **122-mm caliber rocket** from a **Multi-Barrel Rocket Launcher (MBRL)** at **Integrated Test Range (ITR)**, Chandipur off the coast of Odisha.

### ABOUT:

#### • 122-mm caliber rocket

- Four enhanced range version of 122 mm rockets were test fired with full instrumentation.
- These rockets have been developed for Army applications and can destroy targets up to 40 km.

#### • Pinaka Rockets

- Twenty-five enhanced Pinaka Rockets were launched in quick succession against targets at different ranges.
- The enhanced range version of Pinaka rocket system can destroy targets at distances up to 45 kms.

#### Pinaka multi-barrel rocket launcher

- Pinaka is a multiple rocket launcher produced in India and developed by the **Defence Research and Development Organisation (DRDO)** for the Indian Army.



- The system has a maximum range of 40 km for Mark-I and 60 km for Mark-I enhanced version, and can fire a salvo of 12 HE rockets in 44 seconds.
- The system is mounted on a Tatra truck for mobility.
- Pinaka saw service during the **Kargil War**, where it was successful in neutralising enemy positions on the mountain tops. It has since been inducted into the Indian Army in large numbers.
- As of 2014, about 5,000 missiles are being produced every year while an advanced variant is under development with enhanced range and accuracy.
- As of 2019, an upgraded guided missile version of the system has been test-fired, with a range of over 90 km.

## 20 Nanogenerators for electricity generation from vibrations

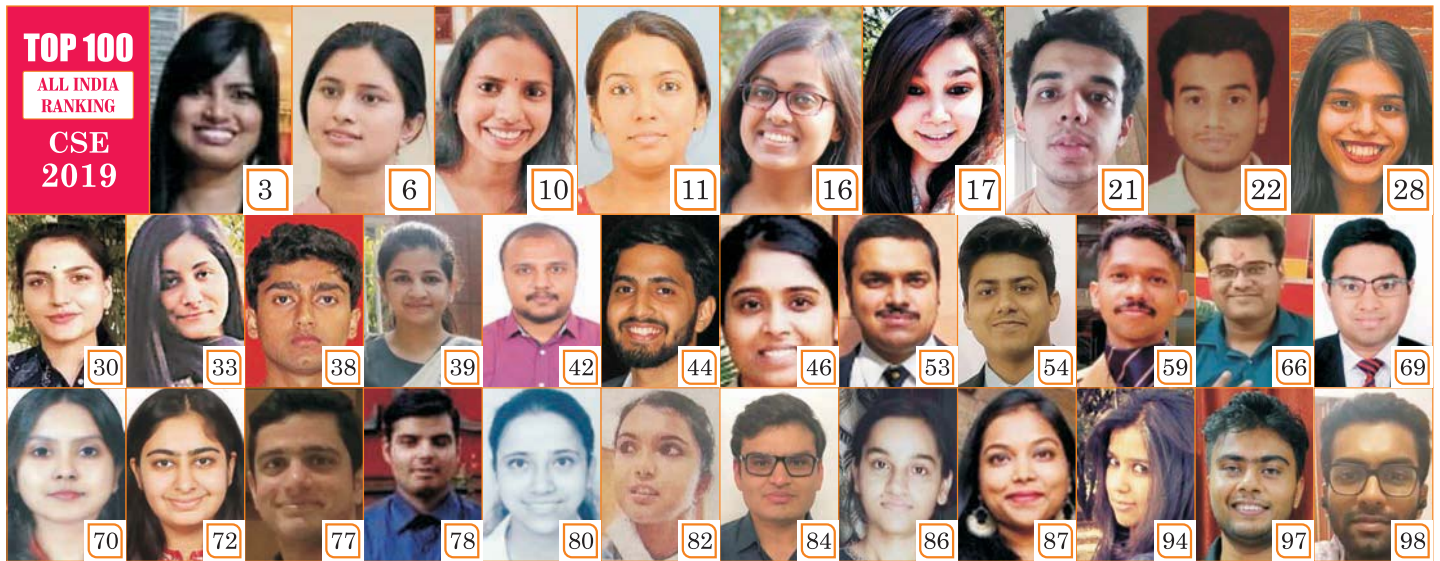
### CONTEXT:

Scientists have fabricated a simple, cost-effective, bio-compatible, transparent nanogenerator that can generate electricity from vibrations all around for use in optoelectronics, self-powered devices, and other biomedical applications.

### ABOUT:

- The triboelectric nanogenerators (TENG) make use of mechanical energy in the form of vibrations present everywhere in different forms to generate electricity.
- The energy harvesting TENG works on the principle of creation of electrostatic charges via instantaneous physical contact of two dissimilar materials followed by generation of potential difference when a mismatch is introduced between the two contacted surfaces through a mechanical force.
- This mechanism drives the electrons to move back and forth between the conducting films coated on the back of the tribo layers.
- The method employed till date to design TENG use expensive fabrication methods like photolithography or reactive ion etching, and additional process like electrode preparation and so on.
- The fabricated device could light up eleven LEDs by gentle hand tapping and could be a potential candidate for use in optoelectronics, self-powered devices, and other biomedical applications.

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