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MK Yadav Sir

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HURRICANE
(Syllabus: GS Paper 1 – Geography)

How climate change fuelled Hurricane Beryl's record early intensification

ALIND CHAUHAN
NEW DELHI, JULY 8

EXPLAINED CLIMATE

HURRICANE BERYL became the earliest storm on record during the Atlantic hurricane season to have reached the highest Category 5 classification.

The storm, which tore through the Caribbean islands earlier this month, killed at least 11 people after triggering intense floods and dangerous winds in Jamaica, Grenada, Saint Vincent and the Grenadines, and northern Venezuela. On Monday, it made landfall in Texas, United States, as a Category 1 storm, flooding streets and knocking out power for more than two million people in the state.

How are hurricanes formed?

Hurricanes, or tropical storms, form over warm ocean waters near the equator. When the warm, moist air from the ocean surface rises upward, a lower air pressure area is formed below. Air from surrounding areas with higher air pressure rushes into this low pressure area, eventually rising, after it also becomes warm and moist.

As warm, moist air rises, it cools down, and the water in the air forms clouds and thunderstorms. This whole system of clouds and winds gains strength and momentum using the ocean's heat, and the water that evaporates from its surface. Storm systems with wind speeds of 119 kmph and above are classified as hurricanes.

Hurricanes are classified using the Saffir-Simpson Hurricane Wind Scale into five categories (Category 1 to Category 5) based on their sustained wind speeds. While Category 1 hurricanes bring winds of 119 to 153 kmph, Category 5 hurricanes, which are the strongest, have winds of 252 kmph or higher. Storms that reach Category 3 and higher are considered major hurricanes due to their potential to inflict significant damage.

How did Beryl become a Category storm?

Within 24 hours of emerging as a tropical depression with winds of 56.3 kmph on June 28, Beryl transformed into a hurricane. Over the next 24 hours, it rapidly intensified to become a Category 4 hurricane. At that point, Beryl was the first Category 4 hurricane to form in June, according to National Oceanic and Atmospheric Administration (NOAA). The earliest emergence of a Category 4 hurricane was previously seen in the case of Hurricane Dennis on July 8, 2005.

On July 1, Beryl made landfall on Grenada's Carriacou Island as a Category 4 hurricane with sustained winds of over 241 kmph. As it travelled through the Caribbean Sea, it continued to gain strength, and became a Category 5 hurricane on July 2. This made it the earliest Category 5 hurricane seen during the Atlantic hurricane season on record. In fact, the Atlantic has only seen one Category 5 hurricane on record in July — Hurricane Emily, on July 16, 2005.

Beryl was also the strongest July Atlantic hurricane on record, with winds of 265.5 kmph, according to NOAA.

Why did Beryl become a Category 5 hurricane so early?

The hurricane season in the Atlantic begins in June and lasts until November. Generally, the first major hurricanes do not form until September. This is because till that time, the ocean is not warm enough either at the surface, or deeper down to fuel such strong hurricanes, according to NOAA.

This is what makes Beryl so unprecedented. Although it is difficult to attribute a specific hurricane to global warming, scientists see unusually warmer oceans as the primary reason behind Beryl turning into a powerful storm this early in the season.

Since last year, ocean temperatures in the Atlantic — and across the world — have mostly been in record-breaking territory. Not only are sea surface temperatures rising, ocean heat content (OHC) — a measure of the amount of heat present in ocean water — is also soaring, which is a bigger worry. The *graph* shows that this year's OHC (*in red*), for the area of the Atlantic Ocean where most major hurricanes like Beryl form, has been far above the 2013–2023 average (*in blue*).

"For storms like Beryl… if it were moving over a part of the ocean where the warm water was skin deep, it would easily churn up cooler water to the surface, [which can reduce its intensity]… But in this case… the warm water is so deep, it's just going to churn up more warm water. The hot water goes down to probably about 100 to 125 meters deep… It is pretty crazy," Brian McNoldy, an atmospheric scientist at the University of Miami, told *Science News* last week.

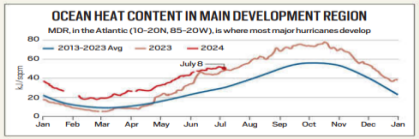
What happens next?

Scientists are still debating over how exactly climate change impacts hurricanes. There is agreement, however, that at the very least, climate change makes hurricanes more prone to rapid intensification — where maximum wind speeds increase very quickly.

The frequency and magnitude of these rapid intensification events in the Atlantic seems to have spiked between 1971 and 2020, according to a 2023 study published in the journal *Nature*.

Therefore, as the world and its oceans continue to become warmer, scientists are concerned that even more powerful hurricanes could form in the near future.

"We're essentially 'stacking the deck' of extreme events against ourselves, making events like Hurricane Beryl not only possible, but more likely," Andra Garner, an assistant professor at Rowan University, told the *BBC*.



Context: Hurricane Beryl became the earliest storm on record during the Atlantic hurricane season to have reached the highest Category 5 classification.

Hurricane

- **About:** Hurricanes, known generically as tropical cyclones, are low-pressure systems with organised thunderstorm activity that form over tropical or subtropical waters.
  - They gain their energy from warm ocean waters.
- **Development of Storm Systems:** As the warm, moist air continues to rise, it cools and condenses, forming clouds and thunderstorms. This system gains strength from the ocean's heat and water evaporation.
- **Other elements affect hurricanes:**
  - Strong vertical wind shear can inhibit the development of hurricanes by tilting the structure of a storm and by forcing cool, dry air into its core.
  - Vertical wind shear is a measure of how much the wind changes in speed or direction at increasing heights in the atmosphere.
- **Classification**: Hurricanes are categorized using the Saffir-Simpson Hurricane Wind Scale, which ranges from Category 1 to Category 5 based on sustained wind speeds.

5 Category Of Hurricanes

- **Category 1**: A wind speed of 74-95 mph (119 to 153 mph).
- **Category 2:** Wind speeds are between 96-110 mph (154 to 177 mph).
- **Category 3**: 111 to 129 mph (177 to 207 kmph) wind speeds. There would be no water or electricity.
- **Category 4:** Winds of 130 to 156 mph (210 to 251 mph).
- **Category 5**: Wind speeds would be 157 mph (253 km and above).

Hurricane Beryl

- **About**: It emerged as the earliest Category 4 storm of the Atlantic hurricane season, with sustained winds exceeding 130 miles per hour.
- **Path:** Currently, Hurricane Beryl is moving across the Windward Islands, including Barbados, Grenada, and Trinidad and Tobago.

THE HINDU Page 8

NEW PROVISIONS FOR POLICE OFFICERS
(Syllabus GS Paper 2 – Polity)

What are new provisions for police officers?

With the new criminal laws coming into effect, how have basic duties of police officers changed? What are some of the changed provisions with respect to arrests of elderly and infirm people? What about preserving electronic evidence? How can electronic evidence be stored?

EXPLAINER

R.K. Vij

The story so far:

The new criminal laws have become effective from July 1. SOPs have been issued by the Bureau of Police Research and Development (BPRD) to guide police officers in implementing the new provisions.

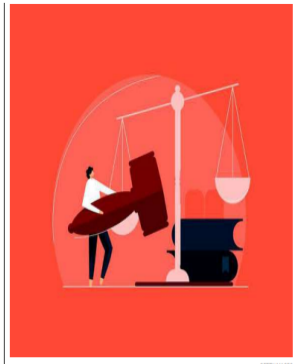
What are rules for registering FIRs?

The officer in-charge of a police station cannot refuse to register an FIR on the basis of lack of jurisdiction or disputed jurisdiction. He is legally bound to register (popularly known as a zero FIR) and transfer such a case to the respective police station. Though this practice was followed earlier too, the Bharatiya Nagarik Suraksha Sanhita (BNSS) now has a direct provision under Section 173; non-registration of FIRs may attract penal action under various sections.

Additionally, while information can be given orally or in writing as before, it may also be given by electronic means which is to be taken on record by the officer in-charge if it is signed within three days by the person giving it. While no one can stop a police officer from enquiring into the information immediately if it is of a sensitive nature, the electronic mode by which information may be given must be decided by the agencies, such as the Crime and Criminal Tracking Network and Systems (CCTNS) portal, the police website or officially published email IDs.

What about videography?

The BNSS mandates videography during a search conducted by the police under Section 185; of the scene of crime (Section 176); and of the process of conducting a search of a place or taking possession of any property (Section 105). Since these are mandatory provisions, any negligence on the part of the police may benefit the accused persons. Therefore, investigating officers (IOs) must be provided electronic devices and proper training to discharge such functions.



GETTY IMAGES

A cloud-based mobile app, 'eSakshya' has been designed by the National Informatics Centre for enforcement agencies, which allows capturing multiple photos and videos. The photographs of witnesses and selfies of IOs may be captured using this app. Each item is geo-tagged and time-stamped to ensure the integrity of data. Since eSakshya is an initiative under the Inter-operable Criminal Justice System (ICJS), this data will be available to other agencies such as the judiciary, prosecution and cyber forensic experts.

What about provisions of arrest?

Information about arrested persons is to be mandatorily displayed in police stations. Section 37 of the BNSS requires a police officer in every police station, not below the rank of Assistant Sub-Inspector, to be responsible for maintaining and prominently displaying information about the arrested persons. Therefore, boards (including in digital mode) containing names, addresses and the nature of the offence must be put up outside police stations and district control rooms.

Some restriction has been imposed on the arrest of frail or sick and elderly persons. Section 35(7) states that the permission of an officer not below the rank of DySP is mandatory for arresting a person charged with an offence punishable for imprisonment of less than three years if such person is infirm or is above 60 years of age. Similarly, though the law now provides for the use of handcuffs in certain cases, the IOs must use them cautiously. The Supreme Court has laid down that handcuffing may be done only when there is a possibility of escaping from custody or causing harm to himself or others.

What about timelines?

In case of medical examination of a victim of rape, the registered medical practitioner is mandated under Section 184 (6) of the BNSS to forward the medical report to the IO within seven days, who shall forward it to the magistrate concerned. Therefore, doctors must be sensitised about the new law. The investigation of POCSO cases is required to be completed within two months of recording the information of the offence. Earlier, this time limit was only for rape cases under the Indian Penal Code.

A new provision under Section 193(3)(h) requires the IO to maintain the sequence of custody of an electronic device. Though maintaining a chain of custody is important for every seizure, emphasis is laid on electronic devices because they are sensitive pieces of evidence and more vulnerable to tampering. While every police officer is required to upgrade his skills about maintaining integrity of electronic records, the task of the (cyber) expert is likely to increase with many of the mandatory provisions coming into effect.

This sub-section also imposes a duty to inform the progress of the investigation within 90 days to the informant or victim.

Section 113 introduced in the Bharatiya Nyaya Sanhita (BNS) defines what is a 'terrorist act' and imposes the duty on an officer, not below the rank of Superintendent of Police (SP), to decide whether to register a case under this Section or the UAPA. Since, no guidelines are given to exercise this discretion, the SP may inter-alia consider factors such as whether the terrorist organisation is notified under the UAPA, approximate time needed to complete investigation, the rank of the IO and the level of scrutiny required, and how dangerous the accused person is.

R.K. Vij is a former Indian Police Service officer. Views are personal.

THE GIST

- The officer in-charge of a police station cannot refuse to register an FIR on the basis of lack of jurisdiction or disputed jurisdiction. He is legally bound to register (popularly known as a zero FIR) and transfer such a case to the respective police station.
- Section 37 of the BNSS requires a police officer in every police station, not below the rank of Assistant Sub-Inspector, to be responsible for maintaining and prominently displaying information about the arrested persons.
- A new provision under Section 193(3)(h) requires the IO to maintain the sequence of custody of an electronic device. Though maintaining a chain of custody is important for every seizure, emphasis is laid on electronic devices because they are sensitive pieces of evidence and more vulnerable to tampering.

Context: The new criminal laws have recently become effective, and the Bureau of Police Research and Development (BPRD) has issued SOPs to guide police officers in their implementation.

New Provisions for Police Officers

- **Rules for Registering FIRs:** The officer in-charge of a police station cannot refuse to register an FIR on the basis of lack of jurisdiction or disputed jurisdiction.
  - **Electronic Submission:** Information for an FIR can be submitted orally, in writing, or electronically, but must be signed by the informant within three days.
- **Videography Mandate:** The BNSS mandates videography during searches, crime scene examinations, and property possession processes under section 185, 175 and 105..
- **Provision of Arrest:** Section 37 of the BNSS requires a police officer in every police station, not below the rank of Assistant Sub-Inspector, to be responsible for maintaining and prominently displaying information about the arrested persons.
  - **Timeline:** In case of medical examination of a victim of rape, the registered medical practitioner is mandated under Section 184 (6) of the BNSS to forward the medical report to the IO within seven days, who shall forward it to the magistrate concerned.
  - **Section 193(3)(h):** It requires the IO to maintain the sequence of custody of an electronic device.
  - This sub-section also imposes a duty to inform the progress of the investigation within 90 days to the informant or victim.
- **Section 113 of Bharatiya Nyaya Sanhita**: It defines what is a 'terrorist act' and imposes the duty on an officer, not below the rank of Superintendent of Police (SP), to decide whether to register a case under this Section or the UAPA.

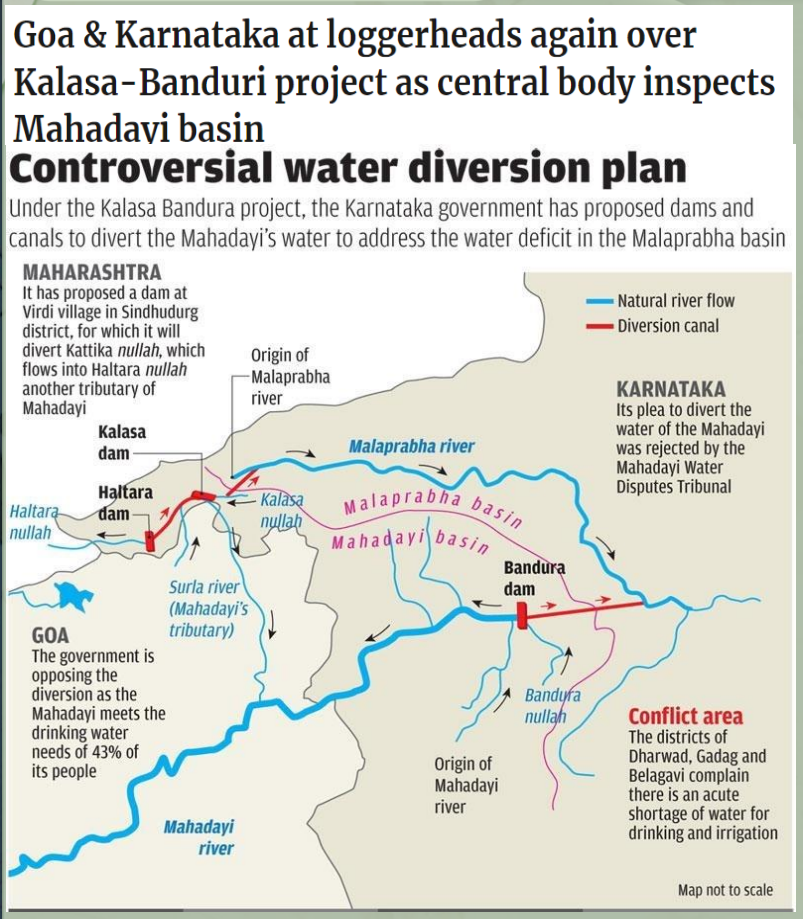
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July 8

MAHADAYI RIVER

(Syllabus: GS Paper 1 – Geography)

Goa & Karnataka at loggerheads again over Kalasa-Banduri project as central body inspects Mahadayi basin



Context: Environmental concerns and tiger conservation claims complicate Goa-Karnataka tensions over the Kalasa-Banduri project, triggered by a central body's inspection of the Mahadayi basin.

Mahadayi River

- **Origin and Name**: Mahadayi or Mhadei, originating in Bhimgad Wildlife Sanctuary in Karnataka, is a significant west-flowing river.
- **Rain-fed Nature**: It is primarily rain-fed and is known as Mandovi once it reaches Goa.
- **Formation of Mandovi:** In Goa, Mahadayi is formed by the confluence of several streams, including the Zuari river, making it one of Goa's major rivers.
- **Course**: The river flows 35 km through Karnataka and 82 km through Goa before emptying into the Arabian Sea.

Kalasa-Banduri Nala Project

- **Project Objective**: Undertaken by Karnataka, the project aims to enhance drinking water supply to Belagavi, Dharwad, and Gadag districts.
- **Water Diversion**: It involves constructing dams on Kalasa and Banduri tributaries to divert water to the Malaprabha river.
- **Beneficiary Districts**: The Malaprabha river supplies drinking water to Dharwad, Belgaum, and Gadag districts.
- **Controversy and Resolution**: Initially planned in 1989, the project faced objections from Goa, leading to the establishment of the Mahadayi Water Disputes Tribunal in 2010.
- **Tribunal Involvement**: Goa, Karnataka, and Maharashtra are all parties involved in the tribunal to resolve disputes over Mahadayi river water sharing.

ECONOMIC TIMES

July 8

GALLANTRY AWARDS

(Syllabus: GS Paper 1 – ART & CULTURE)

Gallantry Awards 2024: President Murmu honours brave soldiers with Kirti Chakra and Shaurya Chakra

Context: President of India awarded 36 Gallantry Awards to personnel from the Armed Forces, Central Armed Police Forces, and State and Union Territory Police in recognition of their exceptional bravery.

Gallantry Awards

- **About**: These are a recognition of acts of courage and self-sacrifice performed by members of the Armed Forces, legally constituted forces, and civilians.
- **Ministry**: Ministry of Defence
- **Announced**: Twice in a year
- **Categories of Awards**: Wartime Gallantry Awards and Peacetime Gallantry Awards.
- **Wartime Gallantry Awards:** Param Vir Chakra (PVC), Mahavir Chakra (MVC), and Vir Chakra
- **Peacetime Gallantry Awards:**
    - **Ashok Chakra**: It is awarded for valor, courageous action or self-sacrifice away from the battlefield.
    - **Kirti Chakra**: It is comparable to the Maha Vir Chakra, the second-highest gallantry award awarded during peacetime.
    - **Shaurya Chakra:** An Indian military honor bestowed for acts of gallantry, bravery, or selflessness in situations not involving direct engagement with the enemy.
- **Other Recognitions**: Sena Medal, Nao Sena Medal, and Vayu Sena Medal.

Major facts:

- All the gallantry awards may be awarded posthumously.
- Persons recommended for the award shall not be involved in any adverse report or should not have been conveyed any displeasure or censure or given any punishment in a court martial proceedings or through administrative action.

LIVEMINT Page 9

GUIDELINE FOR DISABLED PERSONS

(Syllabus: GS Paper 2 – Vulnerable Sections)

SC on disabilities portrayal in media



The verdict followed a plea citing derogatory references in the film *Aankh Micholi*. PTI

The Supreme Court laid down guidelines against "disparaging" portrayal of persons with disabilities in visual media and films on Monday, saying that terms such as "cripple" and "spastic" have acquired "devalued meanings" in societal perceptions.

The verdict came on a plea filed by one Nipun Malhotra, who submitted that the Hindi film *Aankh Micholi* contained deprecatory references to differently abled persons.

Pronouncing the verdict, a bench headed by Chief Justice D.Y. Chandrachud said, "Words cultivate institutional discrimination and terms such as cripple and spastic have come to acquire devalued meanings in societal perceptions about persons with disabilities." Laying down several guidelines, the bench said the film certification body CBFC must invite the opinion of experts before allowing screening.

"Visual media should strive to depict diverse realities of persons with disabilities, showcasing not only their challenges but also successes, talents and contribution to society. They should neither be lampooned based on myths nor presented as super cripples," it added. PTI

Rights of Persons with Disabilities Act, 2016

- **About:** The Act implemented the United Nations Convention on the Rights of Persons with Disabilities, adopted in 2006 and ratified by India in 2007.
- **Replacing the Previous Legislation**: The 2016 Act superseded the Persons with Disabilities Act of 1995, initiating significant changes in disability rights legislation.
- **Mandates for Accessibility:** The Act mandated the central government to establish guidelines and standards for public buildings to ensure accessibility for persons with disabilities, with provisions for periodic review and updates.
- **Free Education Provision**: Every child with benchmark disability between the age of 6 to 18 years entitled to free education.
- **Recognition of Disabilities**: 21 types of disabilities recognized, including intellectual disability, acid attack victims, etc.

Context: In a landmark verdict, the Supreme Court of India has issued guidelines governing the portrayal of people with disabilities in films and visual media, aiming to promote accurate and respectful representation.

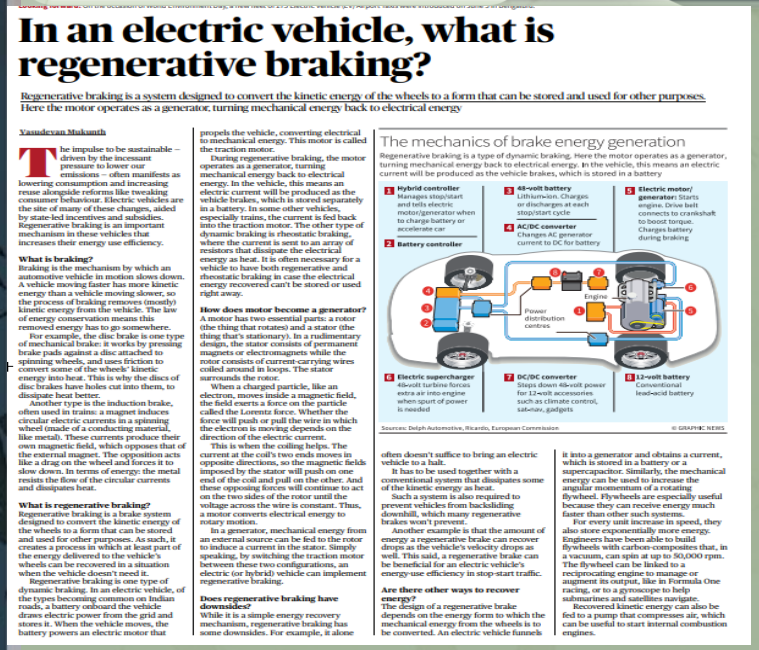
Guideline for Disabled Persons in Films

- **Authentic Representation**: The Supreme Court (SC) emphasized the need for authentic and respectful portrayal of individuals with disabilities in films and media.
- **Boundaries of Creative Freedom**: The court clarified that artistic freedom under Article 19(1)(a) does not extend to mocking, stereotyping, or disparaging marginalized groups, aligning with constitutional and RPwD Act 2016 objectives.
- **Influence of Cinema**: Recognizing cinema's influential role, the court highlighted that inaccurate or stereotypical portrayals can perpetuate harmful misconceptions about people with disabilities.
- **Avoidance of Stereotypes**: Chief Justice of India (CJI) underscored that resorting to stereotypes diminishes the diverse experiences of disabled individuals, contrary to the anti-discrimination principles under Article 14.
- **Impact of Language on Perception**: The court noted that terms like "cripple" and "spastic" contribute to devalued societal perceptions of persons with disabilities, reinforcing institutional discrimination.

THE HINDU Page 9

REGENERATIVE BRAKING

(Syllabus: GS Paper 3 – Sci and Tech)



In an electric vehicle, what is regenerative braking?

Regenerative braking is a system designed to convert the kinetic energy of the wheels to a form that can be stored and used for other purposes. Here the motor operates as a generator, turning mechanical energy back to electrical energy

Yasudevan Mukunth

The impulse to be sustainable – driven by the incessant pressure to lower our emissions – often manifests as lowering consumption and increasing reuse alongside reforms like tweaking consumer behaviour. Electric vehicles are the site of many of these changes, aided by state-led incentives and subsidies. Regenerative braking is an important mechanism in these vehicles that increases their energy use efficiency.

What is braking?

Braking is the mechanism by which an automotive vehicle in motion slows down. A vehicle moving faster has more kinetic energy than a vehicle moving slower, so the process of braking removes (mostly) kinetic energy from the vehicle. The law of energy conservation means this removed energy has to go somewhere.

For example, the disc brake is one type of mechanical brake: it works by pressing brake pads against a disc attached to spinning wheels, and uses friction to convert some of the wheels' kinetic energy into heat. This is why the discs of disc brakes have holes cut into them, to dissipate heat better.

Another type is the induction brake, often used in trains: a magnet induces circular electric currents in a spinning wheel (made of a conducting material, like metal). These currents produce their own magnetic field, which opposes that of the external magnet. The opposition acts like a drag on the wheel and forces it to slow down. In terms of energy: the metal resists the flow of the circular currents and dissipates heat.

What is regenerative braking?

Regenerative braking is a brake system designed to convert the kinetic energy of the wheels to a form that can be stored and used for other purposes. As such, it creates a process in which at least part of the energy delivered to the vehicle's wheels can be recovered in a situation when the vehicle doesn't need it.

Regenerative braking is one type of dynamic braking. In an electric vehicle, of the types becoming common on Indian roads, a battery onboard the vehicle draws electric power from the grid and stores it. When the vehicle moves, the battery powers an electric motor that propels the vehicle, converting electrical to mechanical energy. This motor is called the traction motor.

During regenerative braking, the motor operates as a generator, turning mechanical energy back to electrical energy. In the vehicle, this means an electric current will be produced as the vehicle brakes, which is stored separately in a battery. In some other vehicles, especially trains, the current is fed back into the traction motor. The other type of dynamic braking is rheostatic braking, where the current is sent to an array of resistors that dissipate the electrical energy as heat. It is often necessary for a vehicle to have both regenerative and rheostatic braking in case the electrical energy recovered can't be stored or used right away.

How does motor become a generator?

A motor has two essential parts: a rotor (the thing that rotates) and a stator (the thing that's stationary). In a rudimentary design, the stator consists of permanent magnets or electromagnets while the rotor consists of current-carrying wires coiled around in loops. The stator surrounds the rotor.

When a charged particle, like an electron, moves inside a magnetic field, the field exerts a force on the particle called the Lorentz force. Whether the force will push or pull the wire in which the electron is moving depends on the direction of the electric current.

This is when the coiling helps. The current at the coil's two ends moves in opposite directions, so the magnetic fields imposed by the stator will push on one end of the coil and pull on the other. And these opposing forces will continue to act on the two sides of the rotor until the voltage across the wire is constant. Thus, a motor converts electrical energy to rotary motion.

In a generator, mechanical energy from an external source can be fed to the rotor to induce a current in the stator. Simply speaking, by switching the traction motor between these two configurations, an electric (or hybrid) vehicle can implement regenerative braking.

Does regenerative braking have downsides?

While it is a simple energy recovery mechanism, regenerative braking has some downsides. For example, it alone often doesn't suffice to bring an electric vehicle to a halt.

It has to be used together with a conventional system that dissipates some of the kinetic energy as heat.

Such a system is also required to prevent vehicles from backsliding downhill, which many regenerative brakes won't prevent.

Another example is that the amount of energy a regenerative brake can recover drops as the vehicle's velocity drops as well. This said, a regenerative brake can be beneficial for an electric vehicle's energy-use efficiency in stop-start traffic.

Are there other ways to recover energy?

The design of a regenerative brake depends on the energy form to which the mechanical energy from the wheels is to be converted. An electric vehicle funnels it into a generator and obtains a current, which is stored in a battery or a supercapacitor. Similarly, the mechanical energy can be used to increase the angular momentum of a rotating flywheel. Flywheels are especially useful because they can receive energy much faster than other such systems.

For every unit increase in speed, they also store exponentially more energy. Engineers have been able to build flywheels with carbon-composites that, in a vacuum, can spin at up to 50,000 rpm. The flywheel can be linked to a reciprocating engine to manage or augment its output, like in Formula One racing, or to a gyroscope to help submarines and satellites navigate.

Recovered kinetic energy can also be fed to a pump that compresses air, which can be useful to start internal combustion engines.

The mechanics of brake energy generation

Regenerative braking is a type of dynamic braking. Here the motor operates as a generator, turning mechanical energy back to electrical energy. In the vehicle, this means an electric current will be produced as the vehicle brakes, which is stored in a battery

1 Hybrid controller: Manages stop/start and tells electric motor/generator when to charge battery or accelerate car

2 Battery controller

3 48-volt battery: Lithium-ion. Charges or discharges at each stop/start cycle

4 AC/DC converter: Changes AC generator current to DC for battery

5 Electric motor/generator: Starts engine. Drive belt connects to crankshaft to boost torque. Charges battery during braking

6 Electric supercharger: 48-volt turbine forces extra air into engine when spurt of power is needed

7 DC/DC converter: Steps down 48-volt power for 12-volt accessories such as climate control, satnav, gadgets

8 12-volt battery: Conventional lead-acid battery

Engine

Power distribution centres

Sources: Delph Automotive, Ricardo, European Commission

© GRAPHIC NEWS

Context: State-led incentives and subsidies are driving significant changes in the electric vehicle sector. One key innovation is regenerative braking, which enhances energy use efficiency in these vehicles.

Braking

- **About:** It is the mechanism through which a moving automotive vehicle decelerates.
- It primarily reduces the vehicle's kinetic energy, translating its motion into other forms.
- **Energy Conversion**: Vehicles in motion possess kinetic energy proportionate to their speed.
    - Braking involves converting this kinetic energy into other forms due to the law of energy conservation.
- **Types of Brakes**
    - Mechanical Brakes (Disc Brake)
    - Utilizes brake pads pressing against a rotating disc.
    - Friction generated converts kinetic energy into heat.
    - Features like disc perforations aid in heat dissipation.
- **Induction Brake**
    - Involves inducing electric currents in a conducting wheel.
    - These currents create a magnetic field opposing an external magnet's field.
    - Resulting drag slows down the wheel, dissipating energy as heat through metal resistance.

Regenerative Braking

- **About:** It is a brake system designed to convert the kinetic energy of the wheels into a form that can be stored and used for other purposes.
- **Mechanism:** During braking, the traction motor in electric vehicles functions as a generator, converting kinetic energy back into electrical energy.
- **Comparison**: Contrasted with rheostatic braking, regenerative braking stores recovered energy rather than dissipating it as heat.

How Does a Motor Become a Generator?

- **Motor Basics:** A motor comprises a stationary stator and a rotating rotor, generating motion through interaction with a magnetic field.
- **Operation:** When a motor operates in reverse, as a generator, mechanical energy turns the rotor to induce electrical current in the stator.
- **Application**: Switching the motor's function allows electric vehicles to implement regenerative braking, converting kinetic energy into stored electricity.

LIVEMINT July 8

EARTH'S INNER CORE

(Syllabus: GS Paper 1 – Geography)

Earth's core is now rotating in reverse direction, slowing down: What does it mean?

Context: Recent studies by scientists indicate that the Earth's core has slowed down significantly, potentially reversing its direction of movement.

Earth's Inner Core

- **About**: The innermost part of Earth, located approximately 5,150 kilometers beneath the surface.
- **Composition**: Primarily of iron and nickel, forming a solid metallic ball.
- **Mass**: Makes up around 20 percent of Earth's total mass.
- **Size**: Has a radius of about 759 miles (1,221 kilometers).
- **Temperature and Heat Sources:** Extremely hot, with temperatures ranging from 7200–9000°F (4000–5000°C).
- Heat generated by radioactive decay, residual heat from planetary formation, and heat from outer core solidification.
- **Pressure**: Under intense pressure of about 3.6 million atmospheres, which maintains its solid state despite high temperatures.
- **Surrounding Layers:** Outer core, a superhot layer of molten metals, and further by the mantle and crust.
    - The boundary with the outer core is known as the Lehman Seismic Discontinuity.
- **Magnetic Field**: Generates its own magnetic field.
    - Contains about 10% of the Earth's total magnetic field energy despite its small volume.

Rotation speed of Earth's core slowing down

- **Discovery of Earth's Inner Core:** Danish seismologist Inge Lehmann discovered the planet's inner core in 1936, sparking ongoing scientific inquiry into its properties.
- **Challenges:** Direct observation and sampling of Earth's deep interior are impossible, leading scientists to rely on indirect methods for understanding core dynamics.
- **Seismographic Evidence**: Data from seismograms, measuring waves from earthquakes and explosions, provide crucial insights into the Earth's core rotation.
- **Recent Findings**: A study published in June found that the solid inner core's rotation speed has been consistently decreasing relative to the Earth's surface.

INDIAN EXPRESS

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COGNITIVE TEST

(Syllabus: GS Paper 3 – Sci and Tech)

WHAT IS A COGNITIVE TEST, WHICH MANY WANT JOE BIDEN TO TAKE?

ANKITA UPADHYAY
NEW DELHI, JULY 8



President Joe Biden has refused to walk away from the race. *Reuters*

AMID CONCERN over 81-year-old Joe Biden's fitness to stay in the race for the White House, there have been calls for the President to take a cognitive test to determine the level of his mental acuity.

Biden, who many feel is too old for the physical and mental demands of the world's toughest job, has remained adamant in the face of an increasingly urgent campaign to have him step aside.

In his June 27 debate with Donald Trump and in recent speeches and interviews, Biden has been faltering and incoherent, spoken haltingly in a raspy voice, and demonstrated an absence of facial animation, resulting at times in a flat, open-mouthed expression.

What is a cognitive test?

A cognitive test checks for problems with cognition, which includes brain functions such as thinking, learning, remembering, and using judgment and language. Problems with cognition are described as cognitive impairment.

Cognitive testing is a structured and validated process that seeks to identify deficits, the reasons for their occurrence, and the spheres of the subject's brain they affect. On the basis of the test results, a diagnosis is reached on whether the subject has cognitive impairment, dementia, or pseudo dementia, and interventions – including behaviour therapies and cognitive therapies – are decided.

For whom is this test recommended?

People who have memory deficits, or who think they are losing memory or becoming forgetful, have difficulty in focusing or in judgment, or whose mind is not working as they think it should be working, should take the test.

The test is frequently given by doctors in order to differentiate among dementia and pseudo dementia, and to suggest interventions for cognitive rehabilitation. "For us, doing cognitive function tests is a very regular thing," Dr Praveen Gupta, principal director and unit head of neurology at Fortis Hospital, Gurgaon, said.

Is this a test for only older people?

Age is a significant factor in cognitive decline: the risk of dementia increases in every decade after 60, and becomes very significant after age 75. Dr Gupta said Biden is of an age at which the risk of cognitive impairment is particularly high.

Biden has, however, refused to undergo any kind of neurological examination, including a cognitive test. Being President and running for re-election are cognitive tests in themselves, he has said.

Some younger people also show signs because of stress, overwork and multitasking, Dr Gupta said. "Those people also take these tests to differentiate between early onset of dementia and cognitive impairment, and pseudo dementia," he said.

And how is this test done?

A psychologist checks functions such as memory, retention, language functioning, calculating ability, and special organising ability, in order to evaluate the functioning of individual parts of the brain that are responsible for each of these mental functions.

Context: Amid concerns over the US President's fitness for the White House race, calls have arisen for him to undergo a cognitive test to assess his mental acuity.

Cognitive Test

- **Definition**: Cognitive testing assesses brain functions like thinking, learning, memory, judgment, and language to detect any impairments.
- **Process**: It follows a methodical approach to identify deficits in cognitive functions and determine their causes.
- **Determining Cognitive Impairment**: Results help diagnose conditions like cognitive impairment, dementia, or pseudo-dementia.
- **Treatment Decisions:** Results guide decisions on interventions such as behavior therapies and cognitive therapies.
- **Recommended**: People who have memory deficits, or who think they are losing memory or becoming forgetful, have difficulty in focusing or in judgment, or whose mind is not working as they think it should be working, should take the test.
- **Age and Cognitive Decline**: Age is a significant factor in cognitive decline. The risk of dementia increases with each decade after 60, becoming notably higher after age 75.
- **Purpose of Testing**: Cognitive tests help differentiate between dementia, cognitive impairment, and pseudo-dementia by assessing memory, language, calculation, and organizational skills.

BUSINESS LINE July 8

COPERNICUS CLIMATE CHANGE SERVICE

(Syllabus: GS Paper 3 – Sci and Tech)

World went through its warmest June in 2024, says Copernicus Climate Centre Service PREMIUM

Context: According to the Copernicus Climate Change Service (C3S), June marked the hottest on record globally, with temperatures averaging 0.67°C above the 1991-2020 average.

Copernicus Climate Change Service (C3S)

- **About**: C3S is one of six thematic information services under the Copernicus Earth Observation Programme of the European Union.
- **Operational Framework:** It operates as part of an established programme leveraging existing research infrastructures and knowledge across Europe and globally.
- **Societal Impact:** C3S provides authoritative climate information covering historical, current, and future climate trends globally, supporting informed decision-making.
- **Support for European Policies**: The service aims to bolster European climate policies and actions, enhancing societal resilience against anthropogenic climate change.
- **Scientific Foundations**: C3S bases its outputs on climate research conducted within the World Climate Research Programme (WCRP) and responds to user needs outlined by the Global Climate Observing System (GCOS).
- **Implementation Structure**: The service is implemented by the European Centre for Medium-Range Weather Forecasts (ECMWF) on behalf of the European Commission.

Copernicus Programme

- **Purpose**: Copernicus is the European Union's comprehensive Earth Observation Programme aimed at providing reliable environmental data.
- **Data Collection Systems**: It integrates data from diverse sources including earth observation satellites, ground stations, airborne and sea-borne sensors.
- **Service Areas:** Copernicus delivers information through services focused on land, marine, atmosphere, climate change, emergency management, and security.

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CLASSICAL LANGUAGES IN INDIA

(Syllabus: GS Paper 1 – Art and Culture)

Centre set to tweak criteria for according classical language status

With polls due in Maharashtra, push for the status for Marathi has gained momentum

Sreeparna Chakrabarty
NEW DELHI

Amid demand for classical status for many languages, the Union government has decided to tweak the criteria for giving the special tag.

The Linguistics Expert Committee of the Culture Ministry submitted a report on October 10 last year, suggesting changes, sources in the Ministry told *The Hindu*.

The sources said the Centre had asked the panel to reconsider the rules. The issue was taken up first at a meeting on June 21, 2023. A Gazette notification of the new criteria will be issued after Cabinet approval.

This, in effect, means that classical language status for certain languages, chiefly Marathi, which is under consideration of the government, may have to wait for the notification.

Over the years, some States and literary circles have been demanding classical status for languages such as Marathi, Bengali, Assamese and Maithili.

In 2014, then Maharashtra Chief Minister Prithviraj Chavan constituted a committee of Marathi language experts chaired by Ranganath Pathare, and the report was submitted to the Centre. The Pathare committee had concluded that Marathi fulfils all parameters to be recognised as a classical language.

Mr. Chavan had written to then Culture Minister Shripad Naik requesting that the demand be met.

The issue has been raised time and again by MPs from Maharashtra in Parliament, and the Centre has given assurances at least three times in the past 10 years that Marathi was being considered. Then Union Culture Minister G. Kishan Reddy informed Parliament in February 2022 that "the proposal for according classical status to Marathi was under the active consideration of the Ministry of Culture".

Once a language is notified as a classical language, the Education Ministry helps promote it, which includes instituting two major annual international awards for scholars of eminence in the language. Apart from this, a centre of excellence for studies in the language is set up, and the University Grants Commission is requested to create a certain number of Professional Chairs in Central universities.

With Assembly election due in Maharashtra in October, the demand in support of Marathi has gained momentum. Recently, Congress general secretary Jairam Ramesh posted on X: "For the last ten years, the demand for declaring Marathi as a classical language has been pending with the Modi Sarkar".

The Shiv Sena-BJP government in Maharashtra too upped the game by forming a "persuasion" committee, led by former diplomat Dnyaneshwar Muley, four months ago. The mandate of this committee is to liaison and pursue the matter with Union government officials.

Lakhshmikant Deshmukh, a committee member, told *The Hindu*: "Maharashtra is a rich State. We do not need any funds for the promotion of the language. It is just a matter of pride for us."

Context: Amid a clamour for classical status for many languages, the Central government has decided to tweak the criteria for giving this special tag.

Classical Languages in India

- **Criteria**: The Government of India has established specific criteria for declaring a language as classical, including a high antiquity of early texts, a valuable literary heritage, originality, and distinctiveness from modern forms.
- **Currently Classical Languages**: As of now, six languages hold the prestigious 'Classical' status in India: Tamil (2004), Sanskrit (2005), Kannada (2008), Telugu (2008), Malayalam (2013), and Odia (2014).
- **Demand of classical language tag**: Marathi, Bengali, Assamese and Maithili.
- The Ministry of Culture provides the guidelines regarding Classical languages.

Present Criteria for Declaration of a Classical Language

- **Antiquity Requirement**: A language must demonstrate a high antiquity of its early texts or recorded history spanning 1,500-2,000 years.
- **Body of Ancient Literature**: It should possess a substantial body of ancient literature or texts that are considered valuable heritage by generations of speakers.
- **Original Literary Tradition:** The literary tradition of the language should be original and not borrowed from another speech community.
- **Distinct from Modern Format**: The classical language and its literature should be distinct from its modern format, possibly showing discontinuity with its later forms or offshoots.

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