MADE IN INDIA DEFENCE TECHNOLOGY IN OPERATION SINDOOR

- Operation Sindoor showcased India's ability to strike with remarkable accuracy deep inside Pakistan and Pakistan-occupied Kashmir.
- Specific buildings within terrorist camps and air bases were destroyed with minimal collateral damage, highlighting India's responsible and precise military action.
- **Advanced Guidance and Navigation Systems**
    - The success of these precision strikes was made possible by sophisticated guidance and navigation technologies, integrating both ground-based systems and space-based assets.
- **Role of Indigenous Technologies**
    - India's home-grown navigation system, NavIC (Navigation with Indian Constellation), provided positional accuracy of 10–20 cm.
    - It was supported by high-resolution satellites like Cartosat, RISAT, and EOS, capable of identifying objects as small as 25–30 cm.
- **Contribution of Defence Institutions**
    - Years of research and development by DRDO, ISRO, and other Indian scientific institutions culminated in this capability.
    - The BrahMos missile, likely used in the operation, features state-of-the-art guidance systems developed indigenously.
- **Future Outlook**
    - Guidance and navigation has been identified as one of the 75 technology priority areas in DRDO's 2023 Anusandhan Chintan Shivir, ensuring continued focus and advancement in this critical domain.

Radars and Air Defence in Operation Sindoor

- India's air defence systems played a pivotal role in neutralising almost every Pakistani aerial attack during Operation Sindoor.

- These systems operated in an integrated fashion, combining indigenous and imported technologies.

- **S-400 Triumph and Strategic Symbolism**
  - The Russian-origin S-400 air defence system received high praise, reflecting its significance in ensuring aerial security.

- **Indigenous Radar Backbone**
  - Several DRDO-developed radar systems—such as the Rajendra radar, Rohini 3D radar, low-level lightweight radars, and Low-Level Transportable Radars (LLTR)—formed the core of surveillance and detection, enabling tracking of enemy drones and aircraft.

- **Cutting-Edge Radar R&D**
  - Ongoing DRDO research includes work on:
    - AI-powered radar tools
    - Reconfigurable intelligent surfaces
    - Advanced signal processing
    - Foliage penetration and stealth detection radars
  - These technologies aim to further sharpen India's radar superiority.

- **Indigenous Missile Systems in Action**
  - The operation also saw deployment of:
    - SAMAR systems, capable of intercepting low-flying aerial targets within a 12 km range.
    - Akash surface-to-air missile systems, providing medium-range protection.

- **Upgraded Bofors Guns for Drone Defence**
  - Modernised Bofors anti-aircraft guns, enhanced with radar, electro-optical sensors, and auto-tracking, were effectively used to take down drones, particularly in Jammu & Kashmir.
  - These upgraded units are also deployed along the LAC (Line of Actual Control).

DESALINATION TECHNOLOGY
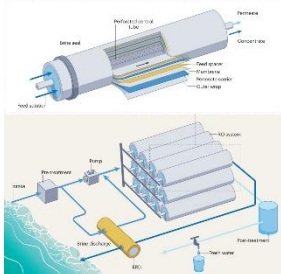
The Defence Research & Development Organisation (DRDO) has developed an indigenous high-pressure nanoporous multilayered polymeric membrane for seawater desalination.

- The project was executed by **Defence Materials Stores Research & Development Establishment (DMSRDE), Kanpur**, under the **Aatmanirbhar Bharat**

- The membrane was designed to meet the **operational needs of the Indian Coast Guard (ICG)**, particularly to withstand **chloride ion-induced instability** in saline water.

- The technology is intended for use in **Offshore Patrol Vessels (OPVs)** of the Coast Guard, providing **self-reliant onboard freshwater capability**.

About Desalination Technology

- **Desalination** is the **removal of dissolved salts and minerals from saline or brackish water** to make it fit for human use. A **desalination plant** converts **seawater into freshwater** by **removing salts** to meet **drinking or industrial quality standards**.

- **Two primary technologies used globally:**
  - **Reverse Osmosis (RO)** – pressure-driven membrane-based filtration.
 - **Thermal Desalination** – evaporation-condensation method using heat.

Working of Reverse Osmosis (RO) Desalination

- **Osmosis** refers to the natural movement of water from an area of **low solute concentration to high solute concentration** through a **semi-permeable membrane**.

- In **reverse osmosis**, **external pressure** is applied to push water from a **high-solute (saline) side** to a **low-solute (freshwater) side**, against the natural osmotic gradient.

- **Microscopic pores** in the RO membrane **allow water molecules** to pass while **blocking salts and other impurities**.

- **Seawater typically has a TDS (Total Dissolved Solids) of ~35,000 ppm**, while RO brings it down to **200–500 ppm**, making it potable.

SOUTHERN STATES WITNESS SHARPER DECLINE IN BIRTH RATES THAN NATIONAL AVERAGE

- The **Sample Registration System (SRS) Statistical Report 2021**, released by the Registrar General of India, reveals a significant demographic shift in India.
- States like Tamil Nadu, Delhi, and Kerala are experiencing a sharper decline in birth rates compared to the national average.
- This trend reflects a broader change in fertility patterns, lifestyle preferences, and access to health and family planning services.

National and State-Level Trends in Birth Rate Decline
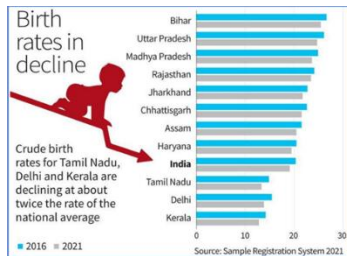
- As per the report, the **all-India crude birth rate (CBR)** in 2021 stood at **19.3 births per 1,000 population**, declining at an annual rate of **1.12%** from 2016 to 2021.
- However, Tamil Nadu, Delhi, and Kerala saw a decline at almost **double this rate**:
  - **Tamil Nadu:** 2.35% annual decline
  - **Delhi:** 2.23% annual decline
  - **Kerala:** 2.05% annual decline

Regional Comparison of Birth Rate Trends

- Southern states such as **Andhra Pradesh (1.26%)**, **Telangana (1.67%)**, and **Karnataka (1.68%)** also showed a faster decline compared to the national average.
- In contrast, **northern and eastern states** showed much slower rates of decline:
  - **Rajasthan:** 0.48%
  - **Bihar:** 0.86%
  - **Chhattisgarh & Jharkhand:** 0.98%
  - **Assam & Madhya Pradesh:** 1.05%
  - **Uttar Pradesh:** 1.09%

- Notably, **Uttarakhand** was the **only state** to record a **rise** in birth rates during the same period.

Insights from Civil Registration System (CRS) 2021

- The Civil Registration System (CRS) 2021 data complements the SRS findings.
- While southern states like **Tamil Nadu, Kerala, Andhra Pradesh, and Karnataka** reported a consistent **decline in registered births since 2012**, many **northern and north-eastern states** have seen a **rise in registered births**, such as:
    - Bihar, Rajasthan, Uttar Pradesh, West Bengal
    - Uttarakhand, Jammu & Kashmir, Ladakh
    - Lakshadweep, Arunachal Pradesh, Mizoram, and Nagaland
- This discrepancy indicates that while population growth is stabilising in parts of southern and western India, it remains robust in several northern and north-eastern states.

Implications and Policy Reflections

- The findings from the SRS 2021 and CRS 2021 underline India's **demographic divergence**.
- Southern states are heading toward **population stabilisation**, while some northern states may face the challenges of managing **youth bulge** and **resource distribution** for a still-growing population.
- These insights are crucial for shaping **targeted public policy** in areas such as **education**, **healthcare**, **urban planning**, and **employment**.
- They also reinforce the need for **differentiated policy frameworks**, given the contrasting demographic realities between states.

Conclusion

India's demographic map is undergoing a complex transition, with southern states leading the way in achieving replacement-level fertility or lower, and parts of the north still exhibiting high fertility trends.

TOWARDS SAFER ROADS - REIMAGINING INDIA'S URBAN MOBILITY AND ROAD SAFETY STRATEGY

- India is undergoing **a major mobility shift** driven by urbanisation and economic expansion.
- With one of the world's largest road networks, India faces **a severe road safety challenge**.
- **For example,** India recorded **1.68 lakh road accident fatalities in 2022**, which translates to approx. 12.2 deaths per 1 lakh population (2.57 in Japan and 2.61 in U.K).
- Therefore, **urban mobility in India must be reimagined** to prioritise inclusivity and safety over speed.

Economic Costs and Developmental Impact of Road Accidents in India:

- **Economic repercussions:** Road crashes cost India an **estimated 3% of its GDP annually**.
- **Impact on development:** This **hampers** national development (loss of human capital, productivity, and strain on healthcare and infrastructure) and underscores the urgency for effective road safety measures.

Constitutional Perspective - Right to Safe Travel:

- **Article 21:** Right to safe road travel is **a part of the fundamental right to life** under the Constitution of India.
- **Significance:** It imposes moral and legal obligation on the State and society to ensure road safety as **a public good and human right**.

Safe System Approach - A Human-Centric Design Philosophy:

- **Core principle:** Human error is inevitable - systems must be designed to reduce harm (fatalities or serious injuries).
- **Priority:** Pedestrian safety is fundamental under this approach.
- **Key interventions:**

- o Urban streets must be redesigned with **wider footpaths, dedicated cycling tracks, well-marked crossings, pedestrian refuge islands**, reduced speed limits, and calming measures such as raised intersections.
- o This system moves away from blaming individual road users and instead emphasises creating a forgiving and resilient road environment.

- **Paradigm shift:** From blaming road users to creating a forgiving environment and resilient infrastructure.

Government Initiatives and Policy Interventions Launched by Ministry of Road Transport and Highways (MoRTH):

- **Black spot rectification:** Over 5,000 high-risk locations addressed.
- **Road safety audits:** Mandatory on highways.
- **Vehicle safety norms:** Airbags, ABS (Anti-lock Braking System).
- **Electronic enforcement:** Speed cameras, CCTV surveillance.
- **Training and fitness infrastructure:** Driving training centres and vehicle fitness centres in every district announced by Union Minister Nitin Gadkari

Integrated Strategy - The Four Es of Road Safety:

- **Engineering:** Safe infrastructure design.
- **Enforcement:** Technological and human enforcement mechanisms.
- **Education:** Awareness and user behaviour change.
- **Emergency care:** Trauma and post-crash response systems.
- Roads must serve as **shared civic spaces** prioritising safety, inclusivity, and sustainability.
- **Focus on vulnerable groups:** Children, pedestrians, cyclists.
- **Reimagining mobility:** Not speed but safety and equity as metrics of success.

Conclusion - Road Safety as a Developmental Imperative:

- As road safety is integral to **Viksit Bharat 2047**, it requires data-driven policy, institutional accountability, and **a societal shift in values**. Road safety is not a luxury, but a foundation for **sustainable and equitable development**.

CENTRE REVAMPS PERIODIC LABOUR FORCE SURVEY (PLFS)

Periodic Labour Force Survey (PLFS)

- PLFS is a large-scale survey conducted by the National Statistical Office (NSO) under the Ministry of Statistics and Programme Implementation (MoSPI).
- **Aim**
    - PLFS was launched in 2017:
        - To generate quarterly estimates of key employment and unemployment indicators for urban areas using the Current Weekly Status (CWS) approach, and
        - To provide annual estimates for both rural and urban areas using both Usual Status (ps+ss) and CWS approaches.
            - Usual Principal Status and Subsidiary Status (ps+ss) assesses a person's activity over the **past 365 days**, while Current Weekly Status (CWS) assesses it over the **past 7 days** prior to the survey.
- **Objective**
    - Its main objective is to provide reliable and timely data on:
        - Employment and unemployment levels
        - Labour force participation rate (LFPR)
        - Worker population ratio (WPR)
        - Unemployment rate (UR)
        - Nature of employment (e.g., regular salaried, self-employed, casual labour)
- **Significance**
    - India lacks reliable high-frequency employment data — PLFS fills that gap.
    - Helps track labour market trends in real-time or near real-time.
    - Used by government, economists, researchers, and international organizations like the ILO, World Bank, etc.

- o Aids in assessing the impact of policies, economic cycles, or crises (e.g., COVID-19) on employment.

SHAKARGARH BULGE

- The Shakargarh Bulge is an **important area in Pakistani territory** that **sticks out into India, bordered by the Ravi and Chenab rivers.**

- Its geography consists of **flat terrain** and **proximity to key road and rail networks**, making it a **strategic corrido**r for both sides.

- The area's flat terrain and its **proximity to Indian cities** such as **Amritsar, Pathankot, Batala, and Gurdaspur,** as well as **road links to Jammu,** makes it a high-priority area for the Indian Army.

- This area was the **site of the notable Battle of Basantar during** the **1971 Indo-Pakistan War.**
    - o It was a 12-day engagement that shaped the outcome of the western front in the 1971 war.