
Prelims Exam Topics

SEAFARER-FIRST INITIATIVE

Context

The **Ministry of Ports, Shipping and Waterways (MoPSW)** launched a 'Seafarer-First' response to safeguard Indian seafarers operating in the conflict-affected **Strait of Hormuz, Persian Gulf, and Gulf of Oman**.

About Seafarer-First Initiative

- The **Seafarer-First** initiative is a coordinated emergency response mechanism to ensure the **safety, welfare, and real-time monitoring** of Indian seafarers in high-risk maritime regions.
- It is implemented by **MoPSW** in coordination with the **Ministry of External Affairs (MEA), Indian Navy, Directorate General of Shipping, and Indian Missions**.
- **Key Features**
 - **Real-time vessel-by-vessel monitoring** of Indian seafarers through a dedicated operational dashboard.
 - Appointment of **dedicated liaison officers** for every affected Indian seafarer.
 - Mandatory **threat assessment** for all vessels before transiting conflict-prone waters.

TRANSPOSABLE ELEMENTS (JUMPING GENES)

Context

Researchers have provided the **first direct visual evidence** of an **RNA-based jumping gene (intron)** moving from one organism to another **without the help of a biological carrier (e.g., virus)**, demonstrating **horizontal gene transfer (transfer of genes between unrelated organisms)** across species.

About Transposable Elements (Jumping Genes)

- **Jumping genes** are segments of DNA that can move from one location to another within a genome.
- Classified into:
 - **Class I (Retrotransposons)**: Move through an **RNA intermediate (temporary RNA copy)** using the enzyme **Reverse Transcriptase (converts RNA into DNA)**.

- **Class II (DNA Transposons):** Move directly as **DNA** using the enzyme **Transposase** (cuts and inserts DNA segments).
- They influence **gene expression**, generate **genetic variation**, and may cause **mutations**.

DISCOVERY OF ERYTHRULOSE IN SPACE

Context

Astronomers have detected **erythrulose**, a **complex sugar**, in an **interstellar molecular cloud** near the centre of the **Milky Way**, marking the **first discovery of a sugar molecule in deep space**.

About the Discovery of Erythrulose in Space

- **Erythrulose** is a **complex sugar** that serves as a building block for biologically important molecules.
- It is the **first sugar molecule** directly detected in the space **between stars**, demonstrating that complex organic compounds can form without planetary environments.
- The discovery supports the hypothesis that some of the **chemical precursors of life** may have originated in space and been delivered to Earth by **comets and asteroids**.

PROTEIN BIOSENSORS

Context

Recent advances in **protein biosensors** have enabled the **rapid detection of disease-related proteins**, offering real-time diagnosis for conditions such as **sepsis, cancer, malaria, and COVID-19**.

About Protein Biosensors

- **Protein biosensors** are analytical devices that detect **specific proteins (biomarkers)** by combining a **biological recognition element** (e.g., antibodies or aptamers) with a **signal-converting transducer**.
- Use **aptamers** or **antibodies** for highly specific protein recognition.

Aptamers

- Short **single-stranded DNA or RNA molecules** that bind specifically to target molecules such as **proteins**.
- More **stable, cost-effective, and easier to synthesise** than antibodies, making them suitable for advanced biosensors.

INDEX OF SERVICES PRODUCTION (ISP)

Context

The **Ministry of Statistics and Programme Implementation (MoSPI)** has released the **first trial Index of Services Production (ISP)** on an experimental basis, introducing India's **first official monthly indicator** to measure the performance of the **formal services sector**.

About Index of Services Production (ISP)

- The **Index of Services Production (ISP)** is a **monthly index** that measures changes in the **output of the formal services sector**.
- It is the **services-sector counterpart of the Index of Industrial Production (IIP)** and is compiled by **MoSPI** using **GST, administrative, and annual enterprise survey data**, without imposing any additional reporting burden on businesses.
- **Base Year: 2024–25.**
- Covers **19 formal service sub-sectors**, accounting for about **60% of India's services sector**.
- Measures **changes in service output** and **is not a measure of Gross Value Added (GVA)**.
- **Data Sources:**
 - **GST data** for most service sectors.
 - **Administrative data** for **Railway Transport, Air Transport, Water Transport (Freight), Banking, and Insurance**.
 - **Annual Survey of Incorporated Services Sector Enterprises (ASISSE)** for assigning sectoral weights.
- Uses **Wholesale Price Index (WPI)** and **Consumer Price Index (CPI)** as deflators to estimate real output.
- **Exclusions**
 - Excludes **core government activities** such as **public administration, defence, and the Reserve Bank of India (RBI)**.
 - Excludes **non-market activities** and the **informal sector**.
 - **Health, education, and ownership of dwellings** are currently not covered and are proposed to be included in future, increasing coverage to about **80%** of the services sector.

GREATER SAND PLOVER

Context

A **Greater Sand Plover** was recently sighted at **Chandu village**, marking the **fifth documented record** of the migratory shorebird in the region.

About Greater Sand Plover

- The **Greater Sand Plover** is a **migratory shorebird**.
- It breeds in **high-altitude arid and open habitats** across **Central Asia and northern China**, and migrates to **coastal mudflats and estuaries** across **Africa, the Middle East, the Indian subcontinent, Southeast Asia, and Australasia** during winter.
- **IUCN Red List: Least Concern (LC)**
- **WPA: Schedule II**

VALMIKI TIGER RESERVE

Context

The **Valmiki Tiger Reserve (VTR)** in Bihar has emerged as one of the state's richest reptile habitats, with **over 45 species of snakes** recorded in its forests.

About Valmiki Tiger Reserve

- **Valmiki Tiger Reserve (VTR)** is located along the **India–Nepal border** in **West Champaran district, Bihar**, and is the **only tiger reserve in the state**.
- It forms the **easternmost limit of the Himalayan Terai forests** in India, comprising **Bhabar and Terai** landscapes.
- Bordered by **Chitwan National Park (Nepal)** to the north and the **Gandak River** to the west.
- Major rivers flowing through the reserve include **Gandak, Pandai, Manor, Harha, Masan, and Bhapsa**.
- Vegetation includes **tropical moist deciduous forests, riverine forests, grasslands, and savannas**, dominated by **Sal**, along with **teak, bamboo, semal, and khair**.
- Supports diverse wildlife such as **Tiger, Leopard, Fishing Cat, Leopard Cat, Gaur, Sloth Bear, Sambar, Hog Deer, Spotted Deer, Blackbuck, Langur, and Rhesus Macaque**.

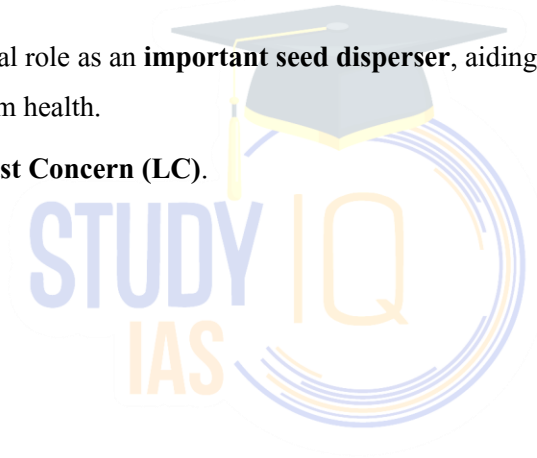
INDIAN GREY HORNBILL

Context

The **Indian Grey Hornbill** has been recorded in the **Gir forests of Gujarat** after an absence of **more than six decades**, marking a significant conservation milestone.

About Indian Grey Hornbill

- The **Indian Grey Hornbill** is a **tropical, arboreal bird** endemic to the **Indian subcontinent**.
- It inhabits **deciduous forests, open woodlands, thorn forests, rural landscapes, and urban parks**, and is commonly observed in **pairs**.
- Primarily **frugivorous** (feed primarily on **fruits**), feeding mainly on **figs**, along with insects and small vertebrates.
- Known for its **loud squealing calls** and social behaviours such as **bill-grappling and aerial displays**.
- Plays a vital ecological role as an **important seed disperser**, aiding **forest regeneration** and maintaining ecosystem health.
- **IUCN Red List: Least Concern (LC)**.
- **WPA: Schedule II**



Mains Exam Topics

URBAN EMPLOYMENT IN INDIA: REIMAGINING METROPOLITAN GROWTH

Context

Recent **PLFS 2025** and **ASUSE 2025** data show that India's million-plus cities are emerging as major centres of formal employment, higher wages, enterprise growth and productivity, reshaping the country's urban labour market.

How are Indian Cities Driving Employment-Led Growth?

- **Agglomeration Economies and Productivity Gains:** The concentration of firms, skilled labour and supporting industries creates economies of scale, knowledge spillovers and innovation, enhancing productivity and expanding employment opportunities.
 - E.g. **ASUSE 2025** shows that **46 million-plus cities** contribute **21% of Gross Value Added (GVA)** despite accounting for only **13% of unincorporated establishments**, reflecting higher productivity.
- **Expansion of Diverse Urban Labour Markets:** Cities support employment across organised industries, modern services and informal urban enterprises, enabling labour absorption for workers with diverse skill levels.
 - E.g. More than **half of the workforce** in million-plus cities is engaged in **regular wage or salaried employment**, while urban logistics, platform work and local services continue to absorb a large workforce.
- **Enterprise Clustering and Innovation Ecosystems:** Dense business networks, startup ecosystems and institutional linkages foster entrepreneurship, innovation and business expansion, creating new employment opportunities.
 - E.g. **Bengaluru, Hyderabad, Pune and Gurugram** have emerged as leading hubs for startups, Global Capability Centres (GCCs) and knowledge-intensive industries.
- **Harnessing the Female Demographic Dividend:** Cities expand women's access to education, formal employment and service-sector jobs, enabling greater utilisation of human capital and broadening the labour force.
 - E.g. Female Labour Force Participation Rate (LFPR) in **million-plus cities** increased from **19.8% (2017–18)** to **27.2% (2025)**.

- **Consumption-Driven Employment Multipliers:** Large urban populations generate sustained demand for housing, retail, logistics, healthcare and hospitality, stimulating employment across multiple labour-intensive sectors.
 - E.g. The **construction sector**, driven largely by urban housing and infrastructure demand, is India's **second-largest employer**, while **trade, hotels and transport** remain among the largest urban employment generators.

What are the Socio-Economic Implications of Metropolitan-Led Employment Growth?

Social Implications

- **Accelerates Rural–Urban Migration and Labour Mobility:** Expanding employment opportunities in metropolitan cities attract workers from rural and smaller urban areas, facilitating labour mobility and structural transformation. However, much of this migration remains circular, reflecting persistent livelihood insecurity and seasonal employment patterns.
 - E.g. The **2011 Census** identifies employment as a leading driver of rural-to-urban migration, while recent **PLFS** trends indicate increasing circular migration.
- **Enhances Women's Economic Empowerment and Social Mobility:** Greater access to education, formal employment and modern workplaces improves women's financial independence, decision-making power and labour-force participation, while gradually weakening traditional occupational and social barriers.
 - E.g. Female Labour Force Participation Rate (LFPR) in **million-plus cities** increased from **19.8% (2017–18)** to **27.2% (2025)**, according to **PLFS 2025**.
- **Deepens Spatial Inequality and Social Stratification:** Rapid employment concentration often outpaces affordable housing and urban infrastructure, leading to slums, informal settlements and unequal access to public services, thereby reinforcing socio-spatial inequalities.
 - E.g. **NITI Aayog's Report on Urban Planning Capacity in India (2021)** highlights significant deficits in urban planning and infrastructure across Indian cities.

Economic Implications

- **Expands Urban Consumption and Employment Multipliers:** Metropolitan employment raises incomes across both formal and informal sectors, generating demand for housing, retail, healthcare, logistics, hospitality and digital services, thereby creating multiplier effects across the urban economy.

- **E.g.** The **Economic Survey 2024–25** identifies domestic consumption as a key driver of India's economic growth, while metropolitan demand sustains employment in retail trade, transport and hospitality.
- **Deepens Regional Economic Divergence:** The concentration of investment, enterprises and quality employment in metropolitan centres widens disparities with smaller towns and economically lagging regions, reinforcing uneven regional development.
 - **E.g. Delhi, Bengaluru, Hyderabad, Pune and Surat** continue to attract a disproportionate share of investment, enterprises and high-value employment.
- **Accelerates Structural Transformation with Persistent Informalisation:** Metropolitan employment facilitates the movement of labour from low-productivity agriculture towards manufacturing and services. However, a significant share of workers continue to enter low-productivity informal and gig employment, limiting the pace of quality job creation.
 - **E.g.** While the **Lewis Dual Sector Model** envisages labour shifting into formal industry, India's urban transition has largely been characterised by expanding **construction, informal services and platform-based employment**.

How Can Urban Employment Catalyse Rural Transformation?

- **Reduces Disguised Unemployment and Accelerates Structural Transformation:** Urban employment absorbs surplus rural labour, facilitating the shift from low-productivity agriculture to higher-productivity manufacturing and services, thereby improving overall economic efficiency.
 - **E.g.** The **Lewis Dual Sector Model** explains how labour migration from traditional agriculture to modern urban sectors drives structural transformation.
- **Strengthens Rural Household Incomes through Remittances:** Urban workers transfer part of their earnings to rural households, supporting consumption, education, healthcare and productive investments in farm mechanisation, irrigation and rural enterprises, thereby reducing poverty and strengthening rural capital formation.
 - **E.g. RBI** studies identify migrant remittances as a significant source of income for rural households, particularly in **Bihar, Uttar Pradesh and Odisha**.
- **Expands Rural Non-Farm Employment:** Growing urban demand stimulates rural industries such as construction materials, rural MSMEs, handicrafts, logistics and business services, creating diversified livelihood opportunities beyond agriculture.

- E.g. Rapid urban construction has boosted employment in **brick kilns, stone quarries and rural building-material enterprises**, while **PMEGP** supports rural manufacturing and micro-enterprises.
- **Transforms Rural Gender Roles through Feminisation of Agriculture:** Migration of male workers to metropolitan centres increasingly shifts agricultural management and household decision-making to women, necessitating greater institutional support through land rights, institutional credit and gender-responsive farm mechanisation.
 - E.g. The **Agriculture Census 2015–16** shows women account for nearly **30% of operational landholders** and over **40% of the agricultural workforce**—a trend further reinforced by recent **PLFS** findings indicating rising female participation in agriculture.
- **Integrates Rural Producers with Urban Value Chains:** Expanding urban markets create sustained demand for agricultural produce and rural products, encouraging value addition, market integration and higher farm incomes.
 - E.g. **e-NAM** and the **Open Network for Digital Commerce (ONDC)** connect farmers, FPOs and rural enterprises with urban consumers, reducing market intermediation and improving price realisation.

How Can India Build Inclusive and Employment-Centric Cities?

- **Strengthen Metropolitan Governance and Municipal Finances:** Empower Metropolitan Planning Committees (MPCs) and Urban Local Bodies (ULBs) under the 74th Constitutional Amendment to integrate spatial and economic planning, supported by fiscal devolution, property tax reforms and municipal bond financing.
 - E.g. **NITI Aayog's Report on Urban Planning Capacity in India (2021)** recommends strengthening metropolitan governance, while **Indore, Pune and Ahmedabad** have successfully raised capital through **Municipal Bonds**.
- **Develop Peri-Urban Manufacturing and MSME Clusters:** Promote labour-intensive industries through peri-urban industrial corridors and MSME clusters, leveraging lower land costs and integrated logistics to generate large-scale employment while decongesting metropolitan cores.
 - E.g. The **National Industrial Corridor Development Programme (NICDP)** and **PM Gati Shakti National Master Plan** support integrated industrial and logistics ecosystems beyond major metropolitan centres.

- **Integrate the Informal Economy into Urban Planning:** Transition from regulating the informal sector to enabling it through designated vending zones, social security, affordable credit and climate-resilient public infrastructure, ensuring inclusive livelihoods for vulnerable urban workers.
 - **E.g.** The **Street Vendors (Protection of Livelihood and Regulation of Street Vending) Act, 2014**, **PM SVANidhi**, and the **Code on Social Security, 2020** strengthen livelihood security for street vendors and gig workers.
- **Strengthen Inclusive Skill Ecosystems:** Expand industry-linked skilling while institutionalising Recognition of Prior Learning (RPL) to certify informal workers, improving employability, productivity and labour mobility across urban sectors.
 - **E.g.** Under the **Skill India Mission**, **Recognition of Prior Learning (RPL)** certifies the existing skills of construction workers, electricians, plumbers and other informal workers.
- **Promote Affordable Housing and Transit-Oriented Development (TOD):** Expand affordable housing, integrated public transport and Transit-Oriented Development to reduce commuting costs, improve labour mobility and enhance equitable access to employment opportunities.
 - **E.g.** **PMAY (Urban)** and the **Metro Rail Policy, 2017** promote integrated housing and mobility through **Transit-Oriented Development (TOD)**.
- **Foster Balanced Regional Urbanisation:** Strengthen Tier-II and Tier-III cities through quality urban infrastructure, local enterprise development and diversified employment opportunities, reducing excessive migration pressures on metropolitan centres.
 - **E.g.** **AMRUT 2.0** improves urban infrastructure and service delivery, while the **One District One Product (ODOP)** initiative promotes region-specific enterprises and local employment ecosystems.