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Daily Current Affairs

To The Point

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GS Paper 3 – Economy

1 India Witnesses Surge in IP Filings Over Five Years

Context: India has witnessed a **remarkable surge in Intellectual Property (IP) filings**, recording a **44% growth** over the past five years. The total filings rose from **4,77,533 in 2020–21 to 6,89,991 in 2024–25**, showcasing the country's expanding innovation landscape and growing awareness of **Intellectual Property Rights (IPRs)**.

Breaking Down the Growth: Geographical Indications Lead the Way

Among the various categories of IP, **Geographical Indications (GIs)** have seen the **highest increase**—a staggering **380% rise**. This is followed by:

- **Industrial Designs**: **266% growth**
- **Patents**: **180% increase**
- **Copyrights**: **83% rise**
- **Trademarks**: **28% growth**
- **Semiconductor Integrated Circuits Layout-Designs (SICLD)**: **20% increase**

This exponential rise is a testament to **India's growing culture of innovation and creativity**, supported by robust government initiatives.

What is Intellectual Property?

Intellectual Property is defined as the **"Product of the Mind"**—creations of human intellect in **industrial, scientific, literary, and artistic** fields. It includes:

- **Patents**
- **Copyrights**
- **Trademarks**
- **Industrial Designs**
- **Geographical Indications**
- **Layout Design of Integrated Circuits**
- **Protection of Plant Varieties & Farmers' Rights**
- **Trade Secrets / Undisclosed Information**

IP Rights grant the **exclusive legal ownership** of these innovations to the creator for a **limited time**, promoting innovation by rewarding **human ingenuity and creativity**.

Key Insight: Are Indian Patents Valid Globally?

No, patents are **territorial rights**, meaning an **Indian patent is only valid within India**. To secure protection abroad, applicants must apply for patents in each individual country, often via the **Patent Cooperation Treaty (PCT)** mechanism for streamlined global filings.

Government Support: Driving IP Growth

India's transformation into an IP-conscious nation is propelled by landmark policy initiatives and technology adoption:

- **National IPR Policy (2016)**: A comprehensive framework to promote and protect all forms of IP under a unified vision.
- **CIPAM**: The **Cell for IPR Promotion and Management**, coordinates the policy's implementation.
- **National Intellectual Property Awareness Mission (NIPAM)**: Spreads IP literacy and basic training across schools and colleges.
- **Startups Intellectual Property Protection (SIPP) Scheme**: Offers **free legal and technical support** to startups for filing patents, trademarks, and design applications.
- **AI & ML-based Trademark Search Tools**: Enhance efficiency and accuracy in trademark examination.
- **Atal Innovation Mission (AIM)**: Established by **NITI Aayog** to foster entrepreneurship and innovation, including:
    - **Atal Tinkering Labs**
    - **Atal Incubation Centres**
    - **Atal New India Challenges**
    - **Mentor India Program**

Additional Insight: India on the Global IP Map

India now ranks among the **top 10 patent-filing countries** globally and is steadily improving its position in the **Global Innovation Index**. This is a strong indicator of the nation's shift towards an **innovation-driven economy**, especially in sectors like **pharmaceuticals, biotechnology, information technology**, and **renewable energy**.

Conclusion: A Promising Future for Innovation in India

The sharp rise in IP filings reflects **India's deepening culture of innovation, creativity, and entrepreneurship**. With continued government support, legal reforms, and awareness programs, India is well on its way to becoming a **global IP powerhouse**. This momentum aligns seamlessly with India's broader goals of **economic transformation**, **self-reliance (Atmanirbhar Bharat)**, and **sustainable development through innovation**.

GS Paper 3 – Science & Technology

2 WiFEX Marks a Decade of Scientific Excellence in Fog Forecasting

Context: India's pioneering **Winter Fog Experiment (WiFEX)** has successfully completed **ten years** of groundbreaking research into **North India's dense winter fog** — a natural phenomenon that disrupts the daily lives of millions during the colder months.

Launched in the **winter of 2015** at **Indira Gandhi International Airport (IGIA), New Delhi**, this unique initiative was spearheaded by the **Indian Institute of Tropical Meteorology (IITM)** under the **Ministry of Earth Sciences (MoES)**. It was executed in collaboration with the **India Meteorological Department (IMD)** and the **National Centre for Medium Range Weather Forecasting (NCMRWF)**.

What is WiFEX? A Global-Scale Effort on Fog

WiFEX is among the **world's few long-term open-field research projects** dedicated exclusively to the study of **winter fog** — particularly across the **Indo-Gangetic Plain**, where thick fog frequently causes **major delays and accidents** in **air, rail, and road transportation**.

Key Objectives of WiFEX:

- To develop **accurate now-casting** (within 6 hours) and **short-to-medium-range forecasts** of winter fog.
- To **minimize the economic losses** and **life-threatening risks** posed by dense fog, particularly in the aviation and transport sectors.
- To aid in **policy formulation and disaster preparedness** by providing timely and precise information.

How the Experiment Was Conducted:

Scientists under WiFEX deployed an array of **advanced instruments**, including:

- **Micrometeorological towers**
- **Ceilometers** (used to detect cloud base and fog layers)
- **High-frequency sensors**

These tools were used to collect high-resolution data on:

- **Temperature stratification**
- **Relative humidity**
- **Wind patterns**
- **Turbulence**
- **Soil heat flux**
- **Aerosol concentration**

This rich dataset enabled researchers to understand the **complex physical mechanisms** behind the **formation, duration, and dissipation** of winter fog.

Game-Changing Output: High-Resolution Fog Prediction Model

A major achievement of WiFEX has been the development of a **high-resolution (3 km) probabilistic fog forecasting model**. This tool is now considered one of the **most advanced fog prediction systems in South Asia**, boasting over **85% accuracy** in predicting **very dense fog** (visibility below 200 meters).

It can forecast:

- **When fog will start**
- **How dense it will become**
- **How long it will last**
- **When it will lift**

Broader Impact: Saving Lives, Boosting the Economy

The insights and tools developed under WiFEX are already helping in:

- **Reducing flight delays and train cancellations**
- **Enhancing road safety** by informing early-morning commuters
- **Protecting lives** by enabling better emergency planning and traffic management
- **Improving energy efficiency** by optimizing power plant operations that are sensitive to weather

Did You Know?

India experiences some of the **densest and most persistent fog events in the world**, particularly between **December and February**, affecting cities like Delhi, Amritsar, Lucknow, and Patna. In recent years, **climate variability** has made fog prediction even more crucial.

Conclusion: A Vision for Safer Winters

With ten successful years behind it, **WiFEX has transformed India's fog forecasting capabilities** and placed the country at the forefront of **atmospheric research**. Its findings continue to contribute to **global climate models** and pave the way for a **safer, smarter, and more prepared India** in the face of winter weather hazards.

GS Paper 2 – Bio-technology, Environment and Disaster Management

3 Breakthrough in Pineapple Protection: Indian Scientists Discover Gene to Combat Fusariosis

Context: In a major leap for agricultural biotechnology, **Indian researchers have identified a crucial gene in pineapple** that may offer an effective and sustainable defence against **Fusariosis**, a devastating fungal disease threatening pineapple crops across the country.

This discovery marks a significant step forward for farmers struggling with crop losses and inconsistent yields due to fungal infections.

Understanding Fusariosis: A Hidden Threat to Pineapple

Fusariosis is caused by the aggressive fungus ***Fusarium moniliforme***, one of the **most destructive pathogens** in pineapple cultivation. It attacks the plant's **stem**, causes **blackening of leaves**, and **rots the fruit internally**, often making it unmarketable.

This disease not only slashes productivity but also leads to **serious economic losses** in key pineapple-producing regions.

Research Highlights: Gene Discovery Brings Hope

Traditional plant breeding methods have long struggled to outpace fast-evolving fungal pathogens. But this latest research brings new hope:

- Scientists focused on the **Somatic Embryogenesis Receptor Kinase (SERK)** family of genes, known for boosting plant immunity and stress tolerance.
- Specifically, they zeroed in on the **AcSERK3 gene**, a natural component of the pineapple's genome.
- By **overexpressing AcSERK3**, researchers significantly **enhanced the plant's immune response**, empowering it to resist **Fusarium infection** more effectively.

This advancement could lead to the development of **disease-resistant pineapple varieties**, reducing dependency on chemical fungicides and increasing farm resilience.

Pineapple at a Glance: India's Tropical Treasure

- **Scientific name**: *Ananas comosus* L. Merr.
- **Family**: Bromeliaceae
- **Climate**: Grows best in **15–30°C**; drought-tolerant due to **specialized water-storage cells**
- **Rainfall requirement**: 600–2500 mm annually (**optimal: 1000–1500 mm**)
- **Soil**: Adapts to various soils but **cannot withstand waterlogging**
- **Cropping patterns**: Can be cultivated as a **monocrop** or **intercrop** in **coconut plantations**

Major Pineapple-Producing Regions:

In India, key pineapple-growing states include:

- **Assam, Meghalaya, Tripura, Manipur**
- **West Bengal, Kerala, Karnataka, Goa**

Globally, top producers are:

- **Thailand, Philippines, Brazil, China, Nigeria, Mexico, Indonesia, Colombia**, and the **United States**

India is among the **top 10 pineapple-producing countries**, and this gene discovery may help enhance its competitiveness on the global stage.

Did You Know?

Pineapples contain **bromelain**, a natural enzyme known for its **anti-inflammatory** and **digestive** properties. Beyond being a tropical delicacy, it also holds **medicinal value** and is used in **cosmetics**, **health supplements**, and **food processing**.

Conclusion: A Step Toward Resilient Farming

The identification of the **AcSERK3 gene** is a potential game-changer for India's pineapple industry. With continued research and field trials, this breakthrough may pave the way for the development of **fungus-resistant pineapple varieties**, ensuring **higher yields**, **better fruit quality**, and **sustainable farming practices**.

GS Paper 1 – Geography

4 Vanuatu in Focus: Island Nation Leads Global Push for Environmental Justice

Context: The Pacific island country of **Vanuatu** has recently made headlines for taking a bold step in global climate advocacy. The nation has formally approached the **International Court of Justice (ICJ)**, seeking legal recognition of **environmental destruction as "ecocide"** — a move aimed at holding polluters accountable for the degradation of nature.

This pioneering action places Vanuatu at the **forefront of international environmental diplomacy**, signaling a growing demand for legal mechanisms to address climate-related harms.

Where is Vanuatu?

Vanuatu is a picturesque **archipelago in the South Pacific Ocean**, located:

- **East of northern Australia**
- **West of Fiji**
- It is part of the **Melanesian subregion** of Oceania

The **capital city** is **Port Vila**, situated on the island of **Efate**.

Geographical Highlights:

The islands of Vanuatu are primarily of **volcanic origin**, resulting in:

- **Mountainous interiors**
- **Narrow coastal plains**
- Frequent **seismic and volcanic activity**

Major islands include:

- **Espiritu Santo** (largest)
- **Malakula**
- **Efate** (home to the capital)

Vanuatu's location gives it a vast **Exclusive Economic Zone (EEZ)** in the **South Pacific**, rich in marine biodiversity and fisheries — critical to its economy and food security.

Political and Environmental Significance:

- Vanuatu is a **parliamentary democracy** and a member of numerous international organizations, including the **United Nations**, **Pacific Islands Forum**, and **Commonwealth of Nations**.
- The country is especially vulnerable to **climate change**, with rising sea levels, cyclones, and coral bleaching posing existential threats.
- Its recent appeal to the **ICJ** underscores a growing movement among **small island developing states (SIDS)** to demand **legal accountability** from major polluting nations and industries.

Did You Know?

- Vanuatu is ranked as one of the **most disaster-prone countries** in the world due to its exposure to **tropical cyclones, earthquakes, tsunamis, and volcanic eruptions**.
- Despite its challenges, Vanuatu is known for its **rich cultural heritage**, with over **100 indigenous languages** spoken — making it one of the most **linguistically diverse countries** per capita.

Conclusion: A Voice from the Pacific

Through its environmental leadership, **Vanuatu is amplifying the voice of vulnerable nations** on the world stage. By pushing for the recognition of **ecocide as a crime under international law**, this island nation is not only safeguarding its own future but also inspiring a **global movement for climate justice and environmental accountability**.

GS Paper 3 – Environment, Ecology, Biodiversity, and Climate Change

5 Arctic Under Threat: Unprecedented Winter Warming Raises Global Alarms

Context: In **February 2025**, the **Arctic archipelago of Svalbard** experienced **unusually high air temperatures** and even **rainfall**, triggering **widespread snowmelt** and the **pooling of meltwater** — an event rarely seen in the heart of the Arctic winter. This extreme weather event highlights the growing impact of **human-induced climate change** in one of the most sensitive regions on Earth.

Arctic Amplification: Why the Arctic is Warming Faster

The Arctic is warming **more than twice as fast** as the global average, a phenomenon known as **Arctic Amplification**. This accelerated warming is the result of multiple interconnected feedback processes:

- **Reduced Albedo Effect**: As ice and snow melt, they are replaced by **darker ocean waters and exposed land**, which **absorb more sunlight** instead of reflecting it. This **increases heat absorption**, leading to even more ice loss—a classic **positive feedback loop**.
- **Lapse Rate Feedback**: In polar regions, **greenhouse gas-induced warming** is concentrated **near the surface**, unlike in the tropics where heat disperses vertically. This makes the surface warming in the Arctic far more intense.
- **Water Vapour's Triple Threat**:
  - Acts as a **powerful greenhouse gas**
  - Creates **cloud cover** that traps heat
  - **Releases latent heat** during condensation, further **boosting temperatures**
- **Atmospheric Heat Transport**: Warmer, **moisture-laden air from the tropics** is now traveling more frequently to the Arctic, delivering additional heat and disrupting the region's energy balance.

Consequences of Arctic Amplification: A Global Ripple Effect

Accelerated Climate Change:

- **Thawing permafrost** is releasing long-trapped **carbon dioxide and methane**, powerful greenhouse gases that are intensifying global warming.

Ecological Disruption:

- **Rain-on-snow events** in winter can remove the insulating snow cover, exposing **tundra vegetation and microbial life** to damaging freeze-thaw cycles.
- This impacts local wildlife like **caribou and Arctic foxes**, which depend on stable snow conditions for survival.

Impact on India and the Global South:

- **Indian Monsoon Disruption**: Research shows that **declining Arctic sea ice** is linked to **stronger, more erratic monsoons** in South Asia, increasing the frequency of **extreme rainfall events and floods**.
- **Sea-Level Rise**: Melting Arctic ice contributes to rising sea levels, threatening **coastal cities** like **Mumbai, Chennai, and Kolkata**, and increasing the **salinization of agricultural land**.
- **Socioeconomic Consequences**:

- **Crop losses** due to erratic weather patterns
- **Public health challenges** from heatwaves and waterborne diseases
- **Infrastructure damage** due to flooding and storms

Did You Know?

- The Arctic is now warming at nearly **four times the global average**, according to recent satellite data — a rate that continues to outpace even the most alarming predictions.
- A study by the **Intergovernmental Panel on Climate Change (IPCC)** notes that Arctic amplification will continue even if **emissions are significantly reduced**, making **adaptation planning essential**.

Conclusion: The Arctic is the Planet's Early Warning System

The **Arctic's rapid winter warming** is not a distant or isolated event — it's a **clear signal of accelerating climate breakdown**. What happens in the Arctic doesn't stay in the Arctic. It has far-reaching impacts on **global weather, ecosystems, food systems**, and **human security**.

The urgent need now is for **strong international climate action**, **emissions reduction**, and **resilient adaptation strategies** — before the Arctic, and the world, crosses irreversible tipping points.

GS Paper 3 – Investment models and Planning

6 World Bank Urges Massive Investment in Green and Resilient Urban Infrastructure for India

Context: A recent **World Bank report**, titled **'Towards Resilient and Prosperous Cities in India'**, emphasizes the urgent need for India to **invest $2.4 trillion** in **climate-resilient and green urban infrastructure** by **2050**. As Indian cities expand rapidly, the report highlights both the immense opportunity and the critical risk posed by climate change to the nation's urban future.

India's Urban Transition: Growth with Vulnerabilities

India is experiencing an unprecedented urban transformation:

- In **2020**, cities were home to over **480 million people**, accounting for **more than one-third** of the national population.
- By **2050**, the urban population is projected to **double to 951 million**, making India one of the most **urbanized nations globally**.
- Between **1985 and 2015**, urban settlements in **high flood-risk zones** increased by **102%**, highlighting a trend of unsafe expansion.
- By **2030**, urban areas are expected to generate **70% of new jobs** and contribute around **75% to India's GDP** by **2050**.

This rapid growth, however, makes Indian cities increasingly vulnerable to **climate-induced shocks**.

Climate Risks Facing Indian Cities:

Indian cities are facing a dual threat of **flooding** and **extreme heat**:

- **Flooding**: Due to climate change and increased impermeable surfaces, cities may see a **3.6 to 7-fold rise in pluvial (surface water) flooding** by **2070**.
- **Heat Stress**: By **2050**, nearly **20% of working hours** in major urban centers could be lost due to **extreme heat**, directly impacting labor productivity and public health.

A Roadmap for Climate-Resilient Urban Development

The World Bank report lays out a comprehensive action plan for Indian cities to become **climate-smart and inclusive**:

Risk-Informed Planning:

- Integrate **climate and disaster risk assessments** into **urban land-use planning**
- Develop **hazard-specific investment strategies** at the local level

Protecting the Urban Poor:

- Identify and support **vulnerable populations** in informal settlements
- Expand **local climate adaptation programs** for low-income communities

Sustainable Urban Expansion:

- Encourage **compact urban growth** through **transit-oriented development**
- Promote **energy-efficient technologies** such as **LED streetlights**

- Restrict development in **climate-sensitive zones**

Resilient Urban Services:

- Upgrade **municipal water systems** to enhance energy and water efficiency
- Invest in **low-carbon solid waste management (SWM)** practices
- Build **cooler cities** through green roofing, urban forests, and permeable pavements

Private Sector Participation:

- Facilitate the role of **private enterprises in risk financing**, insurance, and resilience-building
- Create **public-private partnerships** for green infrastructure development

Did You Know?

India's cities already account for more than **two-thirds of energy demand**, and with rising temperatures, **energy consumption in urban cooling alone** could **triple by 2050**. Investing in **green infrastructure today** could drastically cut future energy costs and emissions.

Conclusion: Investing Today for a Sustainable Tomorrow

India stands at a critical crossroads. With **urbanization accelerating** and **climate threats intensifying**, the choices made today will define the **livability, safety, and prosperity** of its cities for decades to come. The **$2.4 trillion investment** in **resilient, inclusive, and low-carbon urban infrastructure** is not just a necessity — it's an opportunity to build cities that are **future-ready**, **climate-resilient**, and **economically vibrant**.