IITM EIACP PC RP NEWSLETTER
JUL-SEPT 2024

INDIAN MONSOON

LiFE
Lifestyle for Environment

INDIAN INSTITUTE OF TROPICAL METEOROLOGY (IITM), PUNE

ENVIRONMENTAL INFORMATION, AWARENESS, CAPACITY BUILDING, AND LIVELIHOOD PROGRAMME (EIACP)

PROGRAMME CENTRE - RESOURCE PARTNER (PC-RP)

(Ministry of Environment, Forest & Climate Change, Govt. of India)

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CONTENTS

1.	Onset and Withdrawal	03
2.	Rainfall Distribution	05
3.	Rainfall Over Homogeneous Regions	06
4.	Cumulative Rainfall Distribution	08
5.	Observations	08
6.	Deviation from Historical Rainfall Patterns	10
7.	Climatic Factors	10
8.	Increased Frequency of Extreme Rainfall Events	10
9.	Impact of Climate Change	11
10.	Implications	12
11.	IITM EIACP's highlighted contributions for this quarter	13

Preface

India's 2024 monsoon season has demonstrated unique characteristics influenced by climatic shifts and global weather phenomena. This report provides a comprehensive analysis of the monsoon's onset, withdrawal, and rainfall distribution, alongside deviations from historical norms and emerging patterns of extreme weather events. It aims to highlight the seasonal variability and its impact on India's environment and socio-economic sectors.

The study delves into the role of climatic factors like El Niño, La Niña, and the Indian Ocean Dipole in shaping monsoon behaviour. It further explores the implications of these patterns on agriculture, water resources, and disaster preparedness, emphasizing the importance of adaptive strategies to mitigate associated risks.

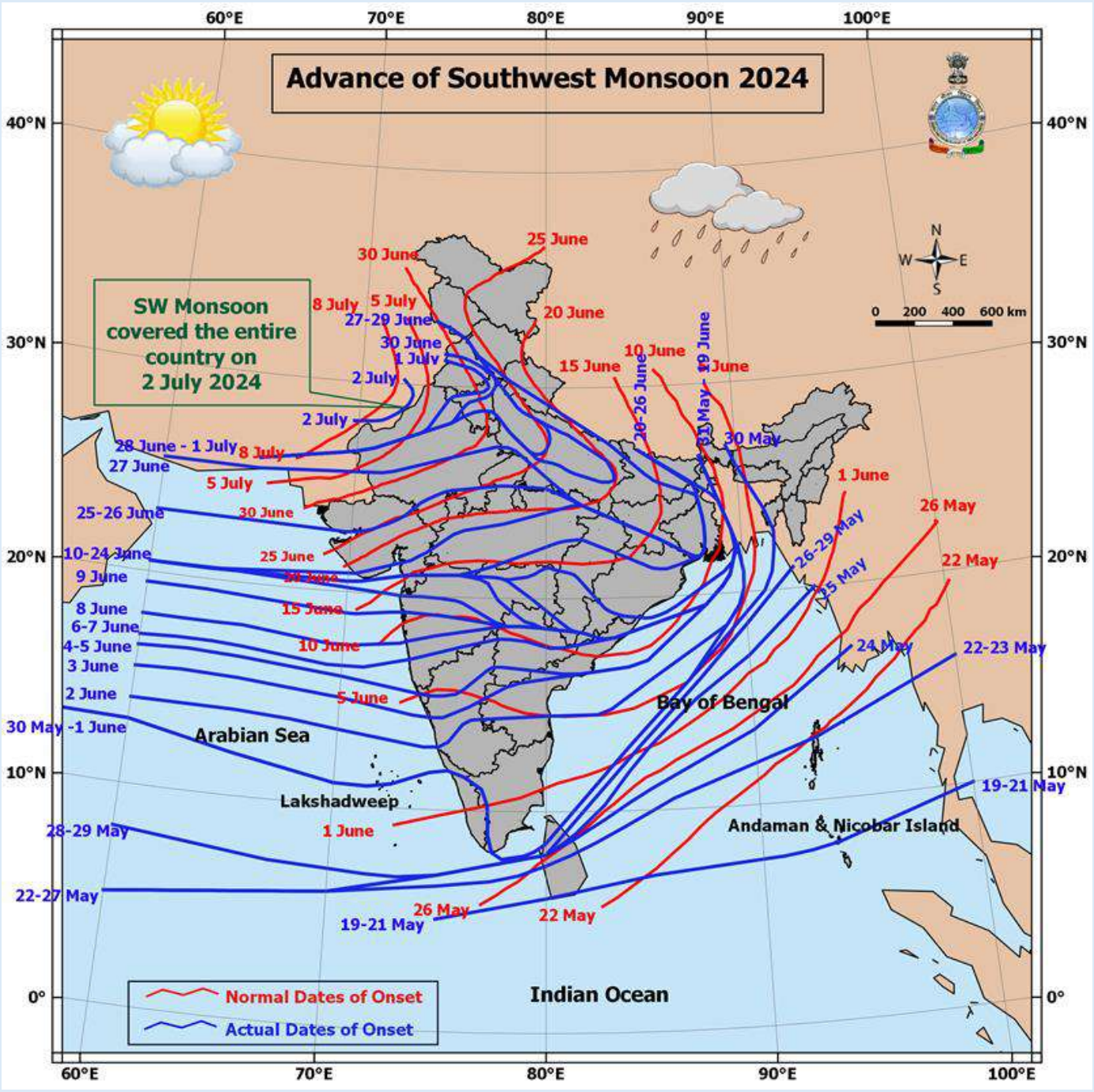
By providing actionable insights, this report serves as a valuable guide for policymakers, researchers, and stakeholders. It underscores the urgent need for improved forecasting systems, sustainable agricultural practices, and resilient water management strategies to address the challenges posed by erratic monsoon behaviour and climate change.

Dr. Latha R

The Indian monsoon is often called the "lifeline of India" due to its profound influence on agriculture, water resources, and socio-economic activities. The 2024 monsoon season brought significant weather events and posed challenges and opportunities across various sectors. This newsletter highlights the season's key statistics, regional variations, and impacts.

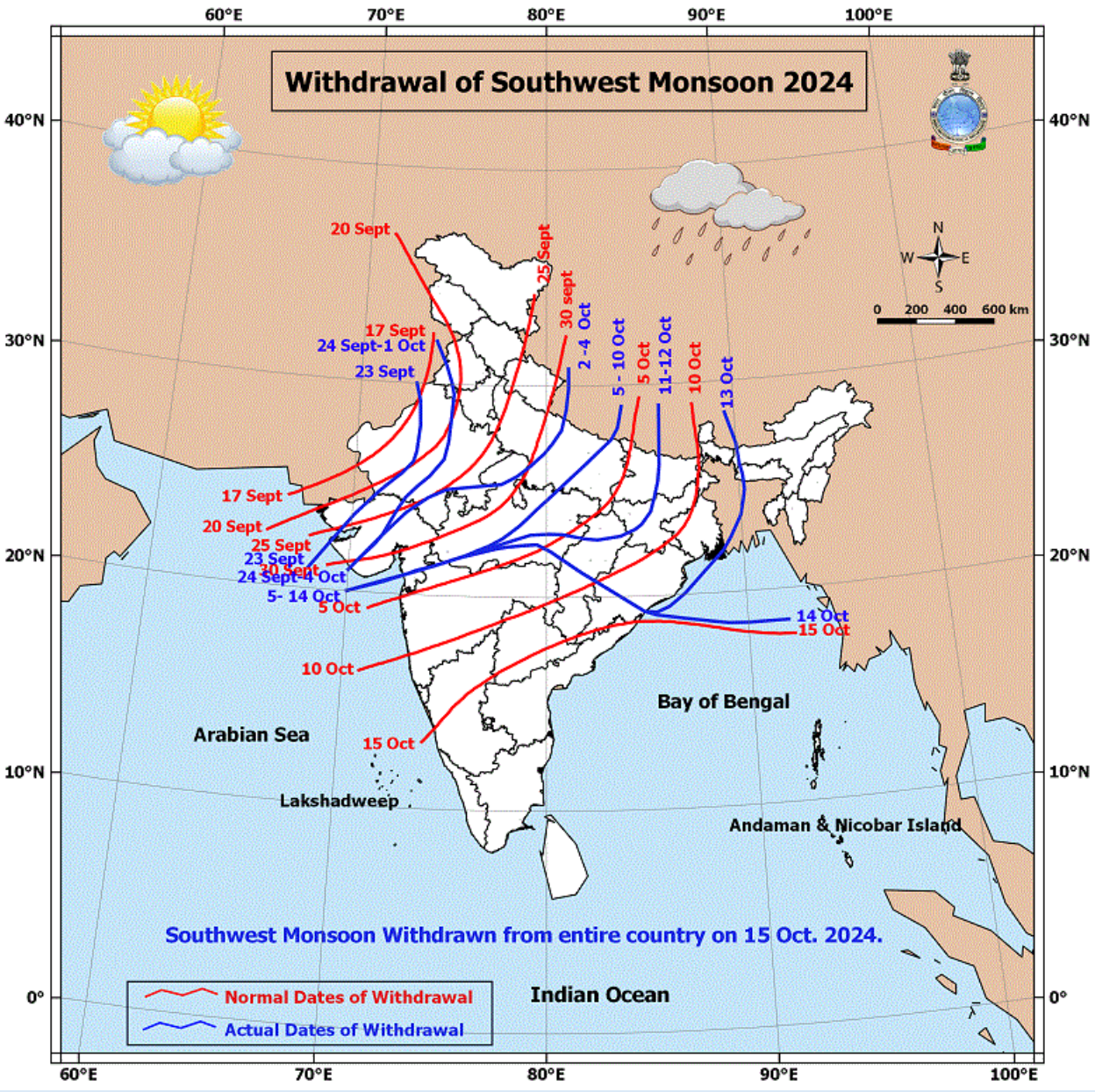
1. Onset and Withdrawal:

Onset Date: June 1st, 2024, as per IMD data.



The **Southwest Monsoon** covered the entire country by **July 2, 2024**, with the actual onset dates closely following the climatological normal. The timely onset and steady progression ensured adequate water availability during the critical sowing period.

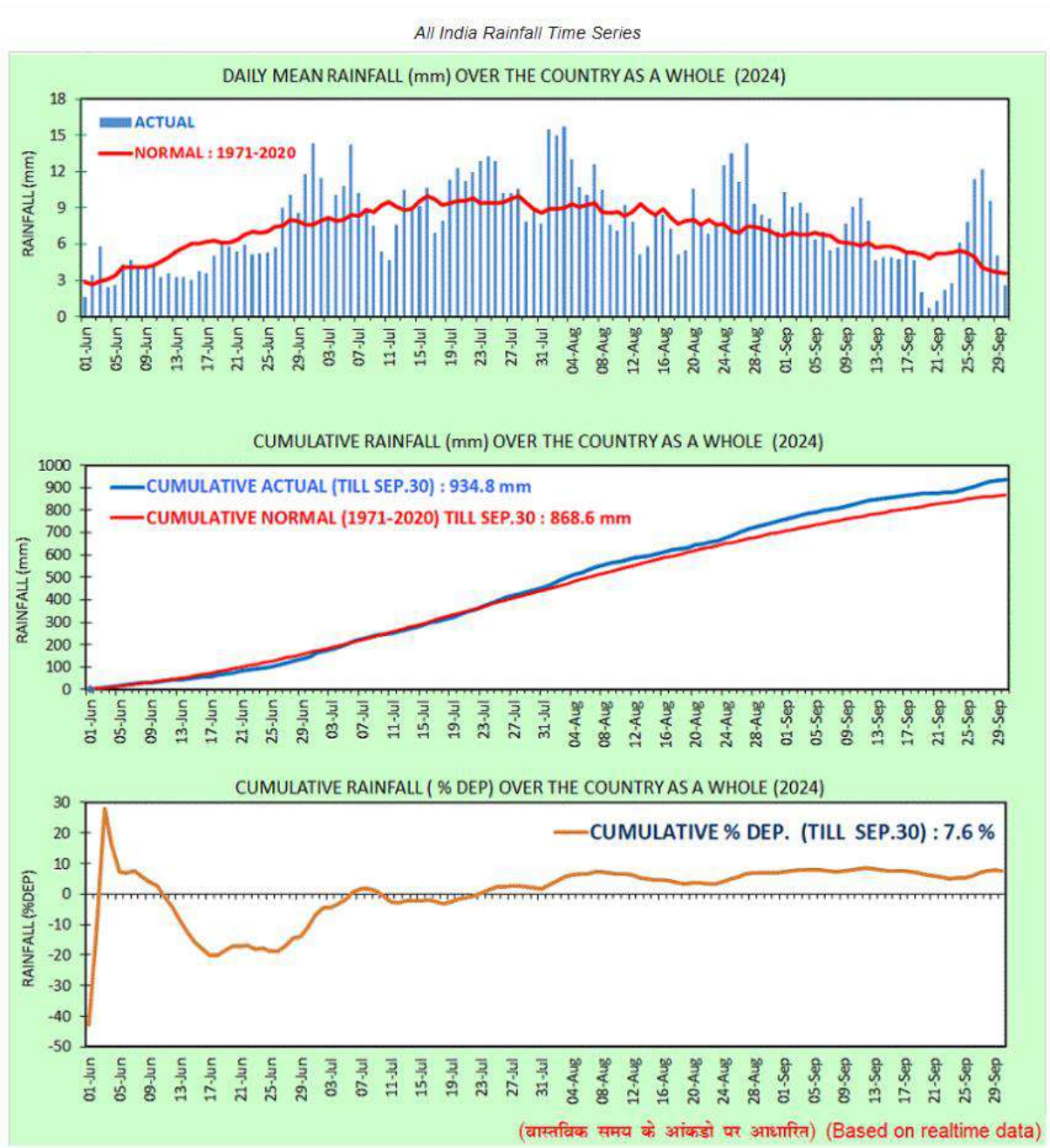
Withdrawal Date: October 15th, 2024, as per IMD data.



Withdrawal began in **western Rajasthan** around **17 September 2024**.It gradually moved eastward and southward, completing the withdrawal from the entire country by **15 October 2024**.In most parts of central and northern India, the monsoon withdrawal occurred **later than normal**. For example, regions around central India saw delays of 5–10 days compared to the usual dates. Delayed withdrawal may affect the **kharif crop harvest**, as prolonged rains could lead to waterlogging or delayed crop maturity. It also has implications for **rabi crop sowing**, as timely monsoon withdrawal is essential for preparing fields.

The retreat of the monsoon is governed by factors like **reduced moisture, weakening of monsoon winds, and the establishment of drier north-westerly winds**. Delays or deviations in the withdrawal process may be linked to global climatic phenomena such as **El Niño** or regional weather patterns.

2. Rainfall Distribution:



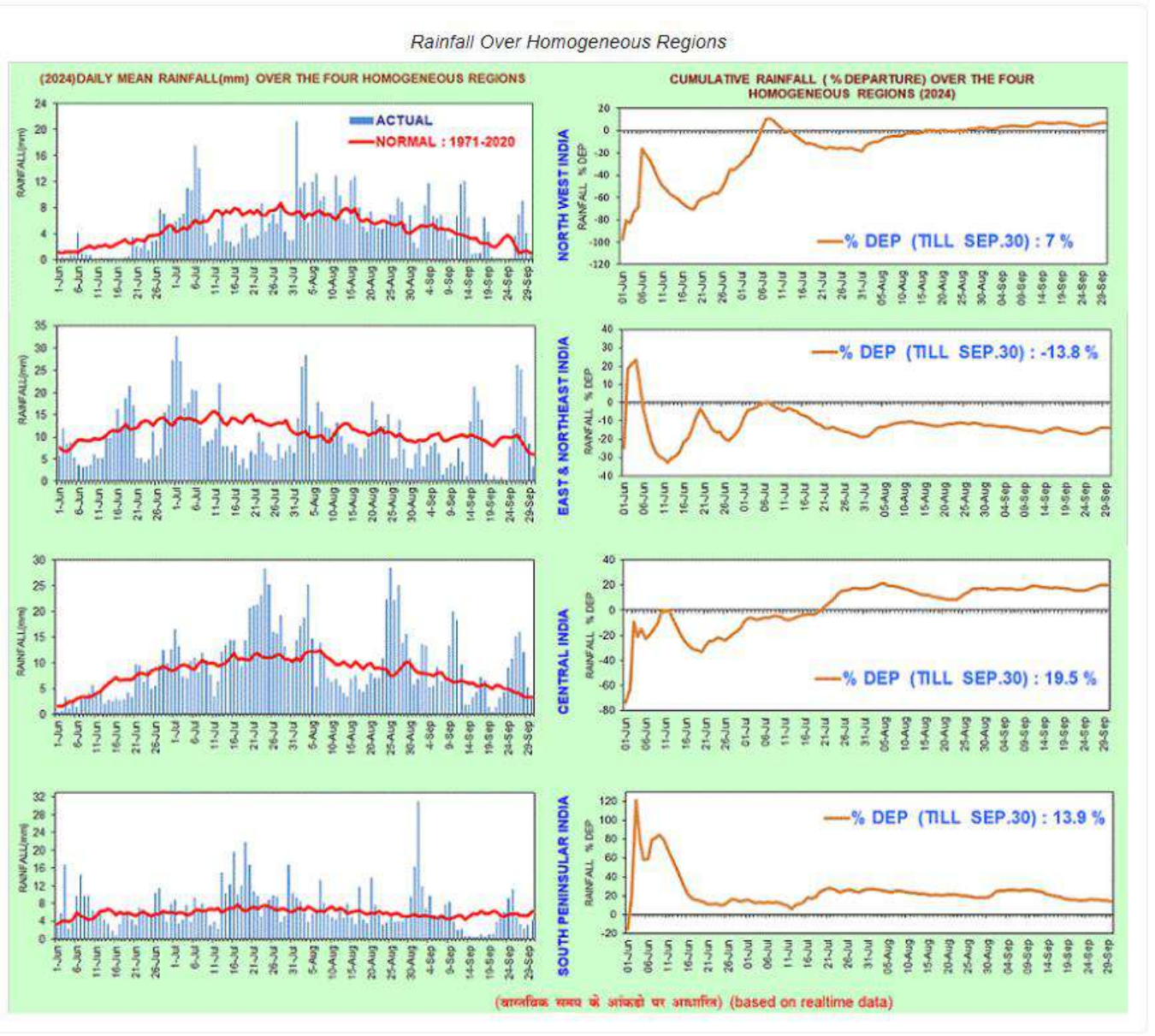
The **All-India Rainfall Time Series** for 2024 reveals daily and cumulative rainfall statistics:

- **Actual rainfall** surpassed the 1971-2020 normal by September 30, reaching **934.8 mm**, while the cumulative normal stood at **868.6 mm**.
- This amounts to a **7.6% surplus** in rainfall, indicating a favourable monsoon overall.

3. Rainfall Over Homogeneous Regions

Region-wise analysis of rainfall for **Northwest India, East & Northeast India, Central India, and South Peninsular India** revealed significant variations:

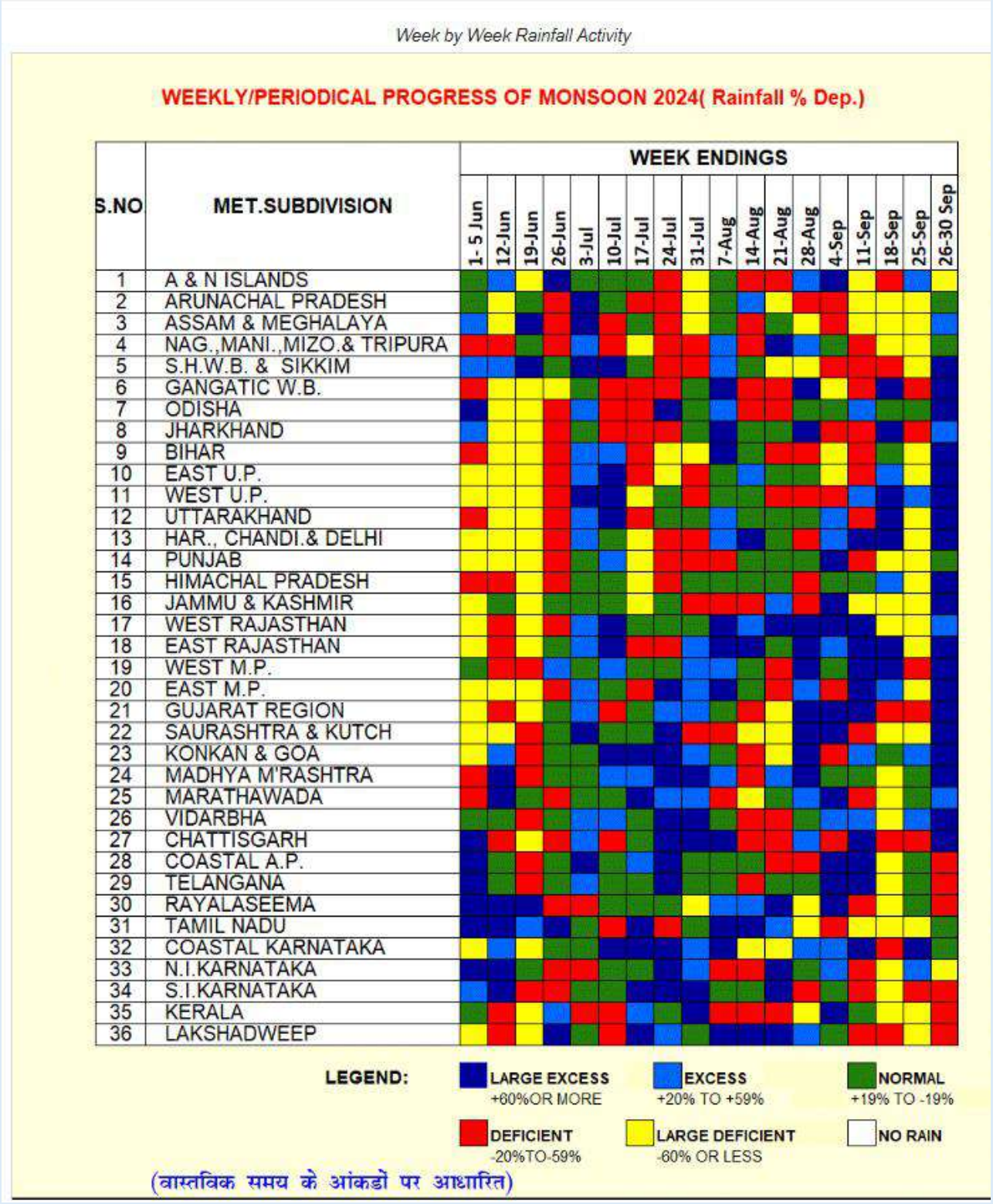
- **Central India** experienced a surplus of **19.5%**.
- **South Peninsular India** and **East & Northeast India** had surpluses of **13.9%** and **13.8%**, respectively.
- **Northwest India** recorded a modest surplus of **7%**.



***Key Fact**:*

***Ancient Practice**: Rainwater harvesting dates back thousands of years and has been practiced in civilizations like the Indus Valley, Mesopotamia, and ancient Rome, where elaborate systems were developed to collect and store rainwater.*

Week-by-week analysis shows the variability in rainfall across 36 meteorological subdivisions. The activity map highlights areas of **large excess**, **normal**, and **deficit rainfall** during the monsoon period.

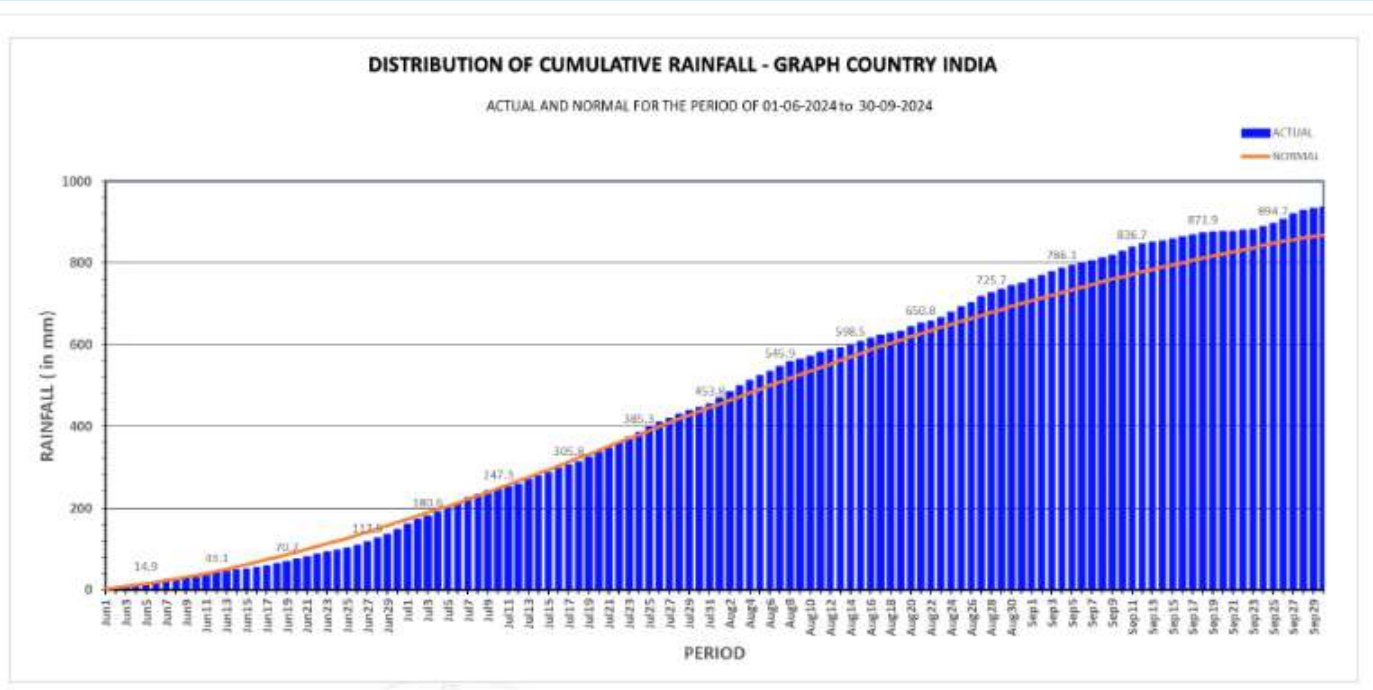


Notable observations:

- Subdivisions in Central and South India showed consistent surplus.
- Northeastern and some Northwestern regions saw intermittent deficits.

4. Cumulative Rainfall Distribution:

The **distribution graph of cumulative rainfall** highlights progressive rainfall accumulation throughout the season. The trend demonstrates consistent alignment with or surpassing the normal values across most weeks.



5. Observations:

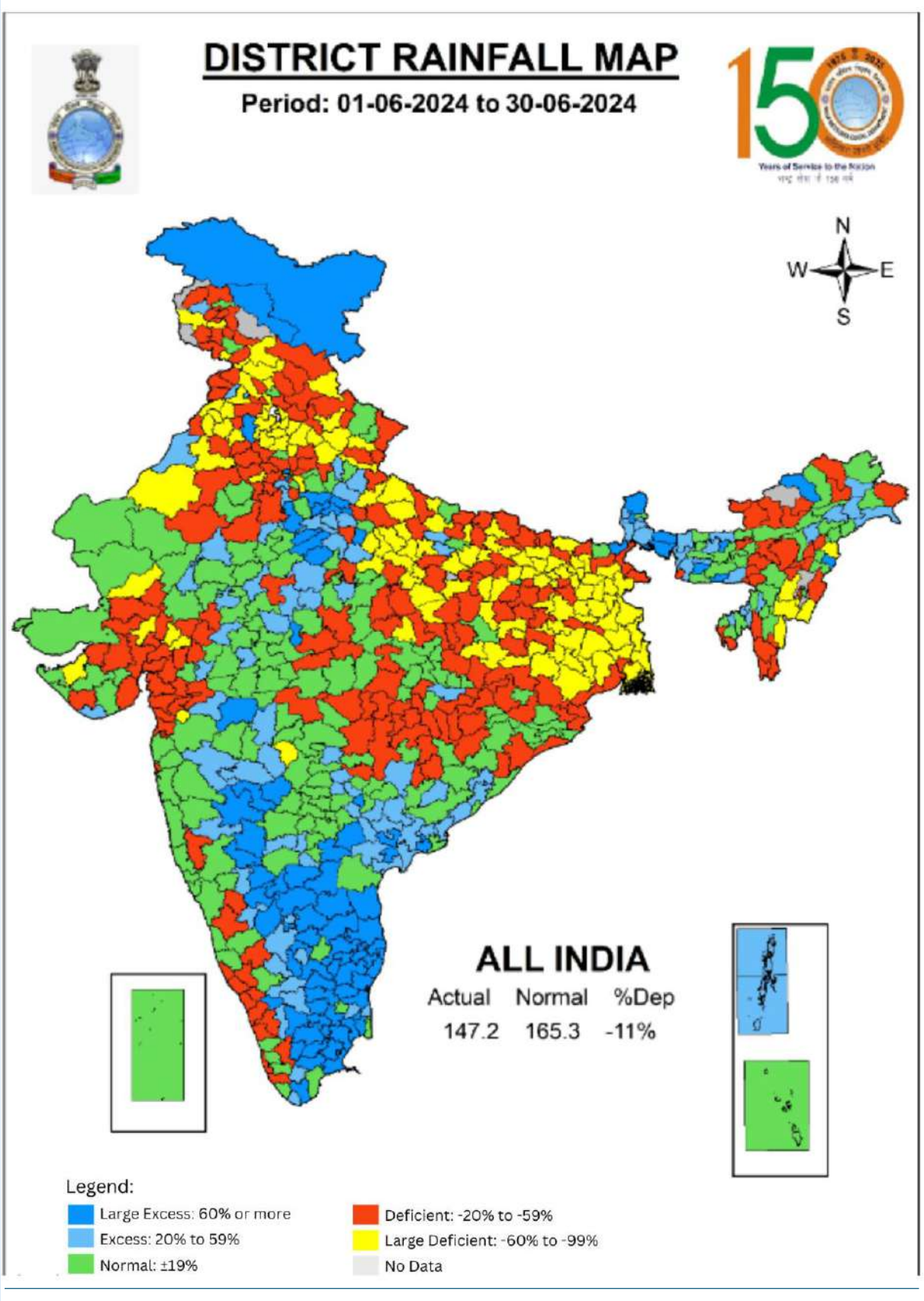
- **Spatial Variability**:

Western and northern India exhibits widespread **deficient to large deficient** rainfall (yellow and red areas). This aligns with delayed or weaker monsoon onset in these regions. Some **excess rainfall** (blue or cyan) is evident in parts of eastern and northeastern India and a few southern districts, which are known to experience early monsoon activity.

- **Regional Highlights**:
  - **Central and Northern India**: Large areas show rainfall deficiency, hinting at weakened monsoon systems or disrupted rain-bearing depressions.
  - **Southwest India (Kerala)**: Mixed trends, with some normal and deficient rainfall areas.
  - **Northeast India**: Generally better rainfall performance, possibly benefiting from pre-monsoon and monsoon trough activities.

Key Fact

Urban Applications*: Cities like Chennai, India, have mandated rainwater harvesting in buildings, which helped alleviate severe water shortages during droughts.*



Key Fact

India receives approximately 1,167 mm of annual rainfall, equivalent to 3,880 billion cubic meters (BCM) of water. However, only about 1,123 BCM is available for use due to runoff, evaporation, and other losses.

6. Deviation from Historical Rainfall Patterns:

- **Below-Normal Rainfall in Some Regions:** While India received overall normal rainfall, some regions like parts of North-West India, especially Rajasthan, Gujarat, and Haryana, experienced below-normal rainfall. This resulted in drought-like conditions in those areas, impacting agriculture and water resources.

- **Above-Normal Rainfall in Other Areas:** Conversely, some regions such as the eastern and central parts of India, including Odisha, Chhattisgarh, and West Bengal, saw above-normal rainfall. These areas faced issues like flooding, especially in urban areas, leading to damage to infrastructure and disruption in daily life.

Overall, the deviation from historical norms reflects a more uneven distribution of rainfall compared to the more predictable monsoon patterns of the past.

7. Climatic Factors:

From July to September 2024, India's monsoon was influenced by developing La Niña conditions, which marked a transition from earlier El Niño conditions. This shift contributed to above-normal rainfall in many parts of the country. The Indian Meteorological Department (IMD) predicted 106% of the long-period average rainfall, with central and southern peninsular India receiving significantly above-average rainfall, while parts of the northeast experienced below-normal precipitation.

Key factors included:

- **Indian Ocean Dipole (IOD):** A positive IOD complemented La Niña's cooling effect, supporting increased rainfall during the monsoon season.

- **Monsoon Systems:** Active low-pressure systems, monsoon depressions, and cyclones enhanced rainfall distribution across rain-fed agricultural zones, benefiting regions like Madhya Pradesh, Maharashtra, and Odisha

Such climate phenomena significantly influenced agriculture and water resources, highlighting the importance of long-term climate predictions for planning.

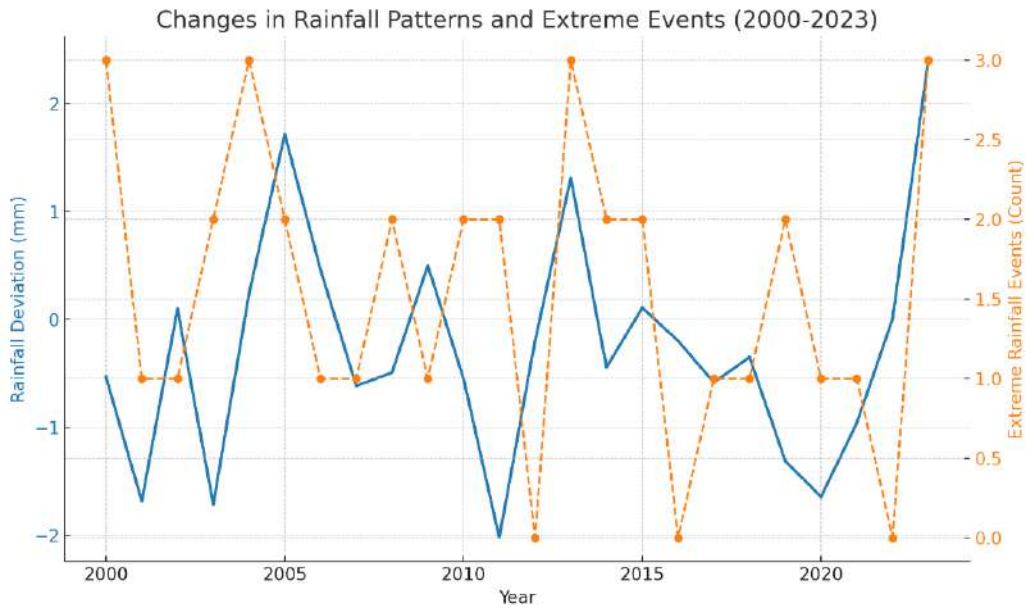
8. Increased Frequency of Extreme Rainfall Events:

- **Heavy Rainfall and Flooding:** There has been a marked increase in the frequency of heavy rainfall events during the monsoon. For instance, parts of Kerala, Karnataka, and Maharashtra witnessed heavy showers leading to severe flooding. In several instances, the rainfall exceeded the capacity of drainage systems, resulting in waterlogging and flash floods.

- **Urban Flooding:** The urban areas have been particularly affected, with cities like Mumbai and Bengaluru facing prolonged rainfall events that overwhelmed stormwater drains. This is

an indicator of both the intensity and frequency of extreme rainfall events, exacerbated by urbanization and climate change.

• **Increased Frequency of Cyclones:** The monsoon season this year also saw an increase in the frequency of cyclonic disturbances, contributing to prolonged rainfall and extreme weather events. For example, Cyclone *Biparjoy* in June and subsequent depressions in the Bay of Bengal impacted rainfall patterns, leading to sustained rains in affected regions.



The graph above represents changes in rainfall patterns and the frequency of extreme rainfall events from 2000 to 2023. The blue line shows deviations in rainfall (measured in millimetres) from the historical average, while the orange dashed line indicates the count of extreme rainfall events per year.

As we can see, the data suggests an increase in both the deviation of rainfall patterns and the frequency of extreme events, highlighting shifts in rainfall trends over the years.

9. Impact of Climate Change:

• Climate change has amplified the intensity of these extreme events. Rising sea surface temperatures and changing atmospheric circulation patterns are believed to play a significant role in increasing the frequency of intense rainfall events and cyclonic disturbances during the monsoon.

• **Regional Variability:** The monsoon season is becoming more unpredictable, with regional variations becoming more pronounced. While some areas are facing water shortages due to reduced rainfall, others are grappling with excess rainfall and flooding.

10. Implications:

- **Agriculture**: Rainfall deficiency can impact sowing activities, especially for kharif crops like rice, pulses, and oilseeds, which rely heavily on timely monsoons.
- **Water Resources**: Below-normal rainfall could lead to stress on reservoirs and groundwater recharge, particularly in central and western regions.
- **Weather Systems**: Delayed onset or fewer monsoon depressions could explain the large deficient regions, coupled with possible climatic factors like El Niño influencing reduced rainfall.

In conclusion, this year's monsoon season underscores the growing impact of climate change, manifesting in erratic rainfall, increased frequency of extreme events, and significant regional variations. These trends are likely to continue, posing challenges for water management, agriculture, and disaster preparedness across India.

Sources:

- India Meteorological Department (IMD)
- Centre for Energy, Environment, and Water (CEEW)
- India Today.

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Key Facts:

Urban and Regional Implementation:

- Hyderabad has mandated rainwater harvesting structures for new constructions from January 2025. Non-compliant residents will face increased water tanker charges
- In Pune, only 20-25% of households currently have rainwater harvesting systems. Residents with functional systems report annual savings of approximately ₹1.5 lakh by reducing dependence on water tankers

Economic and Environmental Impact:

- India spends over $2 billion annually to prevent water runoff using rainwater harvesting systems
- Well-maintained rainwater harvesting pits help recharge groundwater and reduce urban dependency on external water sources.

IITM EIACP's highlighted contributions for this quarter:

❖ **Celebration of "Van Mohotsav/Haryali Saptah - 2024"**

Date: 04 July 2024

On Van Mahotsav – 2024 and as part of the "Ek Ped Ma Ke Naam" campaign, IITM-EIACP PC-RP, Pune conducted a tree plantation drive on a hillside area at Birla Ganesh Temple, Somatane Phata, Pune. The initiative focused on planting trees such as neem, banyan, and peepal to enhance green cover and promote environmental conservation. Fifteen participants took part in this effort, contributing to the greening of the area and supporting the broader goals of reforestation and ecological balance.

Glimpses of tree plantation drive at hillside area at Birla Ganesh Temple

Date: 05 July 2024

IITM-EIACP PC-RP, Pune initiated a unique and impactful competition to engage students in environmental conservation and sustainable living. The core of this initiative was the 'Grow Your Food' competition, which challenged students from classes 5 to 8 of Maharshi Karve School at SPPU, Pune to cultivate their own vegetable gardens. This competition

aimed to foster a direct connection with nature and encourage young minds to embrace sustainable food practices.

❖ **Mission LiFE Awareness for Pandharpur Warkaries:**

Pandharpur Wari is a yatra to *Pandharpur, Maharashtra*, to honour lord "Vithal" and Warkari means "pilgrim". IITM-EIACP conducted a significant awareness session on 1st July 2024 as part of the Mission LiFE (Lifestyle for Environment) initiative at *Shivane, Pune*. This session was tailored specifically for the Warkaries participating in the Pandharpur Yatra, a revered pilgrimage in Maharashtra. Approximately 140+ Warkaries, who are devoted participants of the Yatra, attended the session.

❖ **Awareness Event at Pride English Medium School**

On August 6, 2024, IITM-EIACP PC-RP, Pune, organized an awareness event at Pride English Medium School, involving around 300 students and 20 teachers. The event featured a Mission LiFE awareness session, covering topics like recycling, tree conservation, and pollution, and included a quiz competition.

❖ **World Ozone Day Celebration and Swachhata Hi Seva Campaign**

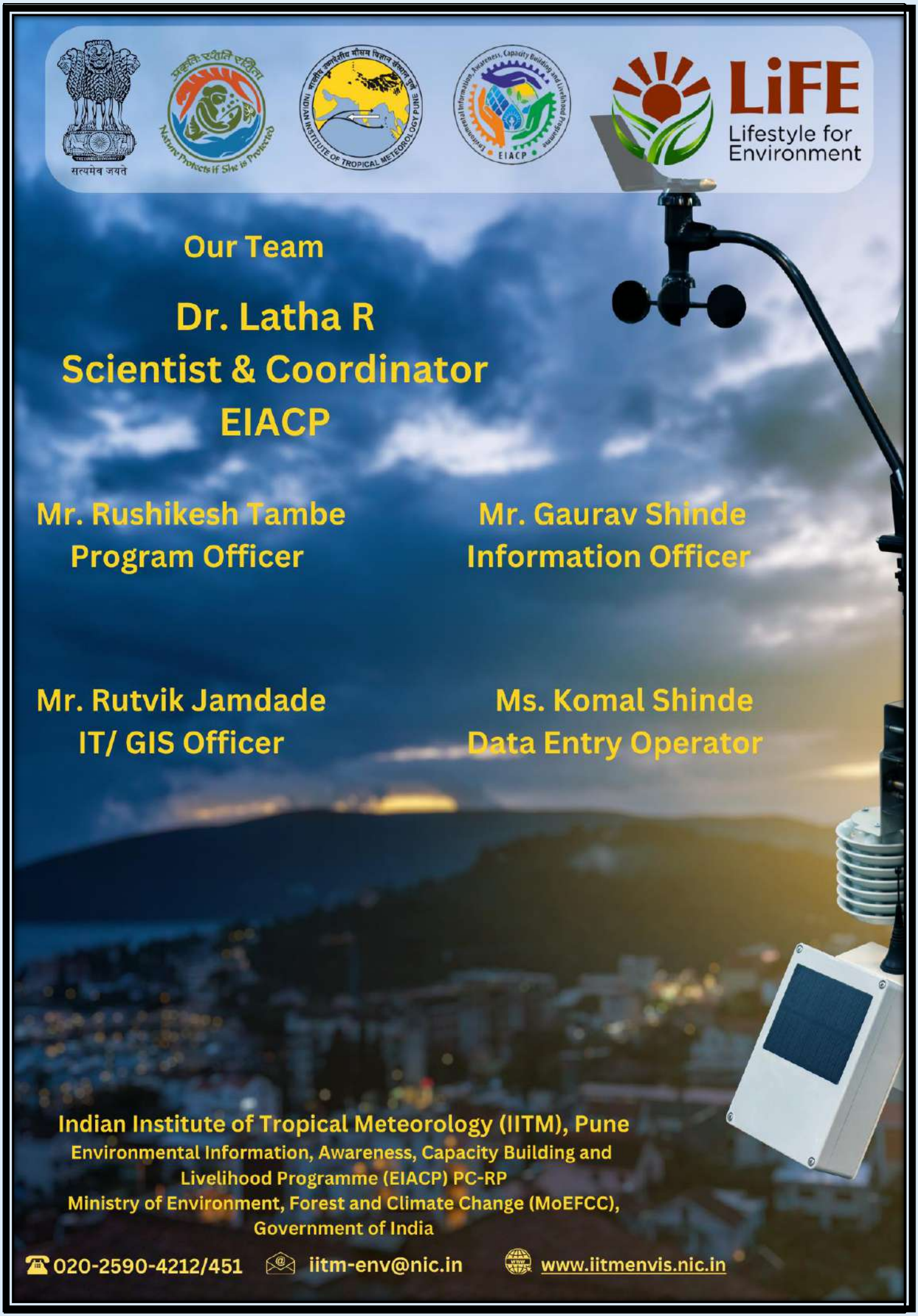
IITM-EIACP Pune celebrated World Ozone Day at Ahilyadevi English Medium School, *Chavan Nagar, Pune,* on September 16, 2024, through a Drawing Competition that involved 110 students.

Key Fact:

Groundwater extraction contributes significantly, with 85% serving rural water needs and 50% for urban areas. Around 62% of extracted groundwater is used for agriculture.

❖ **Mission LiFE Campaign and Awareness for Eco-friendly Ganesha Idols**

In September 2024, IITM EIACP Pune successfully conducted a campaign aligned with Mission LiFE to promote eco-friendly Ganesha idols in celebration of Anant Chaturdashi. The campaign was held at key locations, including *Pashan Lake*, *Aundh Mula River Ghat*, and *Yerwada Mutha River Ghat,* reaching over 5000 citizens. The local mandals (groups) appreciated our work we were provided appreciation certificate. Our team members approached large number of families, came for "Ganapti Visarjan" and appreciated them with the "Climate Warrior" badge and life mission theme pamphlet for willingly involving themselves in getting aware of the Life Mission initiatives and aims.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