



TELANGANA STATE WEATHER DATA ANALYSIS

FROM 2020 – 2024

Presented By : Team Lunatic



DATASET OVERVIEW

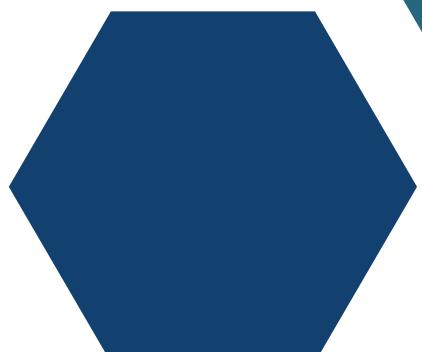


Key Highlights:

- Combined 38 CSV files into one master table using Power Query Editor.
- Total dataset size: ~705K+ records with 10 fields for rainfall, temperature, humidity, and wind speed.
- Created a disconnected metric table to use as a dynamic slicer for visual comparisons.
- Performed data cleaning, transformation, and standardization using Power Pivot.
- Handled missing values, anomalies, and formatting before loading into Power BI.
- Ensured consistent data types for smooth DAX calculations and dashboard visuals.

Conclusion:

After cleaning and merging, the dataset became a unified, reliable source for analyzing weather trends, anomalies, and correlations across years and districts.



PROBLEM STATEMENT

Problem Identified:

- Data was available in 38 separate CSV files covering January 2020 to April 2024, with no unified structure.
- Difficulty in identifying seasonal trends, district-level variations, and correlations among key weather parameters.
- Lack of interactive visualization to monitor changes over time or compare metrics across districts.

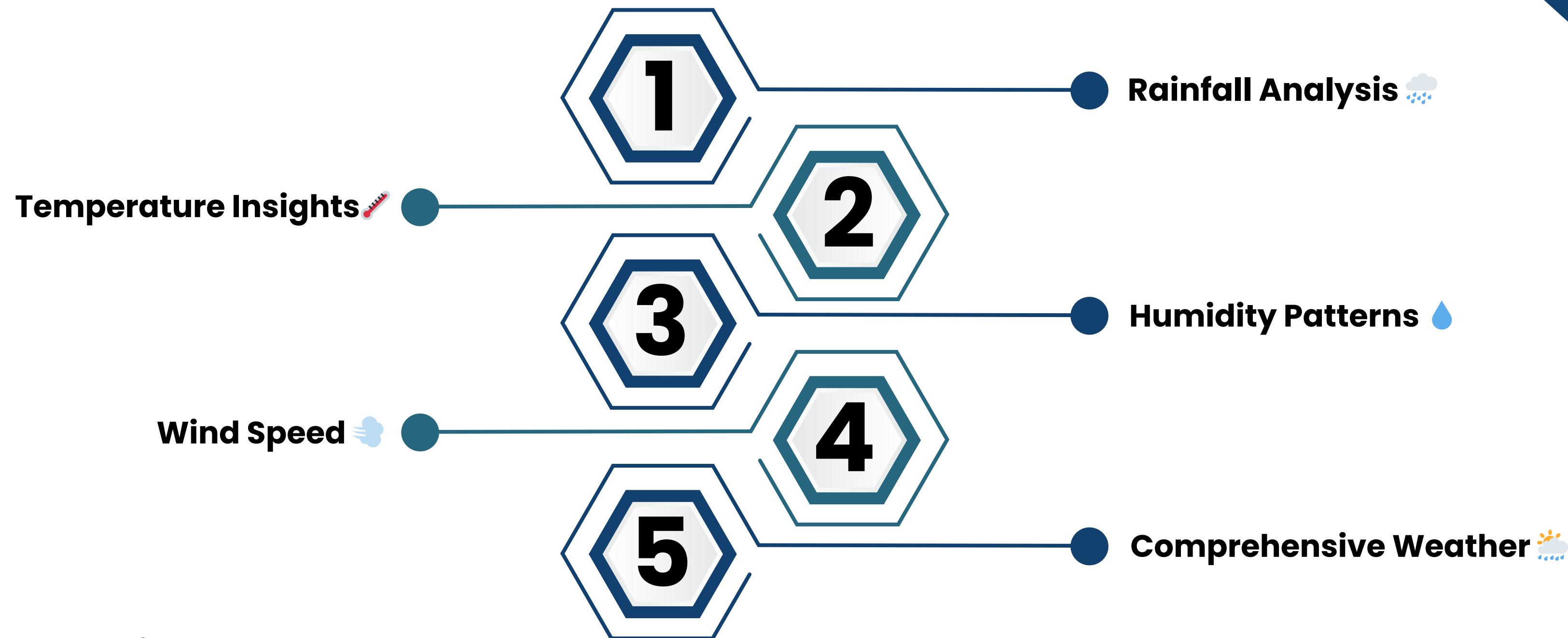
Objective:

To create an interactive Power BI dashboard that integrates, cleans, and visualizes weather data, helping users understand:

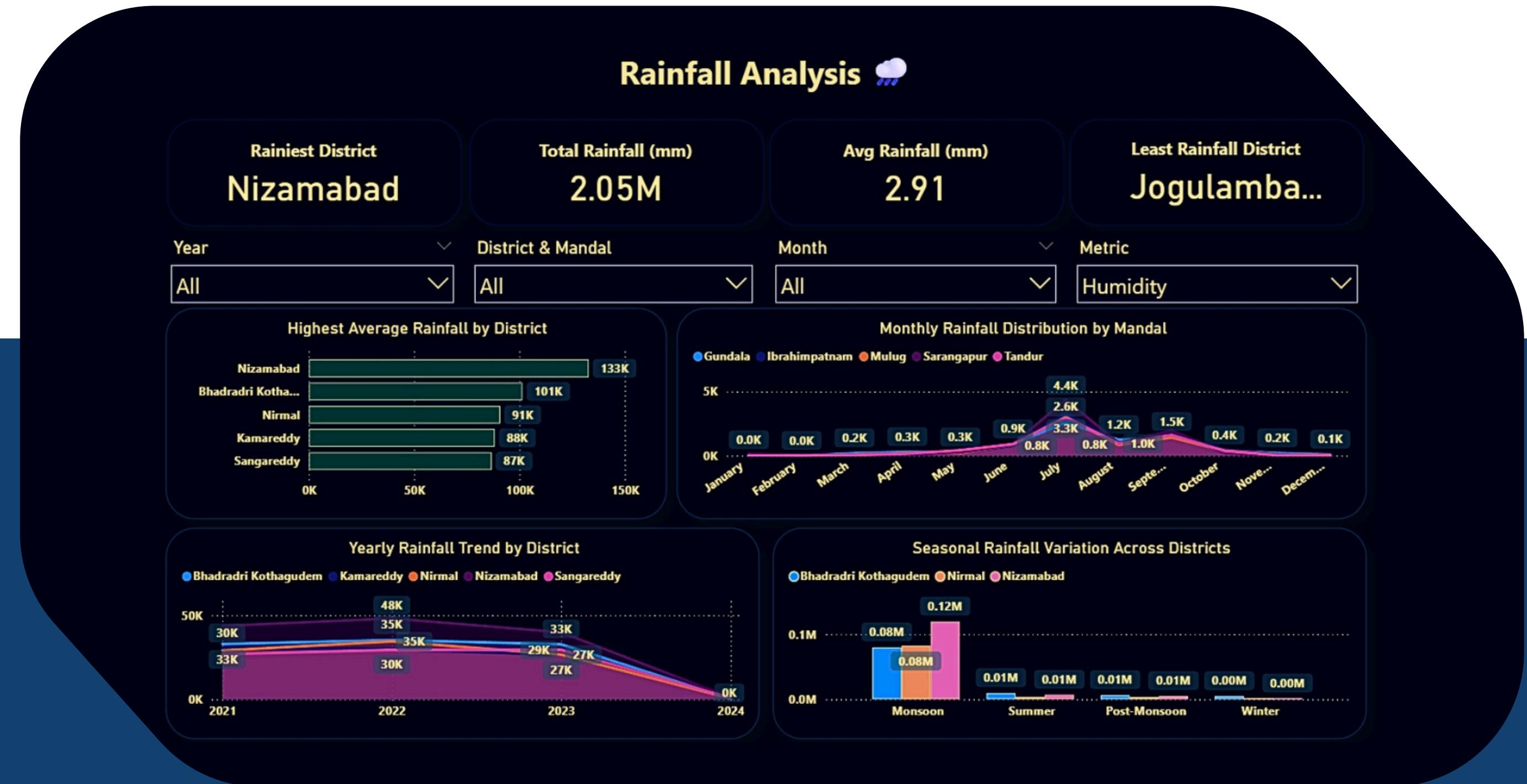
- How rainfall, temperature, humidity, and wind speed vary seasonally and annually.
- The relationships and anomalies among different weather metrics.
- Key districts most affected by extreme weather patterns.



STEPS TO IMPLEMENT WEATHER STRATEGIES



RAINFALL ANALYSIS



This dashboard highlights which districts and mandals received the most and least rainfall. It compares rainfall intensity, distribution, and seasonal variations.



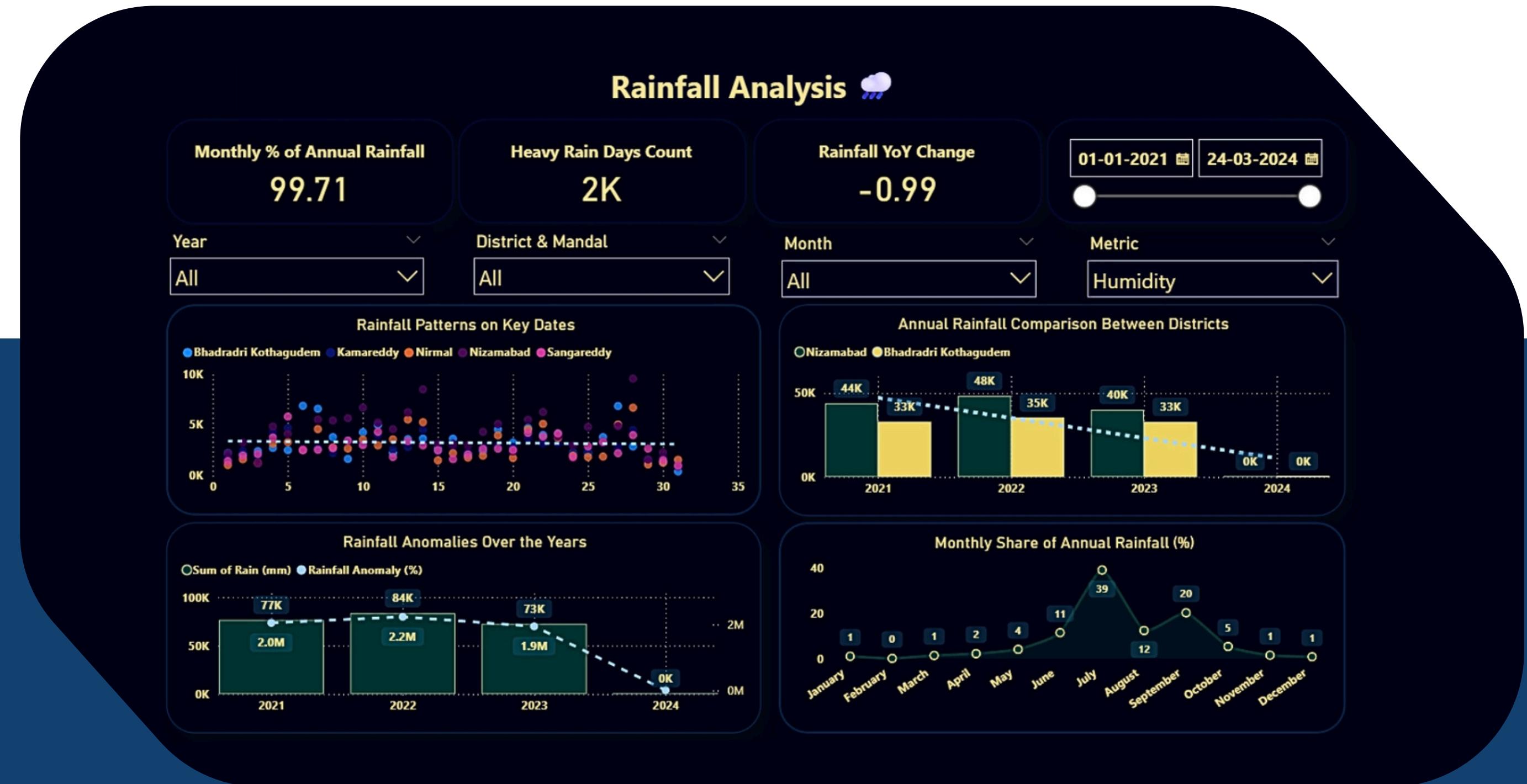
>>> KEY INSIGHTS

- Nizamabad is the雨iest district with a total rainfall of 2.05M mm.
- Jogulamba recorded the least rainfall, showing a major contrast in rainfall distribution.
- The average rainfall across districts is around 2.91 mm.
- Monsoon season contributes the most rainfall – around 0.12M mm in some districts.
- July and August are peak rainfall months, with rainfall ranging from 2.6K to 4.4K mm in certain mandals.
- Other districts like Bhadrakri Kothagudem and Nirmal also show strong monsoon trends.

Conclusion:

Rainfall is highly seasonal and varies sharply across districts. Nizamabad stands out as the most rainfall-prone region, while Jogulamba remains the driest.

RAINFALL ANALYSIS



This dashboard shows detailed rainfall trends and patterns across districts and mandals. It helps to understand how rainfall changes over the years, months, and regions.



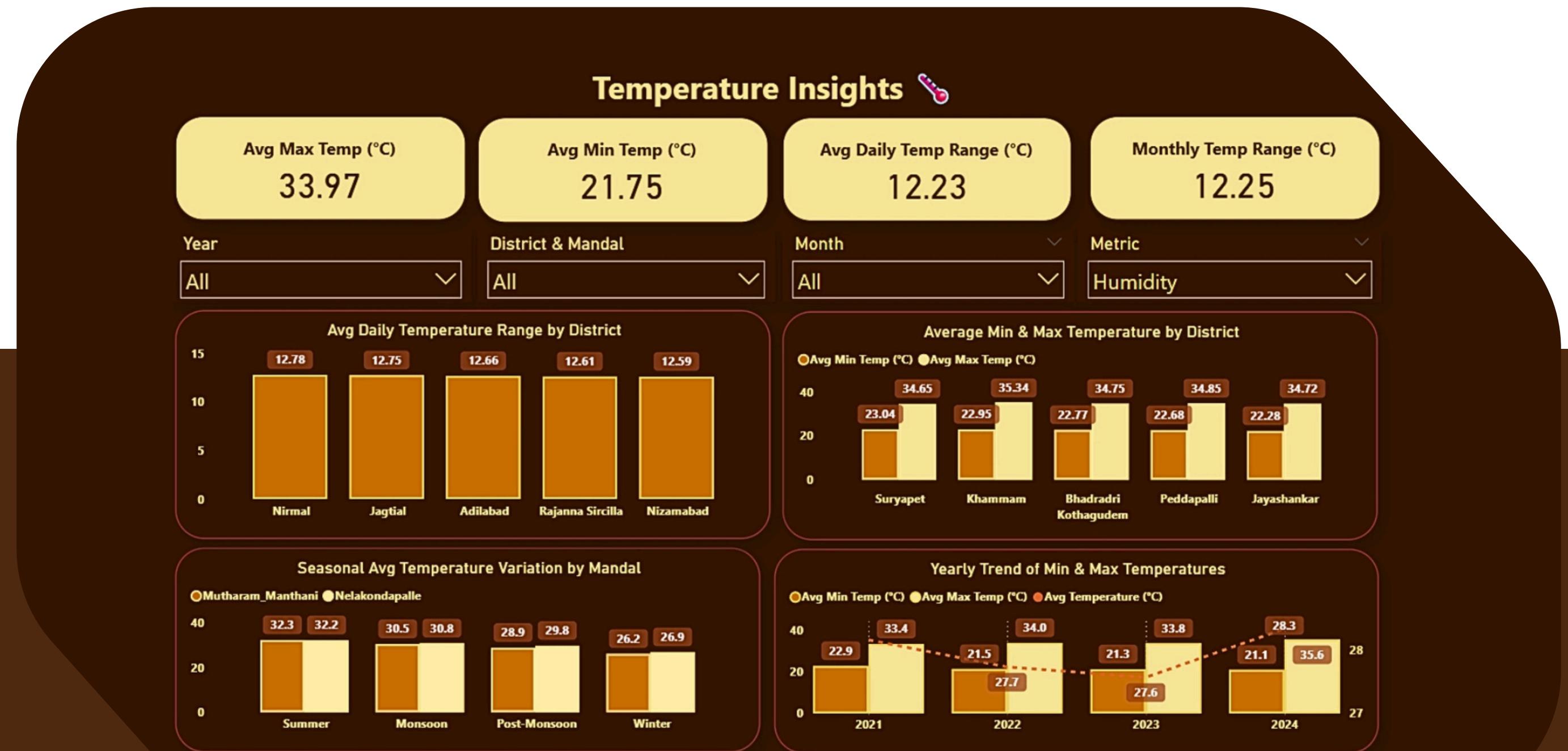
>>> KEY INSIGHTS

- The monthly percentage of annual rainfall is around 99.71%, showing near-complete rainfall data coverage.
- There were 2,000+ heavy rain days recorded between 2021 and 2024.
- Rainfall YoY (Year-on-Year) change slightly decreased by 0.99%, showing a small decline.
- July recorded the highest share of rainfall (around 39%) followed by October (20%).
- Rainfall anomalies show fluctuations across the years – 2022 had the highest rainfall at 84K mm, while 2024 shows a sharp drop.
- Nizamabad and Bhadrak Kothagudem received higher rainfall compared to other districts.

Conclusion:

Overall rainfall has been consistent but slightly declining after 2022, with July and October being the wettest months.

TEMPERATURE INSIGHTS



This dashboard compares daily, monthly, and seasonal temperature variations across different districts and mandals.

>>>> KEY INSIGHTS



- The average maximum temperature is 33.97°C, while the average minimum is 21.75°C.
- The average daily temperature range is around 12.23°C, showing moderate climate variation.
- Nirmal has the highest daily temperature range (12.78°C), followed closely by Jagtial and Adilabad.
- Suryapet and Khammam show the highest average max temperatures (~35°C).
- Summer remains the hottest season (~32°C average), followed by Monsoon and Post-Monsoon periods.
- The yearly trend indicates that both minimum and maximum temperatures slightly increased again by 2024 after a small dip in 2022.

Conclusion:

Temperature fluctuations are moderate across the districts, with summer peaks and stable winter averages. Long-term trends show a small but steady rise in overall temperatures.

TEMPERATURE INSIGHTS



Temperature Insights 🌡️

Hottest District Name

Khammam

Heatwave Days Count

51K

Temp YoY Change

0.05

Coldest District Name

Vikarabad

Year

All

District & Mandal

All

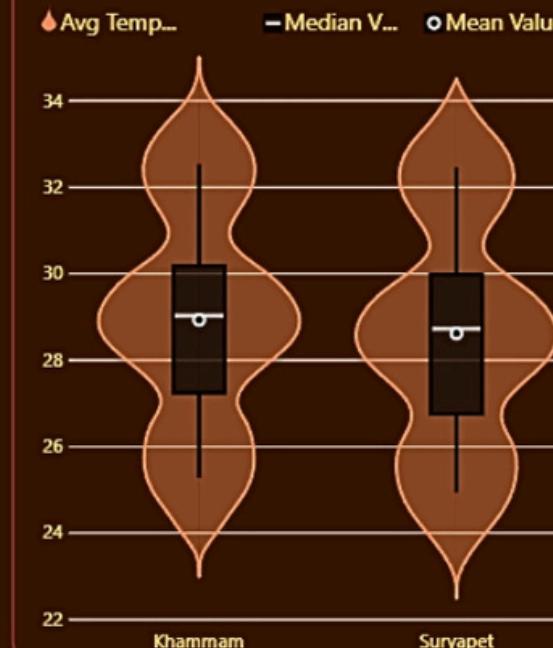
Month

All

Metric

Humidity

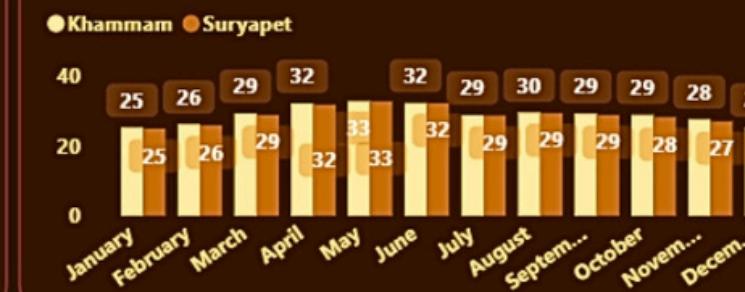
Temperature Distribution Between Two Districts



Correlation Between Avg Min & Max Temperatures



Monthly Temperature Comparison Between Two Districts



District

District	2021	2022	2023	2024
Adilabad	-0.18	0.08	-0.10	0.35
Bhadradri Kothagudem	0.12	0.19	0.17	0.49
Hanumakonda	-0.51	0.05	-0.08	0.24
Hyderabad	-0.35	-0.22	-0.18	0.50
Jagtial	0.08	0.20	0.13	0.41
Jangaon	-0.09	0.00	-0.03	0.23
Jayashankar	0.05	0.23	0.16	0.53
Jogulamba Gadwal	-0.18	-0.06	0.00	0.67
Kamareddy	-0.26	-0.07	-0.20	0.27
Karimnagar	0.00	0.10	-0.02	0.28
Khammam	0.29	0.32	0.32	0.67
Kumuram Bheem	-0.15	0.00	-0.08	0.35
Mahabubabad	-0.01	0.10	0.12	0.53
Mahabubnagar	-0.31	-0.12	-0.12	0.53
Mancherial	0.00	0.10	0.09	0.47
Medak	-0.36	-0.25	-0.33	0.23
Medchal-Malkajgiri	-0.32	-0.16	-0.16	0.44
Mulugu	0.02	0.18	0.13	0.58
Nagarkurnool	-0.39	-0.16	-0.16	0.52

This dashboard gives a clear view of temperature variations across districts and seasons. It highlights the hottest and coldest regions, along with heatwave trends and overall temperature changes over time.

>>>> KEY INSIGHTS

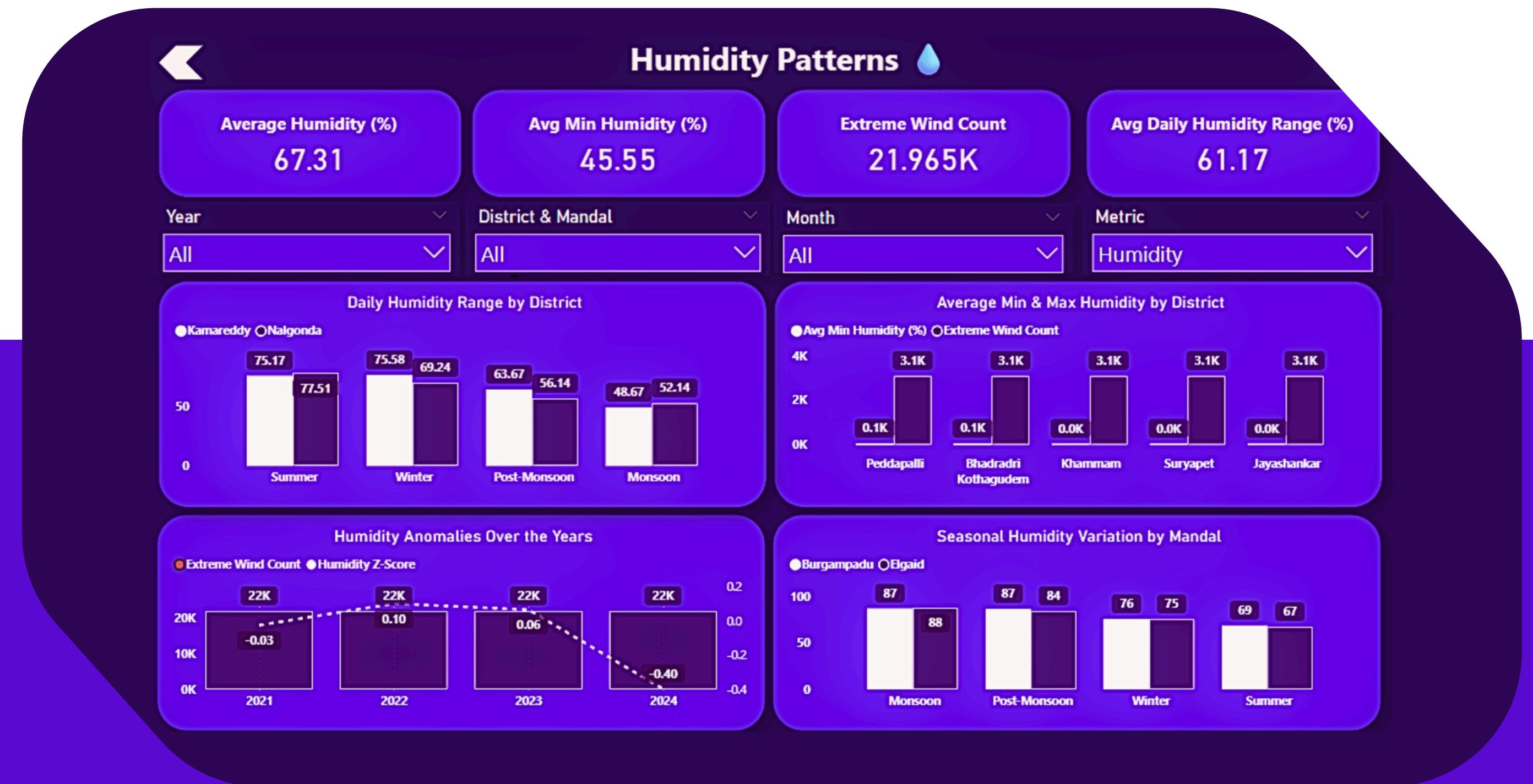


- Khammam is identified as the hottest district, while Vikarabad is the coldest.
- Around 51K heatwave days were recorded during the study period.
- The temperature Year-on-Year change is $+0.05^{\circ}\text{C}$, showing a slight upward trend.
- A strong positive correlation exists between average minimum and maximum temperatures.
- Khammam and Suryapet have similar temperature distributions, with averages around $29\text{--}32^{\circ}\text{C}$ in most months.
- Temperature distribution graphs show consistent median and mean values, meaning less variation.

Conclusion:

Temperatures remain mostly steady with a slight increase in recent years. Khammam experiences the highest heat intensity, while Vikarabad remains relatively cooler.

HUMIDITY PATTERNS



This dashboard explains how humidity behaves across different districts, seasons, and years. It highlights average humidity levels, seasonal variations, and humidity anomalies over time.

>>> KEY INSIGHTS

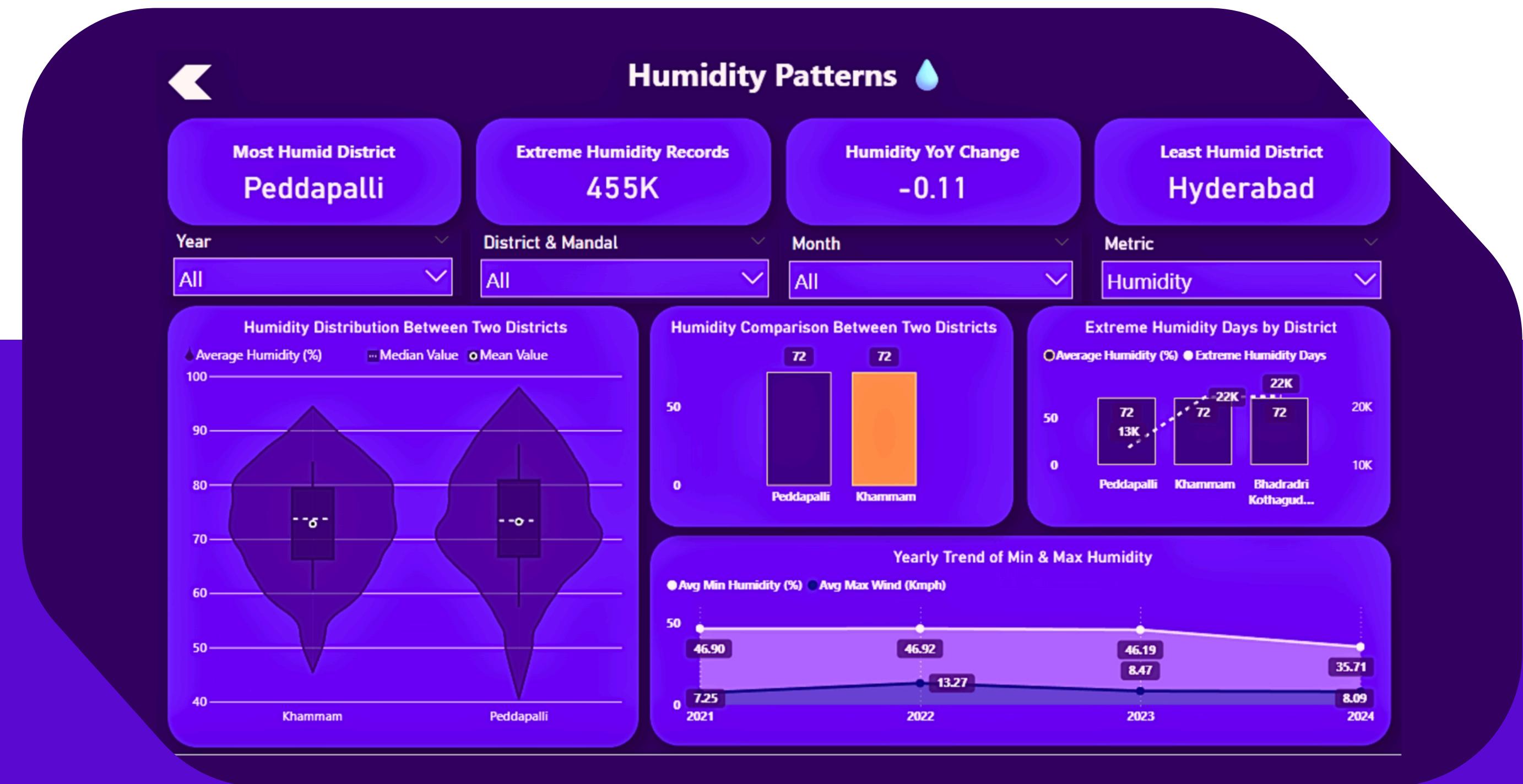


- Average humidity across all districts is 67.31%, while the average minimum humidity is 45.55%.
- The average daily humidity range is 61.17%, meaning humidity changes widely between day and night.
- Kamareddy and Nalgonda show the highest humidity values across all seasons (above 75% in Summer and Winter).
- Monsoon season has the highest humidity (around 87–88%), while Summer has the lowest (around 67%).
- The humidity anomaly trend shows slight ups and downs from 2021–2023, but a clear drop in 2024 (Z-score -0.40).
- Districts like Peddapalli, Bhadravati Kothagudem, Khammam, Suryapet, and Jayashankar show similar average humidity patterns and stable wind influence.

Conclusion:

- Humidity remains highest during the monsoon and post-monsoon seasons and lowest during summer. Overall, humidity shows a slight decreasing trend in recent years, with 2024 recording the sharpest drop.

HUMIDITY PATTERNS



>>>> KEY INSIGHTS



- Peddapalli is the most humid district, while Hyderabad has the lowest humidity levels.
- Humidity YoY change is -0.11, indicating a slight decline over the years.
- Khammam and Peddapalli show similar humidity averages (72% each), as seen in the comparison chart.
- Extreme humidity days peaked in Khammam and Bhadravati Kothagudem (above 22K days).
- The yearly trend shows:
 - Maximum humidity peaked in 2022 (90.99%)
 - Minimum humidity declined steadily from 46.90% (2021) to 35.71% (2024)
- The violin plot shows wider distribution in Peddapalli, meaning more humidity variation compared to Khammam.

Conclusion:

- Humidity shows a slight overall decline, with clear seasonal and district-level differences. Peddapalli and Khammam remain consistently humid, while Hyderabad is the driest and shows minimal extreme humidity cases.

WIND SPEED



Wind Speed Analysis

Avg Wind (Kmph)

4.85

Year

All

Avg Min Wind (Kmph)

0.13

District & Mandal

All

Avg Max Wind (Kmph)

9.57

Month

All

Avg Daily Wind Range...

19.80

Metric

Humidity

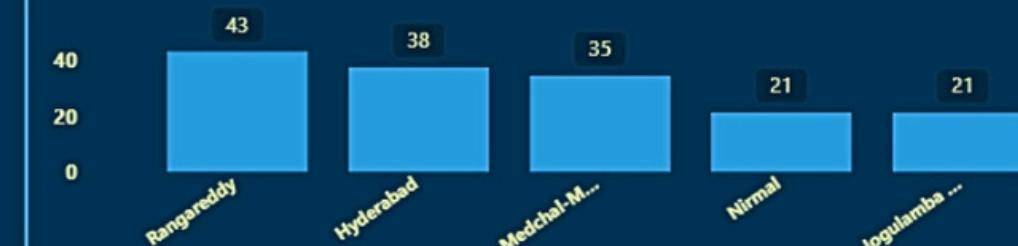
Wind Speed Patterns & Outliers



Average Min & Max Wind Speed by District



Daily Wind Speed Range by District



Yearly Wind Speed Variation by Mandal



This dashboard highlights monthly wind speed patterns, outliers, district-wise ranges, and yearly variations across mandals.



>>>> KEY INSIGHTS

- The average wind speed across all regions is 4.85 kmph, with average max speed of 9.57 kmph.
- The daily wind range is 19.8 kmph, showing a wide variation between calm and gusty days.
- Rangareddy, Hyderabad, and Medchal record the highest daily wind ranges (35–43 kmph).
- Jogulamba Gadwal has a maximum wind speed of 12.1 kmph, while Rangareddy peaks at 13.35 kmph.
- The wind speed pattern chart shows consistent “normal” speeds throughout the year with occasional “very high” peaks.
- Yearly wind speed variation by mandal indicates that 2022 had the strongest wind activity, followed by a steady decline till 2024.

Conclusion:

Overall, wind speeds show seasonal consistency with 2022 marking the most active wind year. Rangareddy and Hyderabad continue to dominate as the windiest districts.

WIND SPEED



Wind Speed Analysis 🌬️

Highest Wind Speed...
Rangareddy

Year
All

High Wind Days
20K

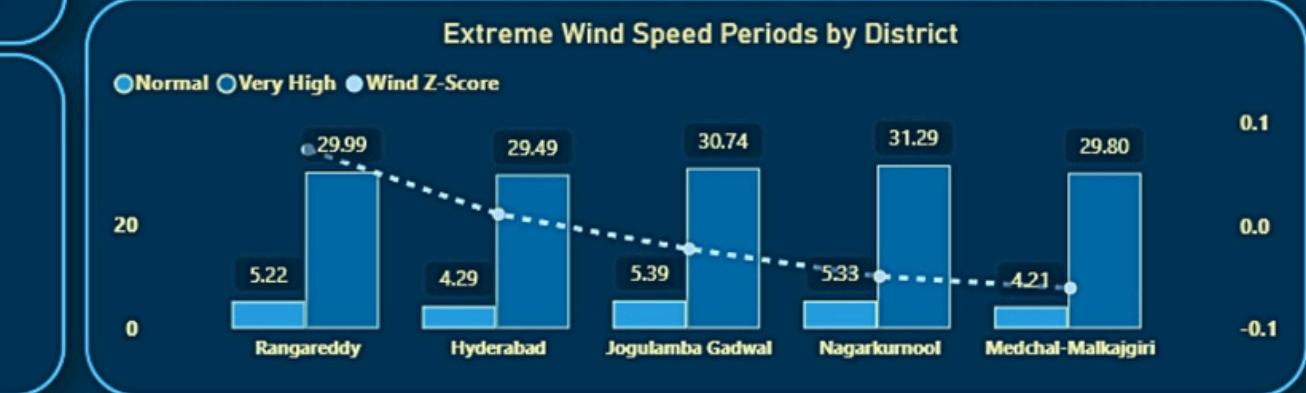
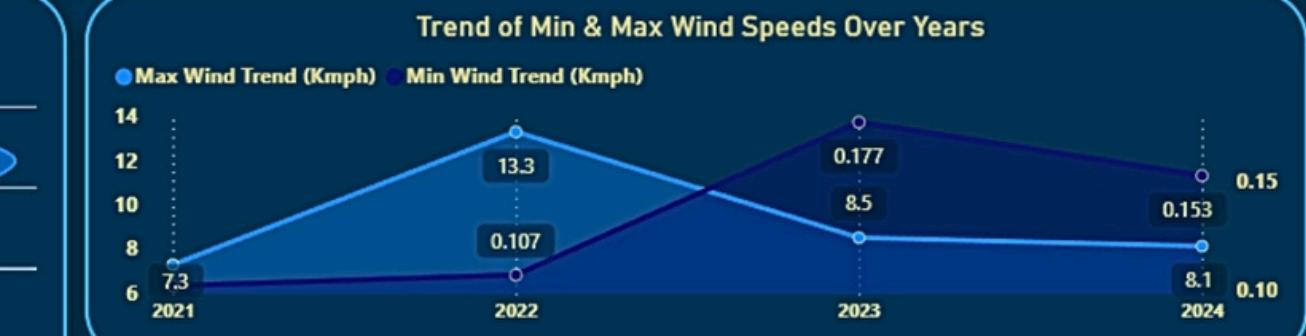
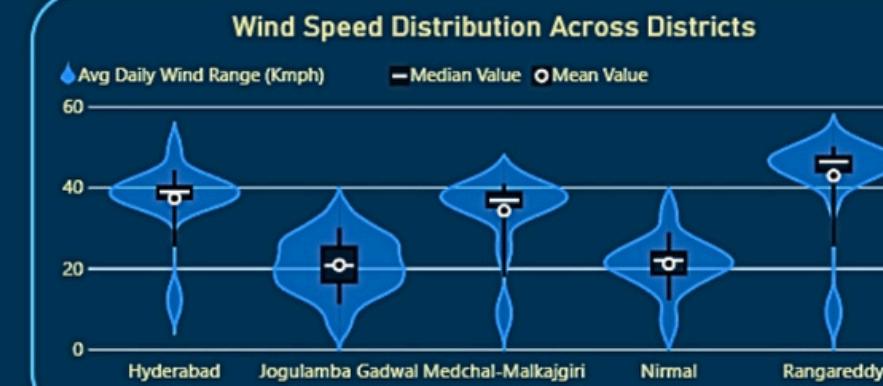
District & Mandal
All

Wind YoY Change
-0.05

Month
All

Lowest Wind Speed...
Mahabubabad

Metric
Humidity



This dashboard shows how wind speed varies across different districts and years. It highlights both the highest and lowest wind speed regions and gives insights into overall wind speed trends.

>>>> KEY INSIGHTS



- Rangareddy recorded the highest wind speed, while Mahabubabad had the lowest.
- Around 20K high wind days were observed during the study period.
- The Year-on-Year (YoY) wind change is -0.05, showing a slight reduction over the years.
- Rangareddy and Hyderabad show similar wind distributions, averaging around 6–7 kmph.
- The maximum wind trend peaked at 13.3 kmph in 2022, then gradually declined in 2023–2024.
- Extreme wind speed periods were highest in Rangareddy (29.99) and Nagarkurnool (31.29).

Conclusion:

Wind speeds remain moderate across districts with occasional peaks. Rangareddy experiences the strongest winds, while Mahabubabad records the calmest conditions.

COMPREHENSIVE WEATHER



Comprehensive Weather Insights

Avg Rainfall (mm)

2.91

Year

All

Avg Temperature (°C)

27.86

District & Mandal

All

Avg Humidity (%)

10.99K

Month

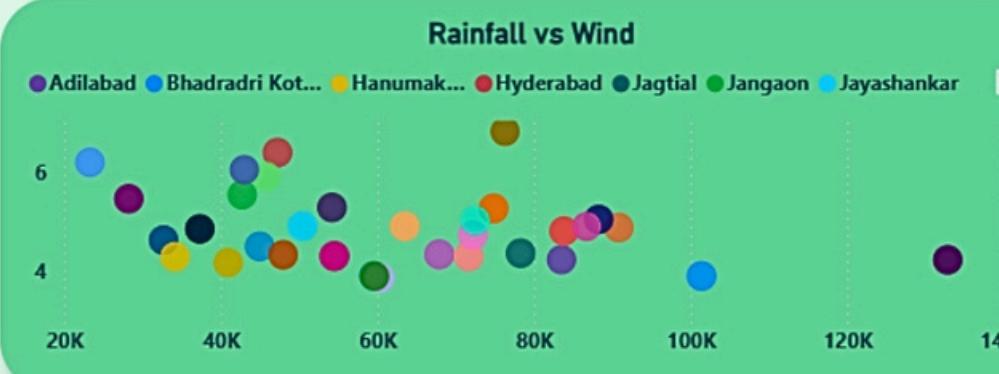
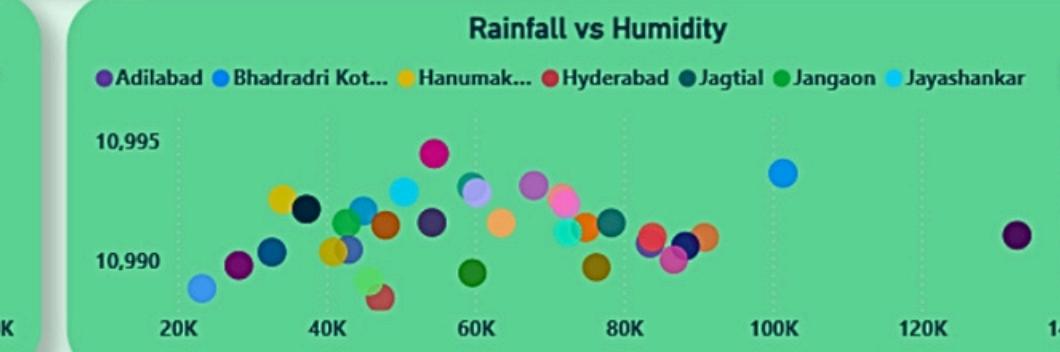
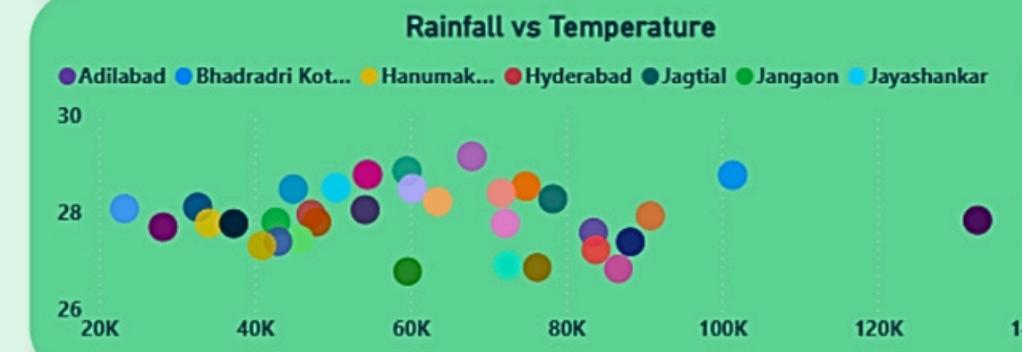
All

Avg Wind (Kmph)

4.85

Metric

Humidity



Corr Rain vs Temp

-0.05

Corr Rain vs Humidity

0.16

Corr Rain vs Wind

-0.28

This dashboard explores how rainfall relates to other weather metrics like temperature, humidity, and wind speed. It helps identify whether these parameters move together or in opposite directions.

>>>> KEY INSIGHTS



- **Average Rainfall:** 2.91 mm
- **Average Temperature:** 27.86°C
- **Average Humidity:** 10.99K%
- **Average Wind Speed:** 4.85 kmph
- The correlation between rainfall and temperature is -0.05, meaning rainfall slightly decreases when temperature rises.
- The correlation between rainfall and humidity is +0.16, showing that higher humidity supports more rainfall.
- The correlation between rainfall and wind speed is -0.28, meaning stronger winds may reduce consistent rainfall patterns.
- The scatter plots clearly show that while temperature and wind fluctuate, rainfall aligns more closely with humidity changes.

Conclusion:

Overall, humidity has the strongest positive link with rainfall, while wind and temperature show weaker or negative correlations. This proves that humidity plays the most vital role in determining rainfall behavior.

COMPREHENSIVE WEATHER



Comprehensive Weather Insights

Daily Rain Range (mm)

55.91K

Year

All

Avg Daily Temp Range (°C)

12.23

District & Mandal

All

Avg Daily Humidity Range (%)

61.17

Month

All

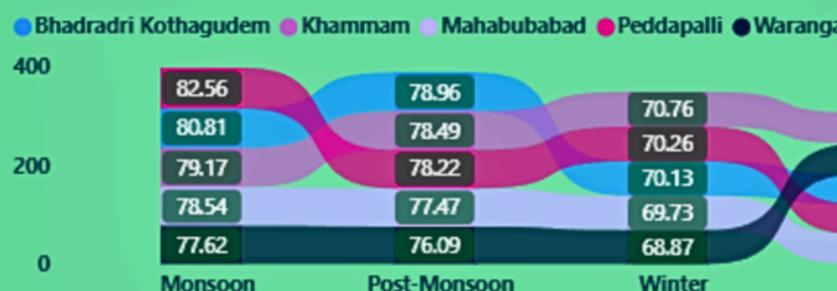
Avg Daily Wind Range (Kmph)

19.80

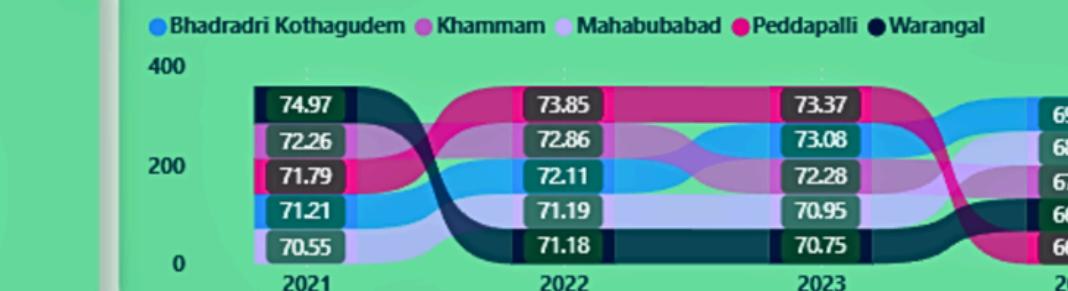
Metric

Humidity

Seasonal Weather Patterns Across Districts



Yearly Trends in Key Weather Metrics



Seasonal Weather Metrics Across Districts

District	Seasonal Rainfall (mm)	Seasonal Avg Temp (°C)	Seasonal Avg Humidity (%)	Seasonal Avg Wind Speed (Kmph)
Nizamabad	1,32,860.70	27.83	66.89	4.23
Bhadradri Kothagudem	1,01,410.20	28.76	71.87	3.90
Nirmal	90,840.20	27.92	66.38	4.88
Kamareddy	88,277.40	27.38	66.32	5.05

This dashboard combines rainfall, temperature, humidity, and wind data to provide an overall understanding of weather patterns across districts and seasons. It shows how key metrics interact and vary through the year.

>>>> KEY INSIGHTS



- The daily rainfall range is 55.91K mm, showing strong rainfall variation between regions.
- The average daily temperature range is 12.23°C, while the average daily humidity range is 61.17%.
- Average daily wind range is 19.80 kmph, indicating steady but variable wind activity.
- Monsoon and Post-Monsoon seasons show the highest weather activity, with rainfall and humidity peaking during these periods.
- Yearly trends show rainfall and humidity declining slightly after 2022, while temperature remains consistent.
- Wind speed stays steady across years, ranging from 3.9 to 5.0 kmph on average.

Conclusion:

The overall weather analysis shows that monsoon patterns dominate regional conditions. Rainfall and humidity have declined slightly since 2022, but temperature and wind remain stable, reflecting a moderate and consistent climate pattern.

COMPREHENSIVE WEATHER



Comprehensive Weather Insights

Rainfall YoY %

-0.98

Temperature YoY Δ (°C)

0.77

Humidity YoY Δ (%)

-7.54

Wind YoY Δ (Kmph)

-0.20

Year

All

District & Mandal

All

Month

All

Metric

Humidity

Anomalies in Weather Data



Δ Temp when Extreme Rain

-1.57

Δ Humid when Extreme Rain

20.55

Δ Wind when Extreme Rain

0.68

Most Affected District

Mahabubnaga...

Anomalies in Weather Data

District	Rainfall Z-Score	Temperature Z-Score	Humidity Z-Score	Wind Speed Z-Score	Anomaly Flag
Adilabad	0.08	-0.08	-0.20	-0.11	<input checked="" type="checkbox"/> Normal
Bhadradri Kothagudem	0.07	0.26	0.28	-0.17	<input checked="" type="checkbox"/> Normal
Hanumakonda	0.00	-0.02	0.17	-0.11	<input checked="" type="checkbox"/> Normal

This dashboard focuses on unusual weather patterns and extreme conditions over the years. It compares changes in rainfall, temperature, humidity, and wind speed, helping identify which districts faced the most irregular weather.

>>>> KEY INSIGHTS



- **Rainfall YoY change:** -0.98%, showing a slight decline in rainfall.
- **Temperature YoY change:** +0.77°C, indicating a gradual rise in temperature.
- **Humidity YoY change:** -7.54%, suggesting a clear decrease in moisture levels.
- **Wind YoY change:** -0.20 kmph, showing slightly calmer conditions.
- Extreme humidity and rain days peaked in 2022–2023 but dropped significantly in 2024.
- During extreme rainfall, temperature drops by 1.57°C, humidity rises by 20.55%, and wind increases by 0.68 kmph.
- Mahabubnagar is marked as the most affected district, showing maximum irregularities.
- Districts like Adilabad, Bhadrak, Kothagudem, and Hanumakonda show normal Z-scores, meaning stable weather behavior.

CONCLUSION

Project Summary:

- This Power BI project analyzed rainfall, temperature, humidity, and wind speed across multiple districts from 2020 to 2024.
- The goal was to identify seasonal trends, yearly variations, and weather anomalies using real data.
- Key findings show that rainfall and humidity are gradually decreasing, while temperature is slightly increasing over time.
- Monsoon season remains the most influential period, contributing the highest rainfall and humidity.
- Districts like Nizamabad, Khammam, and Rangareddy show strong weather variations, while Mahabubnagar faces more irregular conditions.

Key Insights:

- **Average Temperature:** ~28°C
- **Average Rainfall:** ~2.9 mm
- **Average Humidity:** ~11K%
- **Average Wind Speed:** ~4.8 kmph
- **Overall Weather Stability:** Moderate, with a few extreme fluctuations between 2022–2023.





**THANK
YOU
FOR YOUR ATTENTION**

TEAM LUNATIC

A large, three-dimensional text "THANK YOU" is displayed in a dark, futuristic setting. The letters are outlined in a vibrant, glowing pink and blue color, giving them a metallic and illuminated appearance. They are positioned on a stage with a reflective floor, which shows a faint reflection of the text. The background is a dark, solid color, making the glowing text stand out sharply.