Flood Prediction Analysis for Lagos State

Objective

The goal of this analysis is to evaluate various weather and environmental parameters specific to Lagos State to understand their impact on flood conditions and to forecast future trends. This includes examining rainfall, sea level pressure, wind speed, and related factors while considering their correlations and potential impacts on flood risks. Forecasts and historical data are analyzed to provide actionable insights and recommendations tailored to Lagos State.

Methodology

1. **Data Collection and Analysis:**
    - **Average Rainfall, Sea Level Pressure, Wind Speed and Direction:** Calculated monthly averages for Lagos State.
    - **Correlation Analysis:** Determined relationships between weather variables and severe risk.
    - **Threshold Comparison:** Compared environmental metrics against defined thresholds for flood risk.
    - **Forecasting:** Generated forecasts for precipitation, river discharge, temperature, and wind speed relevant to Lagos State.
    - **Historical Rainfall Analysis:** Reviewed monthly average rainfall over multiple years specific to Lagos State.
    - **Future Flood Predictions:** Analyzed predictions for flood risk in Lagos State over the coming months.
    - **Correlation Between Locations:** Examined the correlation between rainfall in Lagos and India.

Insights

1. **Average Rainfall (mm) Throughout the Year:**
    - **June** records the highest average rainfall (14.26 mm), indicating the peak of the rainy season in Lagos State.
    - **January** and **December** have the lowest average rainfall, marking the dry periods in Lagos State.
2. **Average Sea Level Pressure Throughout the Year:**
    - **July** shows the highest average sea level pressure (1014.21 hPa), while **February** has the lowest (1010.53 hPa), indicating significant seasonal fluctuations affecting Lagos State.

3. **Average Wind Speed and Direction Throughout the Year:**
    - **March** has the highest average wind speed (29.33 km/h) with a predominant westerly direction.
    - **May** and **June** exhibit lower wind speeds and more variable directions.
4. **Correlation Analysis:**
    - **Precipitation and Cloud Cover:** Weak positive correlation (0.07), indicating a minor relationship.
    - **Precipitation and Severe Risk:** Very weak negative correlation (-0.06), suggesting minimal direct relationship.
5. **Summary of Key Environmental Metrics:**
    - **Average River Discharge:** 658.95
    - **Maximum Temperature:** 34.80°C
    - **Minimum Temperature:** 26.65°C
    - **Average Humidity:** 89.20%
    - **Average Wind Speed:** 35.15 km/h
    - **Average Sea Level Pressure:** 1014.30 hPa
    - **Average Cloud Cover:** 72.80%
    - **Severe Risk Index:** 75.00
6. **Thresholds vs. Mean Values for Flood Conditions:**
    - Threshold values provided for flood conditions are compared against the available mean values. Specific mean values are not provided; thus, detailed comparisons cannot be made.
7. **Pair plot Summary:**
    - The pair plot indicates varying degrees of correlation between factors such as temperature, humidity, and wind speed, which can influence flood risk.
8. **Forecast Summaries:**
    - **Precipitation (June 29 - July 3, 2025):** Forecasted rainfall ranges from 14.03 mm to 16.73 mm.
    - **River Discharge (June 29 - July 3, 2025):** Forecasted discharge ranges from 460.58 to 548.02 cubic meters per second.

- **Maximum Temperature (June 29 - July 3, 2025):** Forecasted temperatures range from 30.72°C to 31.00°C.
- **Minimum Temperature (June 29 - July 3, 2025):** Forecasted temperatures range from 24.72°C to 25.28°C.
- **Windspeed (June 29 - July 3, 2025):** Forecasted wind speeds range from 25.70 km/h to 27.53 km/h.

9. **Historical Rainfall Data:**
    - Historical data shows variability in monthly rainfall in Lagos State, with high values in June and low values in the winter months, reflecting long-term trends.
10. **Future Flood Predictions:**
    - Forecasted flood risk values for Lagos State in the coming months are as follows:
        - **August 2024:** 25.69
        - **September 2024:** 28.84
        - **October 2024:** 23.91
        - **November 2024:** 24.40
        - **December 2024:** 24.79
        - **January 2025:** 21.97
        - **February 2025:** 31.88
        - **March 2025:** 30.11
        - **April 2025:** 27.45
        - **May 2025:** 25.35
        - **June 2025:** 26.24
        - **July 2025:** 32.68
11. **Correlation Between Lagos and India Rainfall:**
    - The correlation between rainfall in Lagos and India is -0.01, indicating a very weak inverse relationship between rainfall in these two locations.

Actionable Recommendations

1. **Forecast-Based Planning:**
    - Utilize the forecasted values for precipitation and river discharge to anticipate and prepare for potential flood conditions in Lagos State, especially during the peak rainy months of June and July 2025.

2. **Flood Risk Management:**
    - Update flood management plans based on future predictions and historical data for Lagos State. Implement early warning systems and preparedness measures in anticipation of increased flood risk.
3. **Seasonal and Historical Insights:**
    - Adjust agricultural practices and infrastructure maintenance schedules based on seasonal and historical rainfall patterns in Lagos State. Increase monitoring during high rainfall periods.
4. **Cross-Location Analysis:**
    - Although the correlation between Lagos and India rainfall is very weak, continue to monitor global weather patterns as they might provide additional context for local conditions in Lagos State.
5. **Public Communication:**
    - Inform stakeholders and the public in Lagos State about forecasted weather conditions, potential flood risks, and recommended actions to mitigate impacts. Provide regular updates as forecasts evolve.

Conclusion

The flood prediction analysis for Lagos State provides valuable insights into expected weather conditions and flood risks. The forecasts suggest variable flood risk levels throughout the remainder of 2024 and into mid-2025, with notable peaks anticipated in February 2025 and July 2025. The historical and forecast data highlights the need for proactive flood risk management and preparedness strategies. By using the provided forecasts and insights, stakeholders in Lagos State can enhance their response to potential flood conditions, improving resilience and safety for the community.