Results and Discussion – Rainfall Analysis

1. Provincial Rainfall Trends (2015–2025)

Province	Mean Rainfall (mm)	Trend Slope (mm/year)	R^2	Interpretation
Punjab	449.61	+4.23	0.09	Slight increasing trend; weak consistency; variability mostly inter-annual
Sindh	231.02	+9.80	0.119	Moderate increasing trend; high variability; susceptible to monsoon extremes
Khyber Pakhtunkhwa	708.99	–13.80	0.316	Noticeable decreasing trend; moderate consistency; may affect water/agriculture
Balochistan	178.22	+4.16	0.06	Very weak increasing trend; high variability; arid region sensitive to drought
Islamabad	1331.04	+0.22	0.00	No significant long-term trend; rainfall stable
FATA	565.61	–16.57	0.425	Strongest decreasing trend; relatively consistent; high drought vulnerability

Figure 1: *Provincial Rainfall Trends Graph (2015–2025)*
(Insert line graph for each province with trendline here)

2. Comparative Analysis

- **Increasing Trends:** Punjab, Sindh, Balochistan
- **Decreasing Trends:** Khyber Pakhtunkhwa, FATA
- **Stable:** Islamabad

Strongest decline: FATA
Most stable region: Islamabad

Figure 2: *Comparative Rainfall Trends by Province*
(Insert bar or line chart comparing all provinces)

3. Implications

- Heterogeneous rainfall patterns indicate **increasing climatic variability**
- **Higher drought risk** in Khyber Pakhtunkhwa and FATA

- **Potential flood risk** in Sindh due to rainfall variability
- **Need for province-specific water management policies**
- Regions with decreasing trends require **adaptive agriculture planning** and **improved water storage strategies**

4. Key Takeaways

- Northern regions show **pronounced decreasing rainfall trends**
- Southern provinces show **weak to moderate increasing trends**
- Islamabad remains **relatively stable**
- Data highlights **regional hydrological imbalances** relevant for climate adaptation strategies