Steps and Formulae for Drought Assessment

Annual Assessment

1. Calculate the **average annual rainfall** of the particular year ***(Column N in the excel)*** using formula:

$$\text{Average annual rainfall of year} = \frac{\text{Jan} + \text{Feb} + \text{Mar} + \text{Apr} + \text{May} + \text{Jun} + \text{Jul} + \text{Aug} + \text{Sep} + \text{Oct} + \text{Nov} + \text{Dec}}{\textit{Total number of months selected}}$$

2. Calculate the **total annual rainfall** of the particular year ***(Column O in the excel)*** using formula:

$$\text{Total Rainfall of year} = \text{Jan} + \text{Feb} + \text{Mar} + \text{Apr} + \text{May} + \text{Jun} + \text{Jul} + \text{Aug} + \text{Sep} + \text{Oct} + \text{Nov} + \text{Dec}$$

3. Calculate the **mean of annual rainfall for the 30 years** ***(Cell Z5 in the excel)*** using formula:

$$\text{Mean of Annual Rainfall (1988 - 2017)} = \frac{\text{Total Annual Rainfall of 1988} + 1989 + 1990 + \cdots + 2017}{\textit{Total Number of Years Selected}}$$

4. Calculate **75% of mean annual rainfall** ***(Cell Z14 in the excel)*** using formula:

$$\text{75\% of mean annual rainfall} = 0.75 * \text{Mean of Annual Rainfall (1988 - 2017)}$$

5. Now we will categorise the years either **drought or no drought year** ***(Column P in the excel)*** using 75% of mean annual rainfall calculated in step 4. Given is the criteria:

If rainfall > 75% of mean annual rainfall	No Drought
If rainfall < 75% of mean annual rainfall	Drought

6. Then we calculate **rainfall departure** ***(Column Q in the excel)*** using formula:

$$\text{Rainfall Departure (\%)} = \left(\frac{\text{Total Annual Rainfall} - \text{Mean of Annual Rainfall}}{\textit{Mean of Annual Rainfall}}\right) * 100$$

7. Now we will identify the **severity of the drought events** ***(Column R in the excel)*** using rainfall departure (%) calculated in step 6. Given is the criteria:

Rainfall Departure Criteria	Values
–50% to –75% of Rainfall Departure	Severe Drought
–25% to –50 % of Rainfall Departure	Moderate Drought
– 20 to –25% of Rainfall Departure	Mild Drought

8. Now we will calculate the **frequency of drought events** ***(Cell Z29 and Z30 in the excel)*** using formulas:

$$\text{Probability of drought events} = \frac{\text{Number of Drought Years}}{(\text{Total number of years selected} + 1)}$$

$$\text{Frequency of drought events} = \left(\frac{1}{\text{Probability of drought events}}\right) \text{years}$$

Seasonal Assessment

1. Calculate the **total seasonal rainfall** of the particular year ***(Column S in the excel)*** using formula:

$$\textbf{Total Seasonal Rainfall of Year = Jun + Jul + Aug + Sep}$$

2. Calculate the **mean of seasonal rainfall for the 30 years** ***(Cell AD5 in the excel)*** using formula:

$$\textbf{Mean of Seasonal Rainfall (1988 - 2017)} = \frac{\textbf{Total Seasonal Rainfall of 1988 + 1989 + 1990+....+ 2017}}{\textit{Total number of years selected}}$$

3. Calculate **75% of mean seasonal rainfall** ***(Cell AD14 in the excel)*** using formula:

$$\textbf{75\% of mean seasonal rainfall = 0.75 * Mean of Seasonal Rainfall (1988 - 2017)}$$

4. Now we will categorise the years either **drought or no drought year** ***(Column T in the excel)*** using 75% of mean annual rainfall calculated in step 4. Given is the criteria:

If rainfall > 75% of mean seasonal rainfall	No Drought
If rainfall < 75% of mean seasonal rainfall	Drought

5. Then we calculate **rainfall departure** ***(Column U in the excel)*** in order to identify the severity of the drought

$$\textbf{Rainfall Departure (\%)} = \left(\frac{\textbf{Total Seasonal Rainfall – Mean of Seasonal Rainfall}}{\textit{Mean of Seasonal Rainfall}}\right) * \textbf{100}$$

6. Now we will identify the **severity of the drought events** *(Column V in the excel)* using rainfall departure (%) calculated in step 6. Given is the criteria:

Rainfall Departure Criteria	Values
–50% to –75% of Rainfall Departure	Severe Drought
–25% to –50 % of Rainfall Departure	Moderate Drought
– 20 to –25% of Rainfall Departure	Mild Drought

9. Now we will calculate the **frequency of drought events** ***(Cell AD29 and AD30 in the excel)*** using formulas:

$$\textbf{Probability of drought events} = \frac{\textbf{Number of Drought Years}}{(\textbf{Total number of years selected} + \textbf{1})}$$

$$\textbf{Frequency of drought events} = \left(\frac{\textbf{1}}{\textbf{Probability of drought events}}\right) \textbf{years}$$