

# 全臺重要水源集水區歷史長期降雨量趨勢分析

## Trend Analysis of Historical Rainfalls for The Key Watersheds across Taiwan

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### 摘要

臺灣乾濕季分明且豐、枯水期雨量與流量之差異懸殊。在氣候變遷之影響下，水庫集水區雨量之長期趨勢對掌握整體水資源之供水風險，為相當重要資訊。基此，本研究為瞭解氣候變遷對全臺各區域降雨量之長期趨勢，篩選 39 個重要集水區(控制點)，透過蒐集各集水區長期歷史日雨量資料(1969-2023)進行趨勢分析。趨勢分析主要採用 Mann-Kendall 檢定法來判定數列本身是否具有顯著趨勢的特性，結合 Theil-Sen 斜率推估法計算趨勢斜率，即趨勢變化程度。在氣候變遷影響下，前後不同時間區段可能存在相異之降雨特性，本研究採用 Mann-Whitney-Pettit 檢定法尋找前後不同時間區段之降雨特性改變點(change point)，以完整瞭解全臺重要集水區降雨之長期變動趨勢。

分析結果發現，無論是年平均雨量、豐水期降雨量、枯水期降雨量，以及連續不降雨日之變化，多數測站分析結果均未通過顯著性檢定，且各區並無顯著且一致性之長期趨勢變化，惟存在較大的年際變動幅度，其結果與「臺灣氣候變遷科學報告 2023」及「109 年經理計畫滾動檢討」所進行之降雨長期趨勢及變異分析結果一致。儘管如此，臺灣近年已有多次乾旱事件發生(如 2014-2015、2017-2018，與 2020-2021)及極端降雨事件，未來應透過監測及預警系統的持續關注，據以掌握部分地區在特定季節產生之雨量變化，並提早進行適當之防範措施與應變行動。

關鍵詞：氣候變遷，降雨量長期趨勢，趨勢分析

## **Abstract**

In Taiwan, the distinct wet and dry seasons exhibit significant differences in rainfall and runoff. Influenced by climate change, understanding the long-term trends in precipitation in reservoir watersheds is crucial for assessing overall water resource supply risks. This study aimed to analyze the long-term trends in rainfall across Taiwan's regions by selecting 39 important watersheds (control points) and conducting trend analyses using historical daily rainfall data (1969-2023) from each watershed. The trend analysis primarily employed the Mann-Kendall test to determine if the time series exhibited significant trends and utilized Theil-Sen slope estimation to quantify the trend slopes, indicating the degree of trend change. Given the impact of climate change, different periods before and after may exhibit varying rainfall characteristics. The Mann-Whitney-Pettit test was used to identify change points in rainfall characteristics between these periods, aiming to comprehensively understand long-term rainfall variations in key watersheds across Taiwan.

The analysis results indicated that for most watersheds, annual average rainfall, wet season rainfall, dry season rainfall, and consecutive dry days did not show significant trends based on the statistical tests. Furthermore, there was no significant and consistent long-term trend across regions, although there were considerable interannual variations. These findings align with analyses conducted in the "Taiwan Climate Change Science Report 2023" and the "Rolling Review of Master Plan for Water Resources Management in 2020". However, Taiwan has experienced several drought events in recent years (e.g., 2014-2015, 2017-2018, and 2020-2021) as well as extreme rainfall events. Looking ahead, it is essential to detect rainfall variations through monitoring and early warning systems to facilitate timely implementation of appropriate prevention measures and response actions.

**Keywords:** climate change, long-term trend of rainfall, trend analysis