

# 氣候變遷下區域供水系統風險評估與分析

## Risk Assessment and Analysis of Regional Water Supply Systems under Climate Change

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### 摘要

隨著氣候變遷影響日益加劇，水資源面臨前所未有的挑戰，迫切需要強化政府應對極端天氣事件的能力。為應對這些挑戰，水利署提出「水資源領域氣候變遷調適行動方案」，並要求每四年進行檢討與更新。此外，環境部依據《氣候變遷因應法》發布了「氣候變遷風險評估作業準則」，以指導風險評估的實施。因此，下一期的「水資源領域氣候變遷調適行動方案」需基於最新的科學報告(AR6)及「氣候變遷風險評估作業準則」進行風險評估，確保在面對極端天氣事件時，水資源管理策略具備科學性與時效性。本研究基於作業準則，採用「界定範疇」、「檢視資源及氣候衝擊現況」、「評估未來氣候變遷風險」三大步驟，透過危害度、暴露度與脆弱度分析，識別未來的風險差距並制定調適策略。現況基準年選定112年用水需求與1995-2014年水文資料，未來目標年則採用130年與AR6中期情境(2041-2060年，GWL 2.0°C情境)水文資料進行供需風險評估與調適方案測試。而本研究將以北北基桃竹苗為例，而研究結果顯示，未來(民國130年)桃園與新竹兩地區科技工業聚集地將面臨極高風險。針對這些高風險區域，研究提出了調適措施，包括提升水資源的供應穩定性與多元化應對措施，提出了再生水工程、新建海淡廠、淨水場改善計畫、聯通管工程、伏流水工程計畫及水庫更新或增設工程等等計畫。經過調適後，這些地區的綜合風險顯著下降，研究範圍內的風險水準降至中低風險範圍。本研究不僅為研究範圍之供水區區域的風險評估提供了具體依據，還在不同情境下驗證了調適措施的有效性，對未來水資源管理與政策優化提供了寶貴的參考，對提升我國應對氣候變遷的能力具有重要意義。

關鍵詞：氣候變遷調適，水資源風險評估，調適策略

## Abstract

With the intensifying impacts of climate change, water resources are facing unprecedented challenges, making it urgent to strengthen the government's capacity to respond to extreme weather events. To address these challenges, the Water Resources Agency has proposed the "Climate Change Adaptation Action Plan for the Water Resources Sector", which must be reviewed and updated every four years. In addition, the Ministry of Environment, in accordance with the Climate Change Response Act, has issued the "Guidelines for Climate Change Risk Assessment" to guide the implementation of risk assessments.

Therefore, the next phase of the "Climate Change Adaptation Action Plan for the Water Resources Sector" must be based on the latest scientific report (IPCC AR6) and the "Guidelines for Climate Change Risk Assessment," ensuring that water resources management strategies remain both scientific and timely in the face of extreme weather events.

Following the guidelines, this study adopts three major steps: (1) defining the scope, (2) reviewing current resources and climate impacts, and (3) assessing future climate change risks. Through analyses of hazard, exposure, and vulnerability, future risk gaps are identified and adaptation strategies are formulated.

For the current baseline, the study uses water demand in 2023 (Year 112 in the ROC calendar) along with hydrological data from 1995–2014. For the future target year, 2041–2060 (Year 130, GWL 2.0°C scenario under AR6) hydrological data are applied to conduct supply-demand risk assessments and to test adaptation measures.

Taking the Taipei, New Taipei, Keelung, Taoyuan, Hsinchu, and Miaoli regions as examples, the results indicate that in the future (Year 130), Taoyuan and Hsinchu—key hubs for technology and industry—will face extremely high risks.

To address these high-risk areas, the study proposes a range of adaptation measures to enhance the stability and diversification of water supply, including reclaimed water projects, new desalination plants, water treatment plant improvements, interconnection pipeline projects, bank filtration projects, and reservoir renewal or expansion projects. After implementing these measures, the overall risks in these areas are significantly reduced, with risk levels within the study region declining to medium to low risk categories.

This study not only provides concrete evidence for risk assessments in the water supply regions under review but also validates the effectiveness of adaptation measures under different scenarios. It offers valuable insights for future water resources management and policy optimization, and plays a crucial role in strengthening Taiwan's capacity to cope with climate change.

Keywords: Climate Change Adaptation, Water Resource Risk Assessment, Adaptation Strategies