

氣候變遷下崩塌衝擊區位辨識 -以大漢溪為例

Assessing Landslide Impact Zones under Climate Change: A Case Study of the Dahan River Watershed

國家災害防救科技中心、臺灣大學地質科學系

專案助理研究員

朱芳儀

Fang-Yi Chu

副研究員

陳韻如

Yun-Ju Chen

助理教授

陳麒文

Chi-Wen Chen

研究員

李欣輯

Hsin-Chi Li

摘要

根據《國家氣候變遷科學報告 2024》，氣候變遷下，侵臺颱風為強颱的頻率及降雨強度有提升趨勢。此降雨型態的變化將可能加劇未來坡地災害的規模。為降低重大災害的發生，應需提前了解氣候變遷下崩塌面積提升的區位及可能受影響的對象，進而擬定合適的調適策略。本研究以大漢溪集水區為例，採用臺灣氣候變遷推估資訊與調適知識平台(TCCIP)產製具有颱風降雨的動力降尺度資料，結合淺層崩塌模式進行模擬，評估各場颱風事件的崩塌潛勢，並以基期、氣候變遷下最大的崩塌潛勢面積進行分析。以子集水區為分析單元，計算各個子集水區基期及氣候變遷下的崩塌率，透過二時期崩塌率的變化，來辨識氣候變遷下崩塌率提升的區域。崩塌率的提升代表該區域崩塌面積擴大，對於區域內關注對象之衝擊亦可能提高。結果顯示，相較基期，氣候變遷下崩塌率提升較多的子集水區多分布於中上游，對於位於崩塌率提升區域內可能受影響的聚落、道路等關注對象或設施，建議優先檢視其坡地災害風險並評估調適差距，進而盤點資源及規劃調適策略。本研究透過子集水區尺度的崩塌率變化，辨識氣候變遷下崩塌衝擊可能提升之區位，進而，提供未來氣候變遷下坡地災害風險評估之優先區位與對象，並作為調適策略規劃之參考依據。

關鍵詞：氣候變遷，衝擊，動力降尺度資料，崩塌率，子集水區

Abstract

Under the influence of climate change, the frequency of intense typhoons and associated rainfall intensity impacting Taiwan is projected to increase. Such changes in rainfall patterns may exacerbate the scale of future slope disasters. To reduce the occurrence of hazards, it is necessary to proactively assess zones with increased landslide extent and vulnerable targets

under climate change, thereby enabling the development of appropriate adaptation strategies. This study takes the Dahan River watershed as a case study, utilizing dynamically downscaled typhoon rainfall data produced by the Taiwan Climate Change Projection Information and Adaptation Knowledge Platform (TCCIP), combined with a landslide model to simulate landslide susceptibility for individual typhoon events. The analysis compares maximum landslide susceptibility areas under baseline and climate change scenarios. Landslide area ratios were calculated at the subwatershed scale, and changes between the two periods were used to identify zones with increased landslide impact. An increase in landslide area ratio indicates expanded landslide areas and potentially greater impacts on vulnerable targets within these zones. Results show that subwatersheds exhibiting the largest increases in landslide area ratios under climate change are mainly distributed in the midstream to upstream areas. For settlements, roads, and other critical infrastructure located within these high impact zones, it is recommended to prioritize slope disaster risk assessments and evaluate adaptation gaps, followed by resource allocation and adaptation planning. By analyzing Landslide area ratio changes at the subwatershed scale, this study identifies areas with potentially increased landslide impacts under climate change, providing prioritized targets for slope disaster risk assessment and serving as a reference for adaptation strategy development.

Keywords : climate change, impact, dynamical downscaling, landslide area ratio, subwatershed