

氣候變遷情境下土壤沖蝕對碳儲量之影響 -以高屏河流域為例

Impact of soil erosion on carbon storage under climate change scenarios

-A Case Study of Gaoping River Basin

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摘要

氣候變遷對全球環境的影響日益加劇，土壤沖蝕作為地表變遷的重要過程，不僅影響土地生產力，也對碳儲量的穩定性構成潛在威脅，土壤中的有機碳是生態系統碳循環的重要組成部分，其儲存與流失受降雨強度、地形變化與土地利用方式影響，在極端氣候事件頻率增加的背景下，土壤沖蝕可能導致碳儲量流失，使得原本封存於土壤中的碳重新進入大氣，加劇氣候變遷。

因此本研究以高屏河流域為研究對象，研究方法包括蒐集 IPCC 第六次評估報告 (IPCC AR6) 的資料，並建立多種降雨情境，以模擬可能發生的氣候變異，同時透過高解析度的地形、土地利用及土壤類型資料，運用土壤沖蝕模型評估不同條件下的土壤流失情況，此外透過 GIS 技術進行空間分析，以量化土壤沖蝕與碳儲量變化之間的關聯，並探討不同氣候情境下各土地類別土壤沖蝕對碳儲量流失的影響，在如裸露地、開墾農地等區域，因土壤沖蝕嚴重，造成損失碳儲量亦較大，而森林與植被覆蓋良好的區域，損失碳儲量則較低，水土保持為能有效提升土壤碳儲存，展現生態系統保護對碳固存的關鍵作為。

關鍵詞：土壤沖蝕，碳儲量，氣候變遷

Abstract

The impact of climate change on the global environment is increasing. Soil erosion, as an important process of surface change, not only affects land productivity, but also poses a potential threat to the stability of carbon reserves. Organic carbon in the soil is an important part of the carbon cycle of the ecosystem. Its storage and loss are affected by rainfall intensity, terrain changes and land use patterns. Against the background of increasing frequency of extreme climate events, soil erosion may lead to loss of carbon reserves, causing the carbon

originally sealed in the soil to re-enter the atmosphere, exacerbating climate change. Therefore, this study takes the Gaoping River Basin as the research object. The research methods include collecting data from the IPCC Sixth Assessment Report (IPCC AR6) and establishing multiple rainfall scenarios to simulate possible climate changes. At the same time, through high-resolution terrain, land use and soil type data, a soil erosion model is used to evaluate soil loss under different conditions. In addition, spatial analysis is performed through GIS technology to quantify the relationship between soil erosion and carbon storage changes, and to explore the impact of soil erosion of various land types on carbon storage loss under different climate scenarios. In areas such as bare land and reclaimed farmland, the loss of carbon storage is large due to severe soil erosion, while in areas with good forest and vegetation coverage, the loss of carbon storage is lower. Soil and water conservation can effectively increase soil carbon storage, demonstrating the key role of ecosystem protection in carbon sequestration.

Keywords : Soil Erosion , Carbon Stock , Climate Change