

Sediment Yields Estimation under Climate Change and Land Use Impact of the Upper Catchment of the Tuul River Basin in Mongolia

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Abstract

The upper catchment of the Tuul River basin (TRB) is the most stressed watershed, containing over half of Mongolia's total population, accounting for more than 60% of the country's GDP. Although the upper catchment of the TRB is protected, recent changes in land use and climate change have had a significant impact on it, resulting in increased land degradation. This has had a negative impact on the river's ecological health and creates challenges for sustainable water management. Therefore, it is critical to assess current sediment yield as well as potential changes due to climate and land use change. In this study, we used the RUSLE model to estimate the sediment yield under current and future conditions for the upper TRB catchment. According to the current estimation, sediment yield values in the study area were as follows: 52.8% of the area exhibited 0–5.1 t/km²/year, 39.3% exhibited 5.1–17.8 t/km²/year, and 7.9% exhibited 17.8–70.5 t/km²/year. According to future precipitation trends, winter precipitation is expected to rise by up to 60.0%, spring by 25.9%, and autumn by 27.8%. In contrast, summer precipitation is expected to either decrease by up to 5.3% or increase by up to 2.3%. The effect of these climatic and expected land use changes on sediment yield by 2040 was up to a 76% increase compared to 2024 and recommendations for integrated water resource management together with the comprehensive land management made based on the findings.