ASSESSMENT OF RAINFALL-RUNOFF USING SWAT+: A CASE STUDY OF MELANTAI RIVER, MALAYSIA

UNDERGRADUATE THESIS

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ABSTRACT

The Melantai River in Kluang, Johor, has experienced hydrological changes in recent years, such as changing rainfall patterns and runoff. These changes can be caused by urbanization, the changes in land use and climate. Extensive knowledge is needed on the characteristic of land use and soil type, and weather changes in the Melantai River watershed. This study uses SWAT+ to analyze the interactions between land use, soil type and rainfall-runoff processes under climate scenarios. Spatial and environmental data are processed through QGIS as a characterization tool to characterize land use and soil type, while the observed climate data (2010-2021) will be studied. Simulation of runoff volume and hydrological dynamics using SWAT+ gives an understanding of the changes in the water cycle that occur in the Melantai River. This study provides knowledge on land use and soil type of Melantai River watershed, swat+ model that has been adapted to the condition of Melantai river watershed, and evaluation of climate change impacts on rainfall pattern and runoff by simulated the Global Climate Data (GCM) from 2040-2060 using SSP5-8.5 scenario. The results of the study will be an useful tool for policy makers in developing effective water resources management and flood mitigation. this study emphasizes the important role of hydrological modeling in addressing complex problems in the watershed.

Keywords : Rainfall Runoff**,** Land Use, Climate Change, SWAT+

ABSTRAK

Sungai Melantai di Kluang, Johor, telah mengalami perubahan hidrologi dalam beberapa tahun terakhir, seperti perubahan pola curah hujan dan limpasan. Perubahan ini dapat disebabkan oleh urbanisasi, perubahan penggunaan lahan dan iklim. Diperlukan pengetahuan yang luas tentang karakteristik penggunaan lahan dan jenis tanah, serta perubahan cuaca di DAS Sungai Melantai. Studi ini menggunakan SWAT+ untuk menganalisis interaksi antara penggunaan lahan, jenis tanah dan proses limpasan hujan di bawah skenario iklim. Data spasial dan lingkungan diproses melalui QGIS sebagai alat untuk mengkarakterisasi penggunaan lahan dan jenis tanah, sedangkan data iklim observasi (2010-2021) akan dikaji. Simulasi volume limpasan dan dinamika hidrologi menggunakan SWAT+ memberikan pemahaman mengenai perubahan siklus air yang terjadi di Sungai Melantai. Penelitian ini memberikan pengetahuan mengenai penggunaan lahan dan jenis tanah DAS Sungai Melantai, model SWAT+ yang telah disesuaikan dengan kondisi DAS Sungai Melantai, dan evaluasi dampak perubahan iklim terhadap pola curah hujan dan limpasan melalui simulasi data Global Climate Model (GCM) dari tahun 2040-2060 dengan skenario SSP5-8.5. Hasil penelitian akan menjadi alat yang berguna bagi para pengambil kebijakan dalam mengembangkan pengelolaan sumber daya air yang efektif dan mitigasi banjir. Penelitian ini menekankan peran penting pemodelan hidrologi dalam mengatasi permasalahan yang kompleks di DAS.

Kata kunci : Curah Hujan-Limpasan**,** Penggunaan Lahan, Perubahan Iklim, SWAT+