**Detection of Rainfall-Runoff Using Support Vector Machine (SVM) for Sustainable Water Resource Management**

Ramli I.1,5,6\*, Izzaty A.3, Rusdiana S.4 and Ferijal T.2

1Professor,Agricultural Engineering Department, Universitas Syiah Kuala, Indonesia

2Head Lecturer,Agricultural Engineering Department, Universitas Syiah Kuala, Indonesia

3Master Student, International Master Program on Natural Hazard Mitigation and Management, Department of Hydraulic and Ocean Engineering, National Cheng Kung University, Taiwan

4Head Lecturer, Departement of Mathematics, Faculty of Mathematics and Natural Sciences,
Universitas Syiah Kuala, Indonesia

5Department of Environmental Master’s Program, Universitas Syiah Kuala, Indonesia

6Research Center for Environmental and Natural Resources, Universitas Syiah Kuala, Indonesia

\*ichwana.ramli@usk.ac.id

***ABSTRACT***

One of the natural disasters frequently experienced is flooding, which is a consequence of climate change phenomena resulting from unstable rainfall patterns. Flood risk can be assessed based on rainfall, land use conditions, and river change density, which are crucial factors for flood-prone areas. These locations are often near coastlines, especially in urban areas situated in coastal zones. In the Krueng Pase Watershed, it has been found that land use near urban areas, such as wetlands, has increased annually. Land use modeling with an accuracy test of 83% has shown a continuous decrease in forest areas. This correlates with the population growth in city centers, leading to increased construction activities. Using a support vector machine based on machine learning, flood risk mapping was conducted around the Krueng Pase Watershed to monitor satellite images from Sentinel-2 through the Google Earth Engine (GEE) cloud platform. The results related to flood risk areas in the Krueng Pase Watershed show that in 2016, the area at risk was 527.4 hectares. By 2020, the flood risk area had sharply increased to 2,037.8 hectares, with many areas mapped as flood-affected. This increase was due to extensive construction in the city center and the reduction of forest function areas based on the 2020 land use change results. Furthermore, the Support Vector Machine (SVM) model observed that in 2023, the flood risk area in this study location decreased significantly to 919.5 hectares, showing a substantial reduction from the previous year. This indicates unpredictable climate change affecting rainfall patterns. Therefore, as seen in 2020, increased rainfall can significantly elevate the flood risk area, which requires careful monitoring and mapping for the Krueng Pase Watershed.

**Keywords:** Flood Risk, Climate Change, Rainfall, Sentinel-2, Suport Vector Machine (SVM).