

Monitoring of Discharge and Sediment transport in Agricultural Basin A Case Study in Keduang Sub-Basin, Central Java, Indonesia.

農業地域からの土砂流出のモニタリング
ーインドネシア国中部ジャワケドゥアン流域の事例ー

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I. Introduction

Sedimentation is one of the issues in the water resources management while it will be affecting water volume in the reservoir such as Gajah Mungkur reservoir which is an important object in Wonogiri regency and other regencies. Gajah Mungkur Reservoir is practically used for irrigation, aquaculture, hydropower, drinking water and tourism. Keduang sub-basin is the highest producer sedimentation into Gajah Mungkur reservoir rather than others sub-basins those surrounding the reservoir. So that Keduang sub-basin needs to be concerned to mitigate sedimentation into Gajah Mungkur Reservoir. Conducting monitoring of sedimentation is required for future planning for maximizing the capacity of the reservoir by reducing sedimentation into the reservoir. The objective of this study is to monitor discharge and sediment transport from upstream to downstream in the Keduang sub-basin.

II. Materials and Methods

The Keduang sub-basin is a part of the Bengawan Solo basin. Geographically, the area of the Keduang sub-basin is 39,736.28 ha. The most dominant land use is rice fields, and the climate of the area is tropical. The monitoring of discharge and sedimentation is started from August 2018 until March 2019 that located from upstream to downstream to know the movement of sediment transport. Water level logger and streampro ADCP had used for monitoring the discharge. Sediment had analyzed by taking water sampling to measure suspended loads in the laboratory at Gadjah Mada University. The formula to calculate suspended load is shown in Eq 1.

$$Q_{si} = C_{si} \times Q_i$$

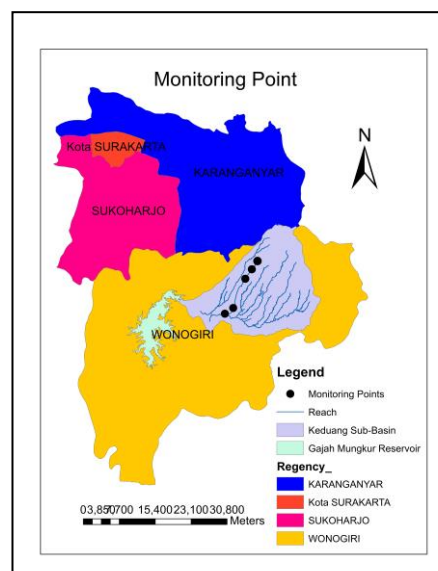


Fig 1. Monitoring points

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Where: Q_{si} ; suspended loads (kg/s), C_{si} = sediment concentration in the water (mg/l), Q_i is discharge (m^3/s)

III. Results and Discussions

The results indicated that discharge and suspended loads would be increasing from upstream to downstream area. The highest discharge and suspended load is in the main channel of the Keduang River which is accumulated from other streams and also the highest discharge and suspended loads occurred in February rather than other months due to in this period is rainy season. The increasing of sediment transport from upstream to downstream may cause by a land cover change in the downstream area from agricultural to residential, inappropriate soil and water conservation practices. It needs to be concerned to reduce sedimentation that can reduce the volume of the streams such as happened in several rivers in this research especially in the E. The value of sediment concentration of point E is highest than others, so the river is already filled out by sedimentation so that the discharge had gradually reduced. The decreasing water volume would be affecting the amount of water that allocated for irrigation purposes. Besides that, it will also increase surface run-off that means water could not be stored anymore inside the basin.

IV. Conclusion

The discharge and suspended loads would be increasing from upstream to downstream that caused by several factors such as land cover change, inappropriate water management, inappropriate soil and water conservation practices. So that it needs to be concerned to reduce sedimentation and to increase water volume in the channel for other purposes such as irrigation, water consumption and other activities.

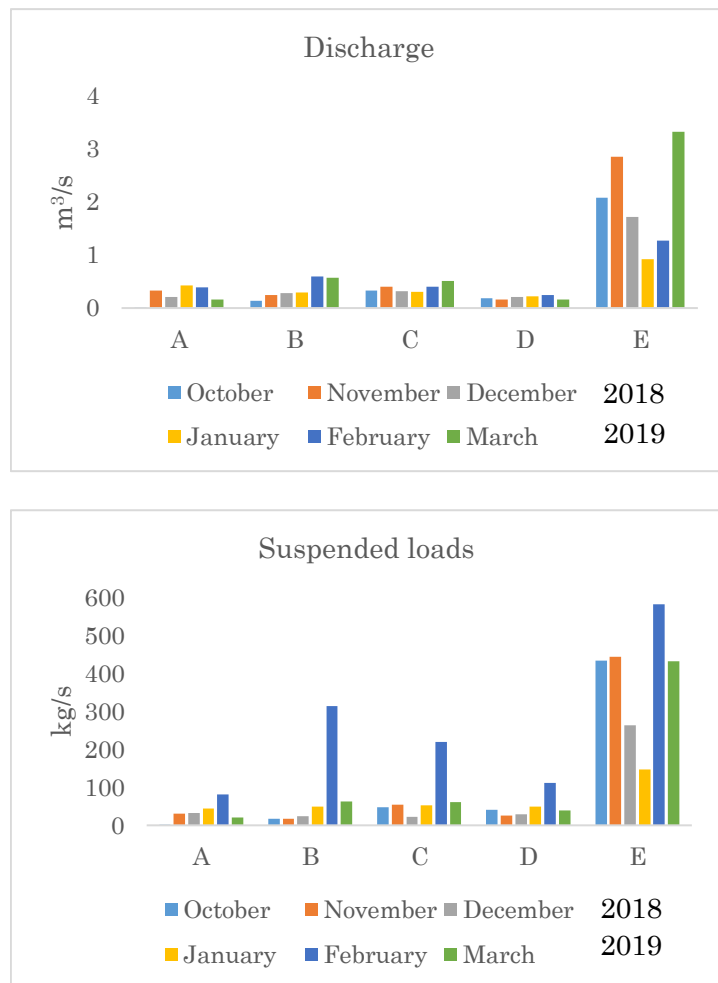


Fig 2. Discharge and suspended loads