

## Estimation of sediment sources using radionuclide in upper Brantas river basin, East Jawa, Indonesia

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## Abstract

The information of upstream sediment sources and dynamics should be essential to study the sedimentation problem in river basin. Brantas river has several environment issues which are river bed variation, water pollution and sedimentation of Sengguruh and Sutami reservoir in East Jawa, Indonesia. The purpose of this study is to estimate contribution rate of sediment yield from potential sediment sources such as forest, hilly cultivated land and other in this area.

Pb-210ex (half-life; 22.3 years), naturally occurring radionuclide, is used as tracer of soil particles (Walling et al., 1993). Soil and sediment samples were collected to measure Pb-210ex activity and inventory in the Brantas river basin. Soil samples were collected at the site of different gradient and land-use and river bed materials and suspended sediment were also sampled. All of samples were analyzed by Gamma-spectrometry, Pb-210ex activity was determined by subtracting Pb-214 activity (Walley et al., 1993).

The soil erosion rates at potential sediment sources were estimated by Pb-210ex inventories using Mass-balance model and diffusion and migration model. Soil erosion rates of cultivated land and forest area were 39.2 kg/m<sup>2</sup>/yr and 2.1 kg/m<sup>2</sup>/yr, respectively.

The surface soil of forest area and cultivated land were characterized by relatively high Pb-210ex activity. Deeper soil such as channel bank, gully and landslide scar was assumed to contain almost no Pb-210ex (Olley et al., 1993). The sediment yield from forest area was thought to be negligible by estimation of soil erosion rate by Pb-210ex inventories, the contribution rates of sediment yield from cultivated land and deeper soil were estimated by comparing Pb-210ex activities of sediment samples. Contribution rates of cultivated land for three watersheds, LA, UB and entire upper Brantas river basin were 4%, 44% and 23%, respectively. Large contribution rate in UB watershed agrees well with the expansion of cultivated land in recent years. Small contribution rate in LA watershed is thought to reflect small percentage of cultivated land in the watershed. Thus, this result concluded that one of the main factors of sedimentation is cultivated land in this basin.