

Determining Sources of Sediments at Nkula Dam in the Middle Shire River, Malawi, Using Mineral Magnetic Approach

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Abstract : Shire River is the largest and longest river in Malawi emptying its water into the Zambezi River in Mozambique. Siltation is now a major problem in the Shire River due to catchment degradation. This study analysed soil samples from tributaries of the Shire River to determine sources of sediments that cause siltation using the mineral magnetic approach. Bulk sediments and separated particle size fractions of representative samples were collected from tributaries on the western and eastern sides of the Shire River, and Nkula Dam. Eastern tributaries showed relatively higher ferrimagnetic mineral contents and ferrimagnetic to anti ferromagnetic ratios than western tributaries. Sediments from both sides of the Shire River were distinguished by χ_{ARM} , SIRM versus χ_{lf} and S-100 versus SIRM. Findings in this study showed that most of the sediments originated from the western part of the Shire River. Tributaries on the eastern side of the Shire River had higher values for concentration related parameters (χ_{lf} , χ_{fd} , χ_{ARM} , SIRM, HIRM, S-100, and $\chi_{ARM}/SIRM$) than tributaries on the western side. Bulky and detailed magnetic measurements carried out on particle size fractions provided additional confirmation of magnetic contrasts between the two sides of the river suggesting differences in lithology, topography, climate and weather regimes in the catchments. This study demonstrated that the magnetic approach can provide a reliable means of understanding major sediment sources of Nkula Dam and similar situations. It can also help to assess future variations in sediment composition resulting from catchment changes

Keywords : ferrimagnetic minerals, Shire River, tributaries rivers, particle size ,topography

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