

Lake Abaya, Southern Ethiopia: Silting and Contamination of a Natural Freshwater Reservoir due to Soil Erosion Processes in its Hinterland - A Case Study from the Northern Lake Area -

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Lake Abaya is a graben fill in the southern section of the Main Ethiopian Rift Valley. To the south a 1 km wide barrier covered by swampy forestland separates Lake Abaya from neighbouring Lake Chamo. In total, the drainage basin of the Lake Abaya – Lake Chamo system covers a watershed of approximately 18,600 km² while lake areas cover ~1,550 km² and have a freshwater volume of ~18.6*10⁹ m³.

Lake level of Lake Abaya is measured since 1970. During that period, the lake level was subject to frequent changes. Since the mid-1980s, water levels of Lake Abaya continuously increased. Although climatic conditions during that time repeatedly changed, climatic conditions as the only factor influencing lake level changes - although significant - have to be excluded based on results of climate data time series analysis. Furthermore, analysing Lake Abaya's lake level changes, it has to be considered that at least since the 1970s dramatic population growth, changes in land-ownership, clearing of forests and bushland, as well as changes in cultivation methods caused a dramatic increase in sediment yield of Lake Abaya tributaries, thus, influencing basin bathymetry and volume. Because of its shallow depth (max. depth of 26 m) the lake level of Lake Abaya reacts sensitive to changes of water and sediment input. Hence, Lake Abaya is an ideal location to analyse the complex pattern of climatic and human impacts on lake level changes. Nevertheless, due to the location in the Ethiopian Rift Valley, neo-tectonics at the southern barrier influencing the outflow into Lake Chamo have to be considered.

The heavy metal concentration of the most recent sediment layer corresponds with the geogenic background, given that industrial development in the Lake Abaya drainage basin is negligible. At the same time, contamination of the freshwater reservoir, by POPs attached to the suspended loads surface, e.g. DDT and derivatives, has to be anticipated. Southern Ethiopia is highly affected by malaria and, until today, DDT and Lindan containing pesticides are used in agriculture as well as private households. In addition to high input rates, suspended load causes high turbidity in Lake Abaya which causes a reduction in primary production and, consequently, causing a decrease of fish population.