Water Quality Monitoring within the Abaya Chamo Drainage Basin

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This study assesses the results of water quality monitoring in the Abaya-Chamo Basin in Southern Ethiopia. A range of water quality and hydrological variables was monitored over the period 2002-2004 for the lakes Abaya and Chamo, the rivers Hare and Kulfo, as well as several other water sources within the basin. The parameters include pH, conductivity, turbidity, alkalinity, chloride, total and suspended solids, calcium, hardness, ammonia, sulphate, sulphide, chlorophyll A, spectro-photometric absorption, sodium, potassium, silica, soluble reactive phosphorous, nitrate, nitrite, air and water temperature, air pressure, dissolved oxygen, biochemical oxygen demand, and chemical oxygen demand. In addition, river flow for the Hare and Kulfo rivers was monitored. Method validation for the analytical chemical determinations is presented as well as the time series of measured concentrations.

The variation of monitored values for the lakes and rivers was studied with respect to known physical and geochemical water quality interrelationships. The seasonal variation of water quality and factors that influence these variations are discussed. In order to examine long-term trends due to major hydrological events and human development as opposed to cyclic seasonal variation within the lakes, monitored data for the lakes was combined with a small number of available data collected several years back. The sensitivity and response of the water sources to the associated catchments and anthropogenic influences have been evaluated. These cause-response water quality characteristics were examined with respect to water quality management and environmental protection issues associated with further development of water sources in the basin.

The interrelationships among water quality variables were evaluated, correlating between scarcely monitored and frequently monitored data. A detailed time-series is established, while modelling the relationship between frequently monitored data of river discharge with other water quality variables, such as suspended solids and turbidity. Major reclassification of the aggregate data was attempted by application of principal component and cluster analysis. This preliminary assessment reveals the underlying factors for water quality variation. For example, chloride measurements in rivers are mainly affected by precipitation input.