Effects of water abstraction on the riparian vegetation along Kiladeda River in Pangani River Basin, Tanzania, 2013

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Abstract:

Water and vegetation are vital for sustaining life. However, they are becoming more stressed following population growth and associated demands for water. As a result, most continent discharges. are classified as "moderate" to "highly threatened" by human activities, partly through water abstraction. Kiladeda river of Pangani river basin in Tanzania is no exception. The river is experiencing over abstraction driven by a number of forces, including increased human population and irrigation farming. The latter is by far the biggest user of water from the river, especially in upstream. Consequently, downstream discharges have now reduced to zero during dry season. The main aim of this study was to investigate the effects of water abstraction on the riparian vegetation along Kiladeda river. Specifically, this study analyzed discharge and abstraction trends from Kiladeda river, between the years 2000 and 2011, indicators of over abstraction and water stress which were then related to the status of riparian vegetation in terms of vegetation percentage cover and species diversity. Finally the study assessed measures being taken to mitigate the effects of water abstraction on the riparian vegetation along Kiladeda river. Data collection methods included; in-depth interview, participatory observation and transect walk, vegetation survey, river discharge and abstraction measurements and secondary sources such as review of available literature. Analytical tools used were water withdrawal ratio (WWR) , percentage flow reduction (PFR), Daubenmire forms, Simpson diversity index (SDI), and Microsoft office Excel 2003 and 2007. The seven furrows found in the study area were investigated. The long-term average river discharge decreased and water abstraction by open furrows from Kiladeda river portrayed increasing trend over time with a slight decreasing trend during wet season. There was a strong relationship R2=0.8 between increasing water abstraction to a declining river discharge. Water stress indicators showed that, dry season had high PFR (54.01 %) compared to wet season PFR (34.93%). Water abstraction at the upstream and middle stream was very high compared to downstream, to the extent of exceeding the amount of water spelt out in water use permit (0.3m 3 /s). WWR during dry season was very high (0.73) compared with wet season (0.17). The totals of 26 large (15M2) SQPs were established, within which other small quadrats (2M2) SQPs were established. From these quadrats, 26 different plant species were identified. Riparian vegetation results indicated absolute decline in percentage cover ground (PCG), increase in percentage bare ground (PBG), decrease in species richness, abundance as well as diversity D=0.05. More than 15 plant species had disappeared while 11 new species were identified. To control the effects of water abstraction, water and vegetation management practices were identified. These included; periodic cleaning and maintenance of furrows, introduction of water users association (WUA) called UKAKIWI, water use permit, penalties and fines that ranged from 5,000Tsh to 500,000Tsh. Though mitigation measures taken in the study area showed signs of success, they were extremely fragmented. They were not taking into account increased human populations which was escalating

demand on freshwater resources and riparian vegetation. The study puts forward the following recommendations; sustainable management of the buffer zones along all rivers, effective multi-sector participation in planning, design and management of river water and riparian vegetation and construction of boreholes and wells in downstream areas to cater for domestic water requirements during dry season.