

## ABSTRACT

The dam development is an essential part of managing water resource and can enhance Hydropower production, flood control and agriculture practices in a watershed. Further, dam construction and operation lead to change in natural water distribution, aquifer recharge pattern in downstream and upstream of the Dam site. In this study, the suitability site for dam development was determined with the help of Remote sensing (RS), Geographical information system (GIS) and Analytical hierarchy process (AHP) for sustainable water allocation in the Little Ruaha Catchment of Tanzania. The nine parameters such as elevation, slope, stream order, drainage density, land use land cover, soil type, geology, lineament and rainfall are used to generating suitable dam site. The AHP method employ the Multi criteria decision analysis (MCDA) to assign weight to these parameters to generate suitability map which reveal High suitable, moderate suitable, low suitable and non-suitable site. The twelve dam sites are identified in the region of High suitable and moderate suitable region. Furthermore, the comprehensive evaluation was taken to understand the proposed dam site and impact of new dam in water allocation. The factor considers such as topographical, environmental, geological, socio-economic and Hydrological conditions which are based on dam cross section, dam axis, dam depth and storage capacity. Ultimately, five dams were selected to optimize water resource in the catchment due to presence of excess amount of water available and dam series alignment in the catchment. The total runoff volume of the catchment is estimated by using Soil Conservation Service Curve Number (SCS-CN) is 630,000,000 m<sup>3</sup> per annual. The main water user of the catchment is agriculture practices located in upstream and hydropower dam located in downstream. The total water demand required for both main users is estimated as 234,750,000 m<sup>3</sup>. Hence the catchment has excess water of 395,250,000 m<sup>3</sup> that will be collected by five dam to optimize water resources. Therefore, the five dam ensure sustainable of water management in the catchment. So, this study is assuring the authority to make decision on constructing the new dam in the upstream for optimize water resource and sustainable water allocation without negative impact to users. Additionally, by constructing new dam in the upstream it helps to minimize the sediment develop by agriculture practices that affect hydropower reservoir located in downstream. Finally, this study reveals the benefit of sustainable water resource management and improve the human life by increase the production in agriculture and ensuring hydropower production.

**Key Words:** RS, GIS, MCDA, AHP and SCS CN methods, Suitability map, Dam site selection and Water optimization