

## Interventions in land use practices and climate variability/change adaptation needed to reverse declining water resource in little Ruaha river

### Key messages, findings, recommendations

Both climate change and land use land cover changes have impact on the Little Ruaha River water flow. It was noted that the effect of climate change is higher than that of land use land cover change. It was further revealed that the combined effect of climate change and land use land cover change affected water flow in the Little Ruaha River tremendously. To combat the problem of climate change and land use land cover changes on river flow, it is recommended that:

- District council should facilitate the development of land use plans for villages along the Little Ruaha River catchment
- District council should facilitate the development and improvement of irrigation infrastructures along the Little Ruaha river catchment to increase water use efficiency and cope with the climate change resulting into scarcity of irrigation water

### Summary

Climate change and land use and land cover change are among the great challenges facing the Little Ruaha River catchment. We therefore conducted a study to assess the impact of climate change and land use land cover change on stream flow in the catchment. We found that climate change had higher effect on river flow than land use land cover changes. However the combined effect of climate change

and land use land cover change affected water flow in the Little Ruaha River tremendously. In order to solve the problems of reduced water flow in the Little Ruaha catchment, the District council should facilitate the development of land use plans for villages along the Little Ruaha River catchment. Also the council should facilitate the development and improvement of irrigation infrastructures along the Little Ruaha river catchment.

## Introduction

The Little Ruaha River Catchment is part of Great Ruaha River catchment within Rufiji Basin. The catchment area has multiple land uses such as irrigated agriculture, livestock keeping, hydropower production, environmental conservation, wildlife and tourism. However, Climate change and land use and land cover change are among the great challenges facing the catchment. Therefore we assessed the impacts of climate change and land use land cover change on stream flow in the Little Ruaha River catchment.

## Data sources and approaches

In order to understand the impacts of land use land cover change on stream flow in the Little Ruaha Catchment, analysis of land use land cover change, flows and rainfall was conducted. Daily flows at four gauging stations were used to determine flow characteristics of Little Ruaha catchment namely Rainfall data from four stations as shown in

determination of trends in rainfall in the Little Ruaha River Catchment and . The rainfall and flows data were collected from Rufiji Basin Water Office and Tanzania Meteorological Agent (TMA) Iringa station. The analysis was augmented with land use land cover analysis to reveal its impacts in stream flow. Three time periods was considered in land use land cover change analysis i.e.1990, 1998 and 2011.

## Key issues

### Impact of climate change on stream flow

We found that climate change has high impact on stream flow. It reduced the flow of water by 59% per year for the period from 1980 to 2012

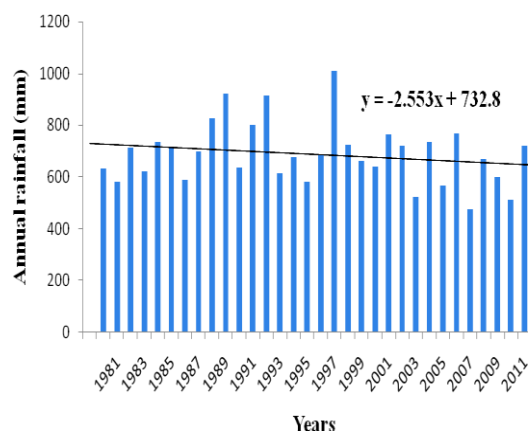


Figure 1: Annual rainfall at Iringa Maji station for the period 1980 -2012

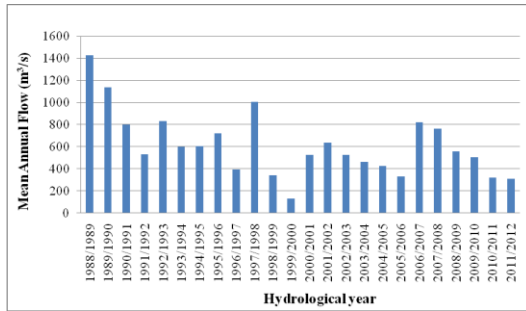


Figure 2: Time series Mean Annual flows at Mawande station (1988/1989 - 2010/2011)

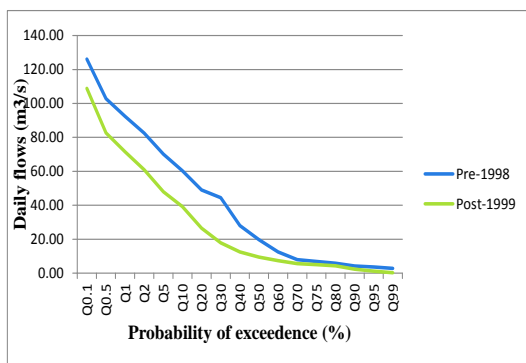


Figure 3: Mean monthly flow duration curve of Little Ruaha River at Mawande gauging station for the periods (1980-1998) and (1999-2009)

### Impact of land use land cover on stream flow

Changes of forest to farm land, woodland, settlement as well as increased irrigated agriculture have contributed to decrease in stream flow by 23% per year for the period from 1980 to 2012.

### Combined effect of climate change and land use land cover change on stream flow

The combined effect of climate change and land use land cover changes has very high effect on the stream flow. It reduced the flow of water by 99% per year for the period from 1980 to 2012.

### Policy recommendations

We recommend the use and importance of utilizing remote sensing and GIS technologies in understanding the natural resources dynamics and generating information that uncovers the problems associated with the catchment management and sustainability of the catchment resources. We strongly recommend use of sustainable land use planning and land use farming practices. Due to the observed changes, and impacts there is a need to strategically introduce projects that deals with restoration of degraded areas through reforestation and natural regeneration, conservation of wetlands and river banks and improve irrigation infrastructures making efficient use of scarce water

resources so as to adapt to climate changes

### Further reading

Kashaigili, J. J., Mahoo, H. F., McCartney, M., Lankford, B. A., Boniface, P. and Mwanuzi, F. L.

(2003). *Integrated Hydrological Modelling of Wetlands for Environmental Management: The Case of the Usangu Wetlands in the Great Ruaha Catchment*. International Water Management Institute, South Africa. 3pp

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