Hochschule Karlsruhe (HSKA) – University of Applied Sciences

International Master Geomatics **Faculty of Geomatics**

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Master Thesis (Year: 2010)

Spatial modelling of rainwater harvesting potential for the Kakamega area in western Kenya

Referees

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Key Words

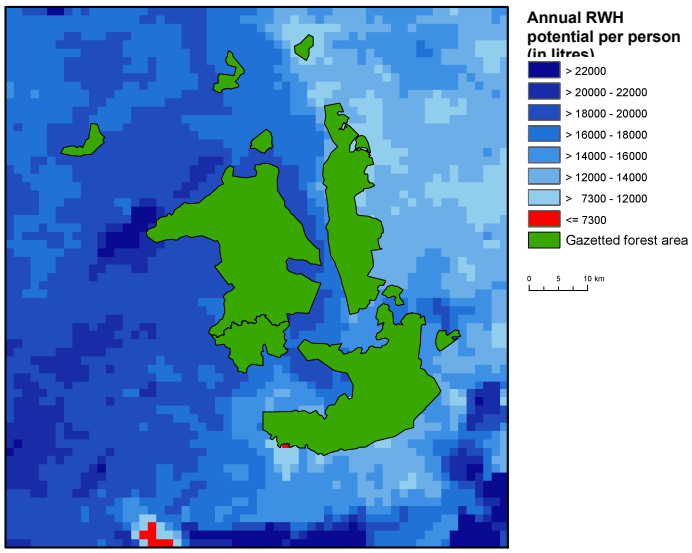
Rainwater harvesting, rainfall interpolation, water demand, spatially explicit modelling, GIS, Kakamega-Nandi forest area

Summary

Many of the challenges faced today by countries, especially in the developing world, in their quest for economic and social development and the achievement of the Millennium Development Goals are either directly or indirectly related to water. Here, water shortage and quality deterioration are some of the problems which require urgent attention and action. In Kakamega area in western Kenya women and children have to walk long distances in search of this precious commodity. The area is known for plenty of rainfall, however, rainwater harvesting (RWH) from roofs is not a common feature in the region.

This thesis aimed at determining the potential of RWH as an alternative or preferred source of safe water for domestic use (drinking and cooking) in Kakamega area. The information could be used to guide planners and to demonstrate its potential to the local people. Spatial modelling techniques using amount of rainfall, population distribution and detailed information available from the classification of very high resolution QuickBird satellite imagery as input data were applied to implement various approaches.

Four conceptual models in parts based on already existing approaches of RWH modelling were developed at three different levels of detail: the Kakamega-Nandi forest area, the smaller QuickBird imagery covered area and Buyangu village only. Each model used slightly different input parameters and was designed to answer distinct questions like a) 'Can RWH meet the monthly water demand?', b) 'How does the RWH potential vary spatially?', and c) 'How much time and/or money can a resident of Buyangu village save per month by investing in a RHW system?' The four models were implemented in ArcGIS ModelBuilder and the results revealed the potential of RWH at the three spatial scales investigated and helped to answer questions as the ones above. As one example, the figure illustrates the annual RWH potential per person for the Kakamega-Nandi forest area at 1 x 1 km² grid cell level (Model II) using simulated fine-scale population distribution as input data.



Distribution of annual rainwater harvesting potential per person in the Kakamega-Nandi forest area at 1 x 1 km² grid cell level.