عنوان مقاله:

Integrating System Dynamics and Remote Sensing to Estimate Future Water Usage and Average Surface Runoff in Lagos, Nigeria

محل انتشار:

ژورنال مهندسی عمران, دوره 4, شماره 2 (سال: 1397)

تعداد صفحات اصل مقاله: 16

نویسندگان:

Gilles Kandissounon - *Graduate Student, Department of Civil and Environmental Engineering, Southern Illinois University, ۱۲۳۰ Lincoln Drive, MC ۶۶۰۳ Carbondale, IL ۶۲۹۰۱-۶۶۰۳, USA*

Ajay Kalra - *Assistant Professor, Department of Civil and Environmental Engineering, Southern Illinois University, ۱۲۳۰ Lincoln Drive, MC ۶۶۰۳ Carbondale, IL ۶۲۹۰۱-۶۶۰۳, USA*

Sajjad Ahmad - *Professor, Department of Civil and Environmental Engineering and Construction, University of Nevada, ۴۵۰۵ S. Maryland Parkway, Las Vegas, NV ۸۹۱۵۴-۴۰۱۵, USA*

خلاصه مقاله:

The goal of this study was twofold; first analyze the patterns of water consumption in Lagos, Nigeria and use them in a System Dynamics (SD) model to make projections about future demand. The second part used remote sensing to quantify the contribution of extensive land use/cover change to urban flooding. Land use/cover dynamics over the past decade was analyzed using satellite imagery provided by Landsat Thematic Mapping (TM). Unsupervised classification was performed with false color composite using the Iterative Self-Organizing Data Analysis (ISODATA) technique in a Geographic Information Systems (GIS). The study area was divided into four different land use types during image classification: bare land, built-up area, water bodies, and vegetation. For water demand, two different scenarios of population growth including 5.5% and 2.75 % annual increase were considered. The results showed that water demand dropped by 67% of its current value when losses in distribution were reduced by 20% and population annual growth rate kept at 2.75% over the study period. Bare land and water bodies lost 1.31% and 1.61% of their current area respectively while built-up area grew by 1.11%. These changes in land use/cover changes led to a 64% increase in average surface runoff, mostly attributable to increasing surface imperviousness and the absence of an adequate urban drainage system.

کلمات کلیدی:

Urbanization; Water Supply and Demand; Flooding; Climate Change; System Dynamics