AWRA 2011 ANNUAL WATER RESOURCES CONFERENCE
Albuquerque, New Mexico
November 7-10, 2011

DEVELOPED TO DEVELOPING: A SUSTAINABLE WATER RESOURCE MANAGEMENT TOOL - PERNAMBUCO, BRAZIL

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ABSTRACT: The arid and semi-arid regions of the world are home to over 35% of the world';s population and are rapidly experiencing population growth. Water is a critical resource that constrains the economic growth and development of arid and semi-arid regions. The availability of water exhibits a high degree of spatio-temporal heterogeneity. A significant portion of the precipitation occurs in a few events of large intensity intersparsed with long inter-event periods. At larger time-scales, climatic fluctuations are erratic and alternate between periods of prolonged droughts to extremely wet seasons. Rainfall amounts also vary spatially, and there is a general disconnect between areas with relatively abundant supplies and areas with significant demands due to other socio-ecological factors that favor inhabitation. Semi-arid/arid regions appear to be more sensitive to such climatic variability because they begin with limited water supplies making modeling/management of such areas full of uncertainty which must be addressed. This is especially a problem in areas where data is sparse.A focused modeling based water resources management study for environmental sustainability was performed of the Capibaribe River Basin in the state of Pernambuco Brazil as a case study for a semi-arid region with sparse data. Mathematical models were used to simulate the movement of water flow, biochemical oxygen demand (BOD, dissolved oxygen (DO), and nutrients. The model was set up using conservation principles. Available stream quality data was used for calibration of the model to match limited field observations. The estimated point and non-point source loadings using GIS were used as model inputs. Given the climatic variability of the watershed, two separate model calibrations corresponding wet and dry periods was performed after the evaluation of data. The method chosen was adapted from previous work carried out by Hernandez (2007) for the Arroyo Colorado watershed in south Texas. The transfer of technology between the two watersheds propagated the uncertainty associated with site specific hydrologic and water quality parameters. This uncertainty was explicitly enumerated to create a more robust management scheme. The results and implications from this study can be transferred globally, to other semi-arid/arid regions which lack data or monitoring programs.

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