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## Surface Water Demand and Supply of Gaborone City and Surrounding Areas as Driven by Climate Change and Population Increase- Bosa Mosekiemang-Botswana International University of Science and Technology

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## Abstract

Most governments have implemented laws and water management strategies. However, the adequate supply of the ever-increasing demand of fresh water continues to be a challenge. For example, many regions are facing formidable freshwater management challenges and resultantly allocation of limited water resources. One of the fundamental concerns is the impact of climate change and population increase on the supply and demand of fresh water in urban areas and high population surrounding villages. The anticipation for better lifestyles and improved water supply has resulted in an increase in migration from rural settlements leading to an increase in the populations of many cities globally. This study therefore investigates the variability and trends in the surface water demand and supply of the city of Gaborone and surrounding areas (Tlokweng, Mogoditshane, Kumakwane, Mmopane, Gabane and Gakuto) in response to population growth trends and climate change scenarios using the Water Evaluation and Planning (WEAP) hydrological model. The study includes analysis of population trends, water production and consumption rates, hydrological information as well as historical and projected climate data at a high spatial resolution of 1 km2.

The current General Circulation (GCM) or Regional Climate (RCM) models are not able provide such data. Therefore, the climate data for existing GCMs will be statistically downscaled using the high resolution Worldclim data to spatial resolution of 1 km2 and bias corrected against Global Climatology Precipitation Center (GPCC) precipitation and Climate Research Unit (CRU) minimum and maximum temperature. The GCM data for historical as well as mid-range Concentration Representative Pathways (RCP4.5) and high emission RCP 8.5 future scenarios of Coupled Model Inter-comparison Project Phase 5 (CMIP5) will be employed in the study. Upon completion, the results of the study could be used for water resources planning and policy analysis, climate change mitigation and awareness creation and educational purposes.

The satisfactory inventory of the always expanding request of new water keeps on being a test in pieces of the globe. This test has been disturbed because of expanding populace and environmental change. The expectation for better ways of life and improved water supply has brought about an expansion in relocation from country settlements prompting an increment in the populaces of numerous urban areas all around the world. This examination thusly researches the changeability and patterns in the surface water interest and supply of the city of Gaborone and encompassing territories because of populace development and environmental change utilizing the Water Evaluation and Planning (WEAP) model for future situations.

The investigation incorporates examination of populace patterns, water creation and utilization rates, hydrological parts of the examination region just as projected environment information at a high spatial goal of 1 km2. The current General Circulation (GCM) or Regional Climate (RCM) models are not capable give such information. In this way, the environment information for existing GCMs is genuinely downscaled utilizing the high goal Worldclim information to spatial goal of 1 km2 and predisposition adjusted against Global Climatology Precipitation Center (GPCC) precipitation. The GCM information for the mid-range Concentration Representative Pathways (RCP4.5) and high emanation RCP 8.5 future situations of Coupled Model Inter-correlation Project Phase 5 (CMIP5) are utilized in the investigation. Under both RCP4.5 and RCP8.5 situations, the supply inflow shows that the degree of repositories at Foresthill, Diremogolo, Gabane slope, Oodi slope and Mabutswe will be decreased during 2081-2097 period. The neglected water interest of the entire investigation region will be 52.5 million m3 in 2050 when contrasted with 1490 million m3 in 2100 under RCP 8.5 environment and high populace development situations. Be that as it may, the neglected interest under RCP4.5 environment and high populace development situations will be 51.14 million m3 in 2050 when contrasted with 1450 million m3 in 2100. Then again, the neglected water request will be diminished by as much as half under the two situations if low populace development pace of 2.2% is expected. As a choice of water the board, expanding water misfortune decrease by 3% consistently could definitely lessen the neglected water interest.