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Water resources development in Swaziland under expected climate change

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The earth's climate will always change due to natural forcing. The natural forcing include: the tilt of the earth which fluctuates between 22^o and 24.5^o after every 41000 years; the wobble of the earth due to the gravitational pull of the sun and the moon and the orbit of the earth varies from near circular to elliptical after every 9508000 years. All of the above have an effect on the amount of solar energy received by the earth which is the principle cause of climate change. However, global average annual precipitation is projected to increase during the 21^{st} century due to anthropogenic activities (greenhouse effect). Therefore, at regional scales both increase and decreases in annual precipitation are projected to be in the order of 5 to 20%. Water resources development under climate change has been determined using General Circulation Model results (rainfall, potential evapotranspiration, air temperature etc.) as inputs to a rainfall runoff model.

Three General Circulation Models (GCMs) were found to simulate very well the observed precipitation for Swaziland. These GCMs are: the Geophysical Fluid Dynamics Laboratory (GFDL), the United Kingdom Transient Resilient (UKTR), and the Canadian Climate Change Equilibrium (CCC-EQ). The three GCMs were used to project the temperature and precipitation changes for Swaziland for year 2075. This information was used to generate the temperature, precipitation and potential evapotranspiration values for four catchments namely: Mbuluzi, Komati, Ngwavuma and Usutu for year 2075. This information was used as input data to a calibrated WatBal rainfall runoff model. Simulation results (after taking into consideration of water use projections) show a water deficit from June to September in both the Komati, and Ngwavuma catchments and a water deficit from May to September in the Mbuluzi and Usutu catchments. This means that the environmental water needs and Swaziland's

water and release obligation to South Africa and Mozambique (20% of the stream flow) will not be met during the winter months under climate change. Preliminary water storage requirements in-order to meet the water demand especially during the winter months has been computed as follows: 99, 110, 80 and 30 million m^3 in the Komati, Usutu, Mbuluzi and Ngwavuma catchments respectively.