The synergy of dynamical and statistical downscaling in climate impact studies could minimize uncertainties

The overexploitation of freshwater resource by man to meet population and economic growth, changes in land use and global dynamics in addition to its uneven distribution makes it a scarce resource. Climate change further threatens the sustainability of the available freshwater. Food production to meet the global growing population is constrained by water scarcity.

Unfortunately, climate models projection of change in surface water resources in Ghana are inconsistent. Scarce data availability for a comprehensive assessment is one of the main challenges in climate impact studies in Sub- Saharan Africa (SSA). Another challenge is the approach of downscaling global circulation models (GCMs) for impact studies. The process of downscaling either dynamical or statistical comes with both advantages and disadvantages. The disparity in results mostly makes it difficult to use in supporting decision making process (Read more about these challenges in Dr Adeyeri's climapAfrica Policy August 2020).

The findings from both dynamical and statistical downscaling could complement each other by minimizing their weaknesses and amplifying their strength (synergy) to support decision making. Knowledge of extreme events from different downscaling methods in climate impact studies is necessary to inform policy on adaptation interventions and reduce climate risks. Moreover, knowing the extremes of what climate could do increases confidence in the results of modeling and further enhance resilience.

Uncertainties in water yield projections through single model application

This study assessed the variations in the impacts of future regional and local climate simulations and land use change on water yields using a hydrological ecosystem

service tool in order to inform water resources management policies in the Pra River Basin of Ghana. Climate models based on their spatial resolution projected different trend of water yield for the period 2020 – 2049. Whereas the regional climate models (RCMs) with coarse resolution (~ 12 – 50 km) projected a decrease in water yield (leading to droughts), the downscaling model (~0.002 km) which was able to capture the observed climatic trends (1981 – 2010) better than the RCMs projected water yield to increase (possibility of increased flood frequency) under the same land use scenario. The high variability in rainfall is normalized in coarse resolution models thereby increasing the uncertainties in climate projections. For instances, a 50 km spatial resolution model assumes that climatic conditions, say rainfall, over an area of 50 x 50 km squared receives the same amount of rainfall and are controlled by the same climatic phenomena. Downscaling models built on observed records mostly captures lost details based on the statistical approach adopted. It assumes that climatic conditions from the observed records would continue in future.

Apply combination of both dynamical and statistical downscaling in adaptation planning and policy formulation to ensure food security

Climate change adaptation interventions should not be limited to historical events and/or one model projections. All possible and available techniques like in this case the combination of both dynamical and statistical downscaling methods to assess the impact of climate change on water yield should be employed and findings giving equal chance of occurrence in decision making.

Using the findings from both dynamical and statistical downscaling approaches for decision making could reduce the error margin in adaptation planning and prevent major disasters. The results show that the Pra River Basin could experience droughts and floods. Therefore, land users should consider both extreme events when planning.

Site specific assessment of climate change impact with both downscaling methods especially on agriculture (employing about 60% and over 50% of the workforce in Ghana and SSA respectively), basically climate dependent (rain-fed) should be done to inform adaptation planning and policy formulation to ensure food security.

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