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Supplementary Materials

Impacts of Projected Urban Expansion on Rainfall and Temperature during Rainy Season in the Middle-Eastern Region in Tanzania

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The Seto urban model forecast was used to derive two scenarios of high and low urbanization for the coast of Tanzania (i.e. 30% and 99% of the seto data indicated the area will be urbanized by 2030). Due to differences in the format of Seto and WRF model landuse dataset external tools and software including window power shell, ArcGIS and Java were used to make the data compatible to each other and perform modifications on WRF MODIS data which were used as a reference (current LULC). Seto et al. (2012) supplementary document (SI Materials and methods) elaborates more on methodologies used to arrive at 2030 Seto urbanized areas forecasts.

Seto urban model forecast data was in format of 1000 GEOPLOT Square (SQR) files as demonstrated in [1] which present individual urban land expansion for each forecast and Seto et.al. (2012) derived probabilistic forecasts in the range from 1-100% [2]. Window power shell was used to convert the individual 1000 SQR files to text file(.txt) and header information was placed into each file, then the files were converted to American Standard Code for Information Interchange format (ASCII) which was compatible for further manipulation in ArcGIS (Geographic Information System Software). The data was then imported into ArcGIS using the model builder tool to automate the 1000 files for easy manipulation by other functions in all files at once. Cell statistic in spatial statistical analyst tool was conducted to manipulate the data and find the mean of all individual 1000 raster files for the purpose of obtaining an overarching urban expansion probabilistic forecast of 2030. The average output was re-projected from coordinate system of World Goode Homolosine (Land) Equal-Area projection to world longitude/latitude geographic coordinate system (GCS_WGS_1984). The data was further underwent a resampling process to have resolution of 30 second resolution(30s) which is equivalent to 0.00833333 since the data of Seto were 5km×5km cells size. The resample raster was then used to create urbanized scenarios by reclassification process. 13 value was assigned to data fall in 30% and 99% chances of being urbanized to idealized present full urbanized category urban and built-up land category of WRF MODIS data.

Moreover, Java programming software was used to read MODIS landuse_30s binary dataset and convert to ASCII format for both domains used in the study. In ArcGIS software, map algebra function with raster calculator under spatial statistical analyst tool was used to merge reclassified urbanized scenarios dataset with WRF MODIS land use using conditional command (CON) to produce a modified file and output to ASCII format. The modified ASCII formatted dataset was taken to Java software to be read and changed to binary for WPS and WRF runs and further analysis of meteorological variables under low and high urbanized scenarios. A summary of the process is illustrated in the Figure S1.

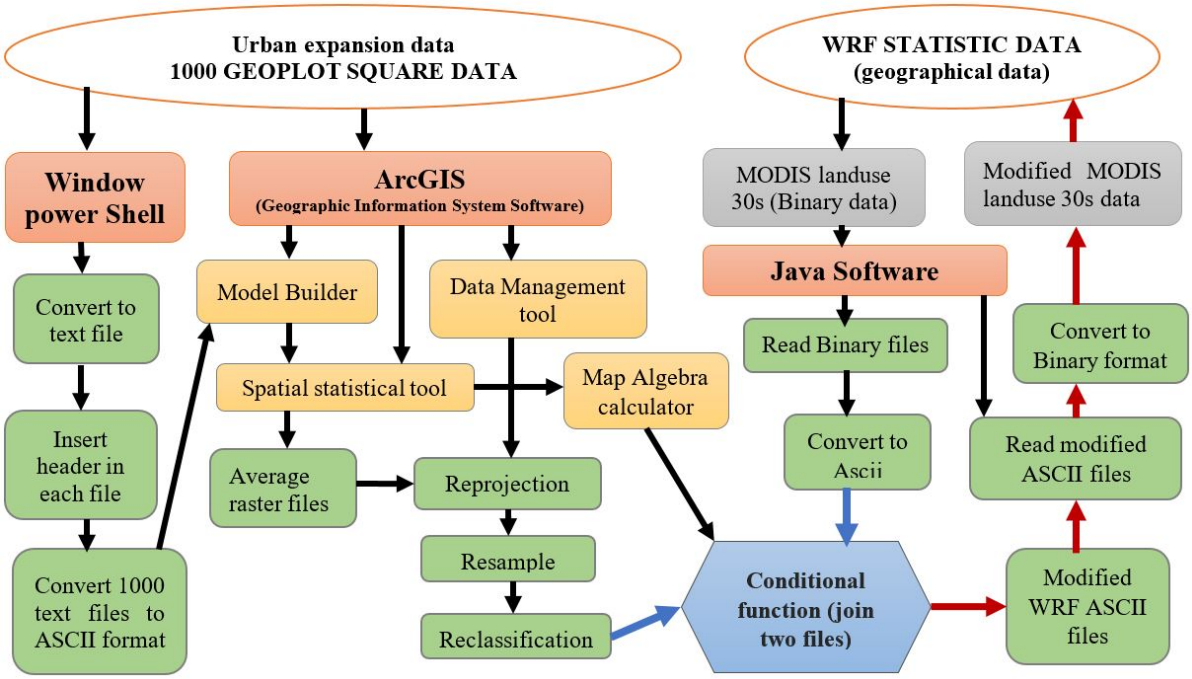

Figure S1. Flow chart for modification of land use data.