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WaterWorld, a spatial hydrological model applied at scales from local to global: key challenges to local application

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WaterWorld is a widely used spatial hydrological policy support system. The last user census indicates regular use by 1029 institutions across 141 countries. A key feature of WaterWorld since 2001 is that it comes pre-loaded with all of the required data for simulation anywhere in the world at a 1km or 1 ha resolution. This means that it can be easily used, without specialist technical ability, to examine baseline hydrology and the impacts of scenarios for change or management interventions to support policy formulation, hence its labelling as a policy support system.

WaterWorld is parameterised by an extensive global gridded database of more than 600 variables, developed from many sources, since 1998, the so-called simTerra database. All of these data are available globally at 1km resolution and some variables (terrain, land cover, urban areas, water bodies) are available globally at 1ha resolution. If users have access to better data than is pre-loaded, they can upload their own data. WaterWorld is generally applied at the national or basin scale at 1km resolution, or locally (for areas of <10,000km2) at 1ha resolution, though continental (1km resolution) and global (10km resolution) applications are possible so it is a model with local to global applications.

WaterWorld requires some 140 maps to run including monthly climate data, land cover and use, terrain, population, water bodies and more. Whilst publically-available terrain and land cover data are now well developed for local scale application, climate and land use data remain a challenge, with most global products being available at 1km or 10km resolution or worse, which is rather coarse for local application. As part of the EartH$_2$Observe project we have used WFDEI (WATCH Forcing Data methodology applied to ERA-Interim data) at 1km resolution to provide an alternative input to WaterWorld's preloaded climate data. Here we examine the impacts of that on key hydrological outputs: water balance, water quality and outline the remaining challenges of using datasets like these for local scale application.