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A virtual globe for environmental impact assessment

Koko Alberti, Kor de Jong, and Derek Karssenberg
Department of Physical Geography, Faculty of Geosciences, Utrecht University, The Netherlands

Assessment of environmental impacts and natural hazards is increasingly required on a global or continental scale. Analyses at this scale transcend political boundaries and require input data with equally global or continental coverage. Unfortunately, the high resolution numerical models used in analyzing soil erosion, storm damage, forest fires, landslides, or hydrological hazards often operate at a much smaller scale, requiring detailed local input attributes which are difficult to obtain globally. Another problem is that global data is often static, while impact and risk assessment studies may require dynamic spatio-temporal data generated from specific user-defined scenarios. There are also obstacles of a technical nature. Researchers adapting local models to operate on a much larger area face restrictions on computational resources, as well as difficulties collecting and processing global high-resolution datasets. This has made access to global and continental scale modeling difficult to all but experienced modelers.

To address these problems a web-based platform has been developed which allows both researchers as well as policy and decision makers to configure and run high resolution ($\pm$100m) environmental models nearly anywhere in the world. Various global datasets have been reprojected and resampled to be used directly as model inputs. Currently available to modelers are the SRTM elevation model, a selection of monthly vegetation data from MODIS, land use classifications, historical climate data, soil information, population density, and near real time weather forecasts. The platform uses the PCRaster-Python modeling framework to process spatio-temporal models in real time; any attribute maps, timeseries data, or model scenarios can be instantly shared or downloaded via a web mapping service (WMS). Several global demo models are available: a topographic model which calculates attributes derived from the elevation (aspect, slope, landforms), a snow model which uses historical climate data to estimate snow accumulation and melt throughout the year, and an erosion risk model which produces monthly erosion risk maps using global rainfall and vegetation variations, while still exhibiting spatial patterns caused by local landforms and topography. The virtual globe platform provides a first step towards open access of global scale model results. More information and a demo are available at http://virtualglobe.geo.uu.nl/.