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Evaluating Impacts of climate and land use changes on streamflow using SWAT and land use models based CESM1-CAM5 Climate scenarios

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Climate change projects have various levels of impacts on hydrological cycles around the world. The impact of climate change and uncertainty of climate projections from general circulation models (GCMs) from the Coupled Model Intercomparison Project (CMIP5) which has been just be released in Taiwan, 2014. Since the streamflow run into ocean directly due to the steep terrain and the rainfall difference between wet and dry seasons is apparent; as a result, the allocation water resource reasonable is very challenge in Taiwan, particularly under climate change. The purpose of this study was to evaluate the impacts of climate and land use changes on a small watershed in Taiwan. The AR5 General Circulation Models(GCM) output data was adopted in this study and was downscaled from the monthly to the daily weather data as the input data of hydrological model such as Soil and Water Assessment Tool (SWAT) model in this study. The spatially explicit land uses change model, the Conservation of Land Use and its Effects at Small regional extent (CLUE-s), was applied to simulate land use scenarios in 2020-2039. Combined climate and land use change scenarios were adopted as input data of the hydrological model, the SWAT model, to estimate the future streamflows. With the increasing precipitation, increasing urban area and decreasing agricultural and grass land, the annual streamflow in the most of twenty-three subbasins were also increased. Besides, due to the increasing rainfall in wet season and decreasing rainfall in dry season, the difference of streamflow between wet season and dry season are also increased. This result indicates a more stringent challenge on the water resource management in future. Therefore, impacts on water resource caused by climate change and land use change should be considered in water resource planning for the Datuan river watershed.

Keywords: SWAT, GCM, CLUE-s, streamflow, climate change, land use change