

Land use / land cover changes and its effect on flow regime in Vietnam's Dong Nai upstream river basin

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Land use and land cover change (LUCC) is one of the major drivers for flow regime alteration. Evaluating the impacts of them on the flow regime has been a subject of ongoing research widely conducted in different countries in the world (e. g. Bewket and Sterk, 2005; Costa et. al., 2003; Dao et. al. 2014; Kashaigili, 2008, Kashaigili and Majaliwa, 2013; Li et. al., 2009; Mou et. al., 2015; Nie et. al., 2011). In Vietnam, studies on hydrological alterations have been receiving much more attention since 2009, due to the increased awareness after "the climate change and sea level rise scenarios for Vietnam" has been issued. However regional scale environment assessment studies especially on the hydrology in Vietnam are still limited. The Dong Nai river basin, the second largest catchment in Vietnam located at the country's key economic development region, account for 23% of Viet Nam's GDP (ADB, 2009). This water resource is one of the important elements to ensure the region is developed sustainably. The purpose of this study is to evaluate LUCC and its effects on the flow regime of Dong Nai upstream river basin tropical basin by using the results of flow-duration curves analysis.

Results from land cover classification of Landsat images of years 1973, 1989, 1994, 2005 and 2014 indicated that forest area has decreased significantly in the period 1994-2005 due to land conversion for agriculture. The proportion of forest area and agricultural land is 73.05% and 23.52% in 1994, 51.60% and 40% in 2005, 44.64% and 50.46% in 2014. Furthermore by the comparison of annual maximum NDVI value during first 15 days of January in whole area, we found that land cover change occurred since the year 1998 leading to the vegetation area was sharply reduced in 1999. In additional, vegetation recovered from 2000 to 2003 before reduced again since 2004.

In this study the Tri An reservoir (basin outlet) and the Da Nhim reservoir (this subbasin area is 154 km²) inflow were used as the stream flows data (1993 to 2009, daily) to analyzed the changes in plentiful - ordinary - low - scanty runoff and flow-duration curves. At the Da Nhim point, we saw the sudden increasing in all of plenty - ordinary - low - scanty runoffs at 1999 and the decreasing trend after that. While at the basin outlet, Tri An dam only scanty runoff did not show the similar tendency. Correspond to vegetation change, the maximum flow increased in 1999, decreased after and increased again in 2006.

Using the spatial and temporal scales satellite data, Landsat and GIMMS-NDVI, the relationship of LUCC and flow regime in the humid tropical Dong Nai river basin was clarified. The large-scale of LUCC lead to an increase in maximum flow and ordinary - low runoffs.

Keywords: Dong Nai river basin, LUCC, flow regime, flow-duration curve