



Impacts of climate change and land use change on Ecosystem services- a case study in Taiwan

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Climate and land use change influenced the ecosystem and biodiversity on various levels and impacts the human beings. It is critical and important to identify the impact from climate and land use change, and thus to facilitate the sustainability land use management strategies to maintain the ecosystem.

Datun river watershed locates the northern part of Taiwan. Dynamic Conversion of Land Use and its Effects model (Dynamic CLUE-S model) is employed to simulate the future land use map under different strategies and different future climate scenarios of RCP2.6 and RCP8.5 from the IPCC fifth assessment report (AR5). Meanwhile, the result of dynamic CLUE-S model is inputted to InVEST model to simulate the future ecosystem services, including the terrestrial ecosystem services (biodiversity, carbon sequestration) and freshwater ecosystem services (water yield, sediment retention, nutrient retention), and thus, compare the result with ecosystem services in 1994 to identify the best land use management strategy on ecosystem protection.

The rainfall and temperature were taken into considerations in Dynamic CLUE-S model, and the comparison shows that the AUC and KAPPA values have significantly increased, which concludes that climate is an important factor in land use change. The result of InVEST model also indicates that the freshwater ecosystem services (water yield, sediment retention) are affected by climate change, especially under the CCSM4 climate scenario.

In this paper, ecosystem services data from 1994 are adopted to identify the conservation priority of a selected region by LISA and Zonation meta-algorithm, different land use restrict areas were recognized to enhance the land use management strategies. Yangming Mountain National Park is selected as the conservation area to implement the land use management scenarios for simulation. Scenario 1 is simply only the Yangming Mountain National Park as conservation area, scenario 5 for no restricted area, strategy 6, 7 and 8 (joint set of Yangming mountain National Park as scenario 2, 3 and 4) for the representation targets of 10 percent, 20 percent and 30 percent ZONATION critical conservation area. The result shows that ecosystem services will be significantly affected by land use change. The Kappa statistical method is used to compare the result with ecosystem services of 1994, and the comparison further prioritized the important conservation areas. The efficacy of scenario 2 makes it the most appropriate scenario for future management, simultaneously, scenario 1 as the current conservation scenario is reasonable as well. However, to enhance and conserve the freshwater ecosystem services and the contained nutrients more efficiently, scenario 2 will be the most appropriate solution which may advance the follow-up policy planning.

Key word: climate change, land use change, ecosystem service, Dynamic Conversion of Land Use and its Effects model, InVEST model, LISA, Zonation