

Developing a Water Resilience Index: A Case Study on Agriculture-Forest Catchments of Eastern Taiwan

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The environmental sustainability index and the Water Resilience Capacity Index (WRCI, I_{ri}) have been used as the theory for developing resilience model in this study. A 10-year database has been collected and analyzed to examine and trial the feasibility of the model. The authors have derived a WRCI model, which is consisted of 18 indicators that are 8, 5, and 5 indicators respectively by social category, water resources category, and environmental category. The indicators screened and selected by the statistical data analysis, field survey, and interviews. Guangfu region is a rural area where it is developed as an agriculture and tourism purposes for decades. The indicators of the social category are included the rates of land use change, under 5-years child mortality, safe drinking water supply, sewage treatment, population growth, aging index, tourist growth, and gross agriculture product per capita. The indicators of water resource category are included precipitation, potential evapotranspiration, agricultural land growth, annual average groundwater level growth, and water footprint change. The indicators of the environmental category are included biodiversity change, waste well disposal, resource recycling, air quality index, and nitrogen-ammonia exceed in water. The results of the model assessment show that the resilience of water resources has a downward trend year by year in last decade. Additionally, the resilience trend in past ten years was highly fitted with the change of precipitation and agricultural water footprint consumption accompanied with minor related to other indicators analyzed in the study area. We found that the value of I_{ri} was significantly matched with the residents' interview results after 2012. The water resource scarcity is extremely concerning by the residence, communities, and government sector because which are related to a regional sustainable development and the living of the people. The water footprints of tourist were increased almost twice after 2009 due to the new policy to increase the Chinese tourist, and the water footprints of agriculture were increasing near 50 % due to the land policy change. The new agriculture policy subsidies have been introducing to solve the aging problem in the area, but it is not very successfully improved the population growth. The environmental monitoring data and social impact factor changes in line, so the future of water governance policy and knowledge transfer should be the first priority to achieve the sustainability. In this study, the suggestions for policymaker for regional water governance should focus on the agricultural development and ecotourism growth. And the economy developments will emphasis to achieve the goal of maximizing water resources sustainability and social welfare and minimizing the environmental cost. In future, we will continue to apply the Water Resilience Capacity Index to improve the governance of the study area to toward a sustainable development.

Keywords: Water Resilience Capacity Index, Water Governance