

The Spatial Analysis of Wetland Ecosystem Services Valuation on Flood Protection in Tone River Basin

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Abstract : Wetlands are significant ecosystems that provide a variety of ecosystem services for humans, such as, providing water and food resources, purifying water quality, regulating climate, protecting biodiversity, and providing cultural, recreational, and educational resources. Wetlands also provide benefits, such as reduction of flood, storm damage, and soil erosion. The flood protection ecosystem services of wetlands are often ignored. Due to climate change, the flood caused by extreme weather in recent years occur frequently. Flood has a great impact on people's production and life with more and more economic losses. This study area is in the Tone river basin in the Kanto area, Japan. It is the second-longest river with the largest basin area in Japan, and it is still suffering heavy economic losses from floods. Tone river basin is one of the rivers that provide water for Tokyo and has an important impact on economic activities in Japan. The purpose of this study was to investigate land-use changes of wetlands in the Tone River Basin, and whether there are spatial differences in the value of wetland functions in mitigating economic losses caused by floods. This study analyzed the land-use change of wetland in Tone River, based on the Landsat data from 1980 to 2020. Combined with flood economic loss, wetland area, GDP, population density, and other social-economic data, a geospatial weighted regression model was constructed to analyze the spatial difference of wetland ecosystem service value. Now, flood protection mainly relies on such a hard project of dam and reservoir, but excessive dependence on hard engineering will cause the government huge financial pressure and have a big impact on the ecological environment. However, natural wetlands can also play a role in flood management, at the same time they can also provide diverse ecosystem services. Moreover, the construction and maintenance cost of natural wetlands is lower than that of hard engineering. Although it is not easy to say which is more effective in terms of flood management. When the marginal value of a wetland is greater than the economic loss caused by flood per unit area, it may be considered to rely on the flood storage capacity of the wetland to reduce the impact of the flood. It can promote the sustainable development of wetlands ecosystem. On the other hand, spatial analysis of wetland values can provide a more effective strategy for flood management in the Tone river basin.

Keywords : wetland, geospatial weighted regression, ecosystem services, environment valuation

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