Developing a Weight Estimation Approach by Structural Equation Modeling for Stream Ecological Evaluation: A Case Study in Shihmen Reservoir Watershed,Taiwan

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Abstract

The condition of ecological habitat near the upper reaches of a reservoir affects water's quality. River managers usually evaluate rivers' environmental and ecological conditions by multiple factors or multiple indexes. It is also a trend to use complex evaluation models. We develop a Stream Integrity Assessment Model (SIAM I) as the hypothetical model and uses Structural Equation Modeling (SEM), especially its statistics technique, to conduct theory-testing. In addition, in order to understand the connections between each index and the overall model fit of the hypothetical model, to estimate weighing parameters of each indexes, and to establish empirical model, the difference between two models with distinct weighing building criterion will be discussed. It is because that different evaluation indexes focus on different contents, resulting in different conclusions. Therefore, this research plans to discuss the weighing parameters among these indexes by SEM and path analysis. Particularly, the hypothetical model's assumption weight is demonstrated as Wi＝1/N. The studied area was the watershed of Shihmen Reservoir, the tributaries of Dahan River. Eight sampling stations were monitored during February 2003 and October 2004. Seven assessing techniques were adopted, including RPI, IBI, QHEI, FBI, RBPIII, GI and SI. The results showed that the calculation SIAM I is inputted the assumption weight; in contrast, the calculation SIAM II is inputted the weight estimated by this research. We see that in this chart, SIAM II has a variance of space of 0.487, greater than that of I, 0.447. That means it is easier to distinguish the ecological environment conditions of different testing stations in the upper reaches watershed of Shihmen reservoir by using the weight estimated by this research than the assumption weight.

Keyword：RPI, IBI, QHEI, FBI, RBPIII, GI