

Research on Transverse Ecological Compensation Mechanism in Yangtze River Economic Belt Based on Evolutionary Game Theory

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Abstract : The cross-basin ecological compensation mechanism is key to stimulating active participation in ecological protection across the entire basin. This study constructs an evolutionary game model of cross-basin ecological compensation in the Yangtze River Economic Belt (YREB), introducing a central government constraint and incentive mechanism (CGCIM) to explore the conditions for achieving strategies of protection and compensation that meet societal expectations. Furthermore, using a water quality-water quantity model combined with factual data from the YREB in 2020, the amount of ecological compensation is calculated. The results indicate that the stability of the evolutionary game model of the upstream and downstream governments in the YREB is closely related to the CGCIM. When the sum of the central government's reward amount to the upstream government and the penalty amount to both sides simultaneously is greater than 39.948 billion yuan, and the sum of the reward amount to the downstream government and the penalty amount to only the lower reaches is greater than 1.567 billion yuan, or when the sum of the reward amount to the downstream government and the penalty amount to both sides simultaneously is greater than 1.567 billion yuan, and the sum of the reward amount to the upstream government and the penalty amount to only the upstream government is greater than 399.48 billion yuan, the protection and compensation become the only evolutionarily stable strategy for the evolutionary game system composed of the upstream and downstream governments in the YREB. At this point, the total ecological compensation that the downstream government of the YREB should pay to the upstream government is 1.567 billion yuan, with Hunan paying 0.03 billion yuan, Hubei 2.53 billion yuan, Jiangxi 0.18 billion yuan, Anhui 1.68 billion yuan, Zhejiang 0.75 billion yuan, Jiangsu 6.57 billion yuan, and Shanghai 3.93 billion yuan. The research results can provide a reference for promoting the improvement and perfection of the cross-basin ecological compensation system in the YREB.

Keywords : ecological compensation, evolutionary game model, central government constraint and incentive mechanism, Yangtze river economic belt

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