

## **Linear and Non-linear Models and Applications of Arrow-Debreu Shadow Price of Water Resources**

Topic: Water Issues Worldwide

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The freshwater resource is the basis of the natural resources and the control element in the development of ecological environment. Meanwhile, it is strategic economic resource as well. The per capita possession of water resources in Shanghai is only 145 cubic meters in 2011, far lower than 2350 cubic meters of China. Though the theory of shadow price has been developed some ideas for solving water resource price problems and has been identified in practice, the applications of shadow price are been restricted considering the difficulties which are hard to solve. The input-output model is combined with linear programming to compute the shadow prices of all production water use and industrial water use in Shanghai on the basis of Shanghai's input-occupancy-output form. The shadow prices of the entire production water use in Shanghai is 3.72 RMB, namely an objective function (GDP) increased by 3.8 RMB in case of unique cube meter water use rise. The shadow prices of industrial water use to industry value added is 13.2 RMB per cube meter. It become more than the shadow prices of all production water use and industry water use in the Sea River basin in 1999, which is the largest with 2.34 and 3.13 respectively. It means that production water use, especially industry water use turn to be increasing costly. Water-saving in manufacturing is the keys of water management during urbanization.