STUDY ON FUZZY PRICING MODEL FOR URBAN WATER RESOURCES

ZHAO RAN-HANG [1,2*], CHAO SHENG-LE[2] and XU SHI-GUO[3]

[1] Doctor, School of Civil & Hydraulics Engineering,
Dalian University of Technology, 116-024, PRC
(Tel: +86-531-8839-2844, Fax: +86-531-8839-2527, e-mail: ranhang-z@sdu.edu.cn)
[2] Professor, School of Civil Engineering, Shandong University, Jinan 250-061, P.R.C
(Tel: +86-531-8839-2527, Fax: +86-531-8839-2527, e-mail: cao_s@sdu.edu.cn)
[3]Professor, School of Civil & Hydraulics Engineering,
Dalian University of Technology, 116-024, PRC
(Tel: +86-411-8470-7680, Fax: +86-411-8470-7680, sgxu@dlut.edu.cn)

With the rapid development of urbanization, many cities are facing some problems related to water resources, such as, a serious shortage in freshwater, worse water environment, etc., it is an important approach for avoiding water resources crisis to improve water price system to promote water saving. Water resources value (WRV) is a very crucial factor involved in water price system. Many WRV models, such as the shadow price model, the marginal opportunity cost model, the supply-demand price model, and the fuzzy comprehensive judge model, have been proposed in the literature. The WRV system is a complex one with randomicity, fuzziness and is composed of three interactive subsystems of society, economy and environment. In this paper, aiming at the fuzzy characteristics of WRV, a fuzzy pricing model for urban water resources is proposed, which consists of a multi-criterion fuzzy evaluation model (I) and computation model (II)of WRV. In part I, various factors affecting WRV are comprehensively evaluated with multiple level and objective; in part II, the price vectors of water resources are constructed according to the definition of the endurance index of water price, then WRV is calculated. Finally, Jinan is taken as a case study to further testify the validness of the proposed model.

The model proposed in this paper offers new directions in the research of water resources price. It not only embodies self-characteristics of WRV (including complexity, fuzziness and development), but also overcomes the limitation of traditional model of fuzzy synthetic evaluation (i.e. optimization criterion parameter α and distance parameter p are both taken as 1.), and portrays the non-linear and complexity relation of water resources system. More over, it considers the dynamics of WRV system with the various factors, such as, water quality, water quantity (Wang G..L, Cao Y.Q. 2002.) and so on.

The pricing model of water resources is based on that water price consists of water resources price, engineering water price and environmental water price. From the definition of water rate index, the upper limit of WRV is analyzed and determined, the price vectors of water resources which assorts with the vector result calculated in the fuzzy evaluation, then the price of water resources is decided by the model. The model combines the price of water resources with the use and profit of water, which made the price of water more reasonable. That is propitious to realize the aim which the water resources is collocated

The outcomes of this research indicate that the fuzzy pricing model for urban water resources is scientific, reasonable and practical.

REFERENCES

Wang, D.X, Wang H, and Yin M.W. (1999). The water resource, the water resource value, the shadow price of water resource. Journal of Evolvement of Water Science (in Chinese).

Biswas.A.K. (1991).Water for Sustainable Development in the 21st century,Address to 7th word Congress on Water Resources, Morocco: Water International.

Jiang, W.L., Wu, X., Lin, T.F. (1998). Study on assessment for water resources value model. Journal of Progress of Earth Science, pp. 179-181 (in Chinese).

Chen, S.Y. (2002). Optimal fuzzy recognition theory and application of complex water resources system. (3), pp.13-18. JiLin University Press, Jilin, China.

Gu SH.P, Lin R.Y, and Liu H.L. (2002). The fuzzy pricing model of water resource. Journal of Research on developing water power.

Jiang W.L (1998). The research on the pricing model of water resource. Journal of Resource Science. (1), pp. 40-41 (in Chinese).

Hu Y., Chao Sh. L., *et al.* (2003). Research on water resource value model. Journal of Shandong University.

Wang G..L, Cao Y.Q. (2002). The fuzzy model based on the method AHP and using of the model on the quality of water. Journal of Project Reconnaissance. (6), pp. 18-19.