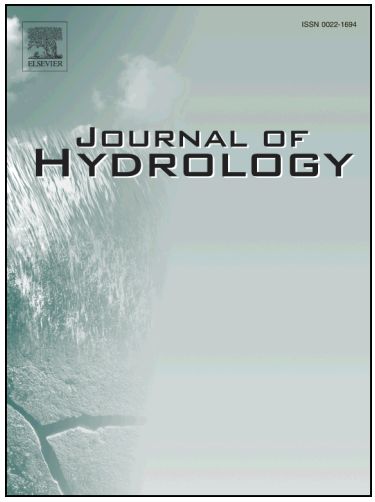

Research papers

Decomposition methods for analyzing changes of industrial water use

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Decomposition methods for analyzing changes of industrial water use

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Abstract: Changes in industrial water use are of the utmost significance in rapidly developing countries. Such countries are experience rapid industrialization, which may stimulate substantial increases in their future industrial water use. Local governments face challenges in formulating industrial policies for sustainable development, particularly in areas that experience severe water shortages. This study addresses the factors driving increased industrial water use and the degrees to which these factors contribute, and determines whether the trend will change in the future. This study explores the options for quantitative analysis that analyzes changes in industrial water use. We adopt both the refined Laspeyres and the Logarithmic Mean Divisia Index models to decompose the driving forces of industrial water use. Additionally, we validate the decomposition results through a comparative study using empirical analysis. Using Tianjin, a national water-saving city in China, as a case study, we compare the performance of the two models. In the study, the driving forces of changes in industrial water use are summarized as output, technological, and structural forces. The comparative results indicate that the refined Laspeyres model may be preferable for this case, and further reveal that output and technology have long-term, stable effects on industrial water use. However, structure may have an uncertain influence on industrial water use. The reduced water use may be a consequence of Tianjin's attempts to target water savings in other areas. Therefore, we advise the Tianjin local government to restructure local industries towards water-saving targets.

Keywords: industrial water use; decomposition method; refined Laspeyres model; LMDI model; driving forces; water saving

1. Introduction

Changes in industrial water use are of the utmost significance in rapidly developing countries such as China (Geng et al., 2012). The fast growth in industrial output (annual rate of 10 %), is expected to exponentially increase the use of industrial water, even after accounting for a drastic reduction in water use per unit of output (Shang et al., 2016a). However, we have reason to doubt the accuracy of such a prediction. According to the experience of developed countries, industrial water use will not continue to increase (Jia, 2001). Specifically, when an economy reaches to a certain stage of development, industrial water use will stop rising and exhibit a downward trend. For example, industrial water use began to decline in Sweden in 1964, in Japan in 1974, and in the US in 1981. China also experienced a decline in industrial