Network analysis of embodied water circulation using input-output model of socio-economic resource flows

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The circulation of embodied water, also known as virtual water, in socio-economic systems has been the center of concern in recent years. An input-output model can represent monetary flow or embodied water flow, which provides a perfect foundation for the investigation of water circulation in a socio-economic system. However, most models ignore the cycling and indirect flows, making it difficult to interpret efficiency of water utilization and sector relationships from a holistic perspective. In this research, based on input-output model of embodied water, we use a network analysis method originally applied for ecological systems to investigate a socio-economic water system, specifically, the Ganzhou region of China. Structural and throughflow analyses derived from network analysis provide a holistic perspective, to reflect its connectivity and interpret the water utilization efficiency by considering the cycling and indirect flows. Furthermore, sector analyses, using control- and utility-based methods, were conducted to further illustrate the relationship between sectors, which can provide a more in depth picture of the sectors role as donor or recipient in the system. This allows one to illustrate the economic or environmental driving force normally hidden without whole system indicators. An interpretation of this method when used for socio-economic embodied water circulation was conducted to further demonstrate their potential application to embodied resources research in socio-economic systems.