



Fighting against water crisis in China—A glimpse of water regime shift at county level



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ABSTRACT

Three decades of economy growth and urbanization has brought China into the rim of water crisis. Transition to sustainability has gained consensus and put into practice at all administrative levels. However, due to locking mechanisms such as sunken investments, vested interests, and economic structure, such transition would not prove to be easy. Here we adopt the Multi-Level Perspective framework to analyze a county level water regime shift in Yiwu of Zhejiang province, which is representative for its economic success and severity of water problem in China. The transition is described as the interactions between water regime subsystems including society, economy, administration, infrastructure, and natural water cycling process, as well as the influence from the landscape level such as politics. Figures show that the water system is making a turnaround to the better side, while the government plays a key role in pushing and managing the transition. This study allows us to have a glimpse of the whole water regime transition currently happening in China, as well as being used for reference in other parts of the developing world, for the promoting of sustainable water resource management.

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1. Introduction

The natural water cycling process provides critical products and services like fresh water, purification and recreation, based on which human civilization has been sustained (Falkenmark, 2003; Acreman and Ferguson, 2010). However, during the past decades, human activities like fresh water exploiting, land using, as well as discharging of contaminated water have driven many water systems worldwide into malfunction, with lost biodiversity and degraded ability of providing goods and services, resulting in water shortage, pollution, floods, etc., and threats economy development and sustainability of society (Poff et al., 2007). The developing world, where population growth and urbanization mainly occur,

will continue to endure pollution and depletion of water resources (Rock and Angel, 2005; van der Steen, 2006). Water conflicts worldwide are becoming increasingly fierce, and the challenges for sustainable water management are ample (Carius et al., 2004; Goldenberg, 2014; Peek, 2014).

China possess 22% of the world's population while only 7% of freshwater runoff. Along with the three decades of rapid economic growth, China has been transferring from an agricultural society to an industrial society at an unprecedented rate. Its urban population surpassed rural areas in 2011, which is expected to reach 60% in 2020 (Mayer, 2014; Ye and Wu, 2014). As a result, pollution from industrial, domestic and nonpoint source, as well as depleted water supplies put China in the throes of a water crisis (Feng and Feng, 2001; Varis et al., 2014). In 2013, the Ministry of Environmental Protection reported that on average about 28.3% of the water in the seven main rivers in China is polluted (Grade IV–V), 59.6% of the ground water are ranked as bad or very bad (MEP, 2014). In spite of this, water use efficiency agricultural and industrial sectors is only 40% (Leong, 2013).

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Water shortages and water quality deteriorates already costed 2.3% of China's GDP, while the actual costs may be much higher (Xie et al., 2008). Besides that, the public's concern on water pollution and associated food quality began to break out, while the rich class are considering of migrating to countries with better environment.

The water crisis signifies an unstable state of the coupled social-ecological system which coevolve under mutual constrain (Goudsblom et al., 1996), further transition to new equilibrium would be expected (socio-metabolic regimes) (Kates et al., 2001; Raskin Banuri et al., 2002; Parris and Kates, 2003; Fischer-Kowalski and Rotmans, 2009; Weinstein et al., 2013). This means that changes in political, social, economic and administrative systems will likely be forced to achieve a socially and environmentally desirable system state (Gibson, 2006; Hanspach et al., 2014). However, because of locking mechanisms in behavior patterns, vested interests, infrastructure, preferential subsidies, laws and

regulations, active change is not easy (Unruh, 2000; Frantzeskaki and Loorbach, 2010), while alternative balance marked by economic depression and social decay is highly possible.

To shift its developing train to a sustainable track, water system transition has set course in China, which involves different aspects of the society and happens on various administrative levels. To address such a transition is no easy task, while many choose an angle of one aspect at national level, we here adopt an alternative perspective at a more elementary level to provide alternative perspectives. County is the basic unit of China in the sense of economy, administration, and geology, which is also true for water management. The analysis of water system transition at this level would provide clue to our understanding if the overall social-ecological system is transferring into a new and sustainable balance. Yiwu is representative for its success in economy and severity in water problem in China, such a case would allow us to have a glimpse of the whole water system transition of China, as



Fig. 1. Location of Yiwu.

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