Mindset Change Needed for China's Water Crisis

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Received: 29 July 2011 / Revised: 29 August 2011 / Accepted: 31 August 2011 / Published online: 4 October 2011

This synopsis was not peer reviewed

Water-related crisis in China has become increasingly frequent and severe in recent years. Astonished by recent extreme weather events, the Chinese government has focused this year's No. 1 Document on water problems (Yu 2011; Gong 2011). Although it is still not clear how the funds (US\$ 615×10^9) will be spent, most of it is expected to be directed to water engineering according to past experiences. Particularly, quite a large portion will go to large-scale projects as they usually represent great political achievements for promotion. However, lessons from past failures tell us that dam building cannot solve the water problems; instead an integrated strategy involving mindset change must be sought for sustainable water use.

Induced by the Chairman Mao's idea that man can triumph over nature, policy-makers believed that the water problems could be addressed through massive water engineering projects. Since the 1950s, China has invested a large amount of money and labor into dam construction and water engineering projects, and has thus been the world's number one in terms of water development project construction, including the world's largest reservoir (the Three Gorges Dam) and the longest water diversion project (South-North Water Transfer Project). Totally, at least 87000 dams have been constructed in China. In addition, currently more than 370 reservoirs with a storage capacity greater than 10 million cubic meters are under construction or being planned within the country (MWRC 2008).

Though these projects have played a certain role in promoting economic development, excessive dependence on hydro-projects has triggered a slew of intractable problems, including soil alkalization, flow dry-up, and

eco-environmental deterioration (Liu and Xia 2004; Pereira et al. 2007). One example is the notorious Sanmenxia Reservoir in the middle Yellow River. Due to ignorance and thoughtlessness on delivery of high sediment load supplied from the Loess Plateau, severe sedimentation behind the dam has occurred immediately after its operation in 1960 (Wang et al. 2005). As a result, the downstream riverbed elevation has been greatly raised, putting riparian residents at high risk of flooding as the riverbed has been several meters higher than the surrounding ground and forming the world-famous 'suspended river' (Wang et al. 2007). After a certain period of time, the levees along the 'suspended river' have to be heightened and consolidated to constrain the water flow within the channel. Similar failures in water engineering projects can also be found in other Chinese river basins, such as the Yangtze River (Lu and Higgitt 2001). These water resources development projects, with an initial intention for water crisis solving, have brought more adverse effects and even further exacerbated the crisis.

Consequently, despite that colossal amounts of funds have been invested, the expected success never really came true, but more often with greater frustrations. For example, the record-breaking droughts in the Yangtze River basin this year have raised wide debates over whether the Three Gorges Dam should be blamed (Lu et al. 2011). Furthermore, quite a number of medium- and small-sized reservoirs in its middle and lower reaches have mostly dried up owing to excessive water pumping and reduced water supply (Fig. 1). The reported drought relief achievements obtained from the gigantic dam were far outweighed by the damage it caused. For the first time, the Chinese government has officially admitted that the project has urgent problems to be resolved (Qiu 2011). Immediately after the droughts, torrential rain triggered floods and landslides in the basin that left hundreds of

Fig. 1 A mostly dried-up reservoir in Huarong County, Hunan Province, near the Yangtze mainstream and about 300 km downstream of the Three Gorges Dam. [Photo by Lishan Ran on May 28, 2011]

people dead and millions homeless, causing direct economic losses of US\$ 6.7×10^9 already (Xinhua News Agency 2011).

It can be seen that, although numerous dams have been constructed, realizing flood control objectives remains challenging. Indeed, the heavy rains have put some dams in danger of overflowing and quite a few have even collapsed, further aggravating the downstream havoc. More importantly, unwise dam building would bring more irreversible damage such as displacement of local people, ecological degradation, earthquakes, and international disputes (Ran and Lu 2011). Out of consideration for the ecological fragility, for example, the Patagonia dam project in Chile, the largest if completed, has been blocked by court due to appeals by environmentalists, though it has been approved by the government (Terradaily News Agency 2011). While for the Three Gorges Dam project, serious social problems have arisen as the relocatees could not quickly adapt to the resettlement environment (Heggelund 2006).

Definitely, it is time to rethink the massive dam building strategy, especially for these planned in fragile environments. It is clear that sole dependence on dams is not the solution to the current water crisis. Worse, with so many

unsolved problems regarding dams' negative effects, more dam-induced disasters are imaginable if the engineering-centered approach continues to be implemented slavishly. Therefore, to fully tackle the water problems, a mindset shift from an engineering-centered approach to an integrated strategy is strongly needed. The integrated strategy must combine efficient water resources management, water-saving technology applications, ecological protection measures, and law enforcement. This can be learned from the already proved success in Israel in its efforts to address its chronic water scarcity (Tal 2006). Particularly, extensive education on water use efficiency and necessary skill training for water users, such as farmers, must be paid enough attention, because they are the end users of water, directly determining to what extent the integrated strategy can succeed.

Acknowledgments This study was financially supported by a grant from National University of Singapore (Grant: MOE2011-T2-1-101).

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