



## **Human activities and its Responses to Glacier Melt Water Over Tarim River Basin**

Hai He (1), Shenbei Zhou (2,3), and Minghao Bai (2)

(1) College of Hydrology and Water Resources, Hohai University, Nanjing, China (shenbei@live.com), (2) School of Business, Hohai University, Nanjing, Jiangsu, 211100, China (szhou4@gmu.edu), (3) Global Environment and Natural Resources Institute, George Mason University, VA, 22030, USA (mybai2@hhu.edu.cn)

Tarim River Basin lies in the south area of Xinjiang Uygur Autonomous Region, the north-west area of China. It is the longest inland river of China. Being far away from ocean and embraced by high mountains, Tarim River Basin is the typical arid region in the world. The intensity of human activities increased rapidly in Tarim River Basin since 1980's and water resources lacking is the major issue restricting the development of social economy. The glacier melt water plays an important role for the regional social and economic development, and it accounts for 40% of mountain-pass runoff. It is a fragile mutual-dependent relationship between local sustainable development and runoff. Under the background of global change glacier melt water process has also changed especially in the arid and semi-arid region. Due to climate change, glacier in Tarim River Basin has melted in an observed way since 1980s, together with increasing trend of annual rainfall and virgin flow in mountain basins. Correspondingly, human activity gets more frequent since 1970s, resulting into the obvious fragile mutual-dependent relationship between basin runoff and water use amount. Through an analysis of meteorological, hydrological and geographical observation data from 1985 to 2015, this thesis make a multi-factor variance analysis of population, cultivation area, industrial development and runoff in upstream and mid-stream of Tarim River under changing conditions. Furthermore, the regulation function of natural factors and water demand management factors on relationship between runoff and water using amount are discussed, including temperature, rainfall, and evaporation, water conservation technology and soil-water exploitation administrative institutions. It concludes that: first, increase in glacier runoff, rainfall amount, and virgin flow haven't notably relieved ecological issue in Tarim River Basin, and even has promoted water use behaviour in different flowing areas and noticeably reduced the influence on water demand management. Second, water demand management factors positively relate to ecological improvement in Tarim River Basin. Third, after a further prediction on glacier melt with fuzzy neural network, it finds that the weaker adjustment influence of glacier runoff would put Tarim River Basin into a much weaker mutual-dependent relationship. The research believes that if short-term activity of society has wrongly adapted to runoff increase from faster glacier melt, it would put social development and ecological recovery of Tarim River Basin into a higher vulnerable way.

Key words: Tarim River Basin, Changing Condition, Glacier Melt, mutual-dependent vulnerability