An Evolutionary Approach to Water Innovation: Comparing the Water Innovation Systems in China and Europe - DTU Orbit (30/12/2018)

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The recent rise of the ‘green economy’ agenda has increased the attention to eco-innovations globally, with issues related to water stress identified as one of the major bottlenecks for sustainable economic growth. Water being a critical resource, more and more countries worldwide are recognizing the need for increasing their innovative capacity within the water sector. Using evolutionary economic theory, this thesis undertakes a longitudinal and comparative analysis of the water innovation dynamics in Europe and China, representing respectively a developed, green early mover economy, and a centrally-planned economy and green late mover. The thesis aims to assess the similarities and differences in the mechanisms applied across these two regions, with a focus on outlining what drives eco-innovation development in the water sector. The thesis builds more specifically on the innovation system framework within evolutionary economic theory, as well as draws on eco-innovation and water specific literature. The analysis seeks to contribute to the still limited water innovation dynamics research, as well as the green economy and to some degree the ‘catching up’ literature, highlighting the innovation conditions of the green economy in regions with different stages of development. The empirical analysis is based primarily on patent data but also draws in trade data for some of the analysis. These data have been little used in water innovation studies and even less situated within an evolutionary economic theoretical perspective. The thesis compares and contrasts the elements and dynamics of the Chinese and European water innovation systems, working on multiple levels. The thesis identifies and characterizes: a) the actors of the water innovation system, b) trends in innovative capacity and the driving forces of the technological development, and c) the degree of Chinese catching up to Europe, both in general as well as related to different technological patterns of eco-innovation in the water sector. The main findings of the thesis are related to the clear differences in the dynamics of water innovation versus water eco-innovations in the Chinese context, where public innovators (universities and knowledge institutions) are found to have a more important role than in Europe in the development of eco-innovation – as opposed to the development of “general” water innovations. This points towards a better association among the actors involved in performing eco-innovation and the water regulations and innovation policies. This alignment is expected given the planned economy of China, but which has not been previously documented or discussed for the water sector. Additionally, the thesis identified and analysed the drivers for the overall (eco) innovative capacity development of the water sector in the two regions, and found them to be similar and strongly related to the national innovative strategy, as well as to public budgets, environmental regulations and R&D development. Generally, Europe presents a higher water (eco) innovative capacity; nevertheless, the thesis also indicates that China is increasing its innovative capacity in the water sector relative to Europe. In particular it could be seen that China is in the process of a “market” technological catch-up while remaining at a much lower patenting innovative performance level than Europe. Both regions present similar eco-innovative patterns, with a strong remaining focus on traditional water pollution technologies and wastewater treatment. This demonstrates there is still a huge potential for green business development related to water conservation and water recovery in both regions that hasn’t been explored yet and may become crucial to the future transition towards sustainability. Overall, the analysis of the thesis contributes to a more nuanced understanding of water innovation dynamics, as well as global water innovation trends than has been conducted to-date. Novel contributions include the combined analysis of the micro aspects of water innovation dynamics, the econometric analysis of innovative capacity drivers, as well as the longitudinal catch-up analysis of combined patent and trade data, including the discussion of the development of different water technological trajectories. The suggested taxonomy for water (eco-) innovations and the trade data list of water technologies can be used as novel indicators to analyse eco-innovation developments and diffusion in the water sector. Given the limited prior research to draw on and limitations regarding data availability, as well as the many very recent green water policy tendencies in China whose effects are yet to be seen, the empirical results of this thesis are not that clear cut. In some respects, China is catching up in water innovations, in other respects not. Further analyses are needed to provide a more thorough understanding of the water innovation performances and dynamics of the European and Chinese water innovation systems.

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