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A resilience perspective to water risk management: case-study application of the adaptation tipping point method

Berry Gersonius (1), Richard Ashley (1), Ad Jeuken (2), Fauzy Nasruddin (1), Assela Pathirana (1), Chris Zevenbergen (1,3)

(1) UNESCO-IHE, Water Engineering, Delft, Netherlands (b.gersonius@unesco-ihe.org, +31-15-2122921), (2) Deltares, Utrecht, Netherlands, (3) Delft University of Technology, Faculty of Civil Engineering and Geosciences, Department of Hydraulic Engineering, Netherlands

In a context of high uncertainty about hydrological variables due to climate change and other factors, the development of updated risk management approaches is as important as—if not more important than—the provision of improved data and forecasts of the future. Traditional approaches to adaptation attempt to manage future water risks to cities with the use of the predict-then-adapt method. This method uses hydrological change projections as the starting point to identify adaptive strategies, which is followed by analysing the cause-effect chain based on some sort of Pressures-State-Impact-Response (PSIR) scheme. The predict-then-adapt method presumes that it is possible to define a singular (optimal) adaptive strategy according to a most likely or average projection of future change. A key shortcoming of the method is, however, that the planning of water management structures is typically decoupled from forecast uncertainties and is, as such, inherently inflexible. This means that there is an increased risk of under- or over-adaptation, resulting in either mal-functioning or unnecessary costs.

Rather than taking a traditional approach, responsible water risk management requires an alternative approach to adaptation that recognises and cultivates resiliency for change. The concept of resiliency relates to the capability of complex socio-technical systems to make aspirational levels of functioning attainable despite the occurrence of possible changes. Focusing on resiliency does not attempt to reduce uncertainty associated with future change, but rather to develop better ways of managing it. This makes it a particularly relevant perspective for adaptation to long-term hydrological change.

Although resiliency is becoming more refined as a theory, the application of the concept to water risk management is still in an initial phase. Different methods are used in practice to support the implementation of a resilience-focused approach. Typically these approaches start the identification and analysis of adaptive strategies at the end of PSIR scheme: impact and examine whether, and for how long, current risk management strategies will continue to be effective under different future conditions. The most noteworthy application of this approach is the adaptation tipping point method. Adaptation tipping points (ATP) are defined as the points where the magnitude of change is such that the current risk management strategy can no longer meet its objectives. In the ATP method, policy objectives, determining aspirational functioning, are taken as the starting point. Also, the current measures to achieve these objectives are described. This is followed by a sensitivity analysis to determine the optimal and critical boundary conditions (state). Lastly, the state is related to pressures in terms of future change. It should be noted that in the ATP method the driver for adopting a new risk management strategy is not future change as such, but rather failing to meet the policy objectives.

In the current paper, the ATP method is applied to the case study of an existing stormwater system in Dordrecht (the Netherlands). This application shows the potential of the ATP method to reduce the complexity of implementing a resilience-focused approach to water risk management. It is expected that this will help foster greater practical relevance of resilience as a perspective for the planning of water management structures.