

Climate change and water security: challenges for adaptive water management

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Water security is a key policy area for the Anthropocene; here we consider recent discourses of adaptive management in relation to water security. Definitions of water security emphasise the dual productive/destructive potentials of water, indicating its inherent economic, social and environmental complexity. Adaptive management has potential to address this social–ecological complexity because it supports a holistic approach. Although adaptive management is sometimes reduced to little more than conventional action under a new name, the potential for integrative, holistic, learning centred approaches remains within the concept of adaptation, and in the complementary conceptualisations of Integrated Water Resources Management, Social Learning and Resilience Thinking. Linking across policy fields (the water–food–energy–nexus) can only be achieved by these types of adaptive flexible and reflective approaches, and there is some, albeit tentative, moves in this direction in China’s National Water Policy, the European Flood Directive and Australia’s Murray–Darling Basin Plan. There is, however, much to do before water security, under an adaptive paradigm, becomes a concept and institutionalised practice that is continuously re-viewed and re-constructed to meet the needs of an ever changing world.

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Introduction

There is immense anthropogenic pressure on global freshwater [1]; human population growth and climate change are key elements of this pressure. Climate change

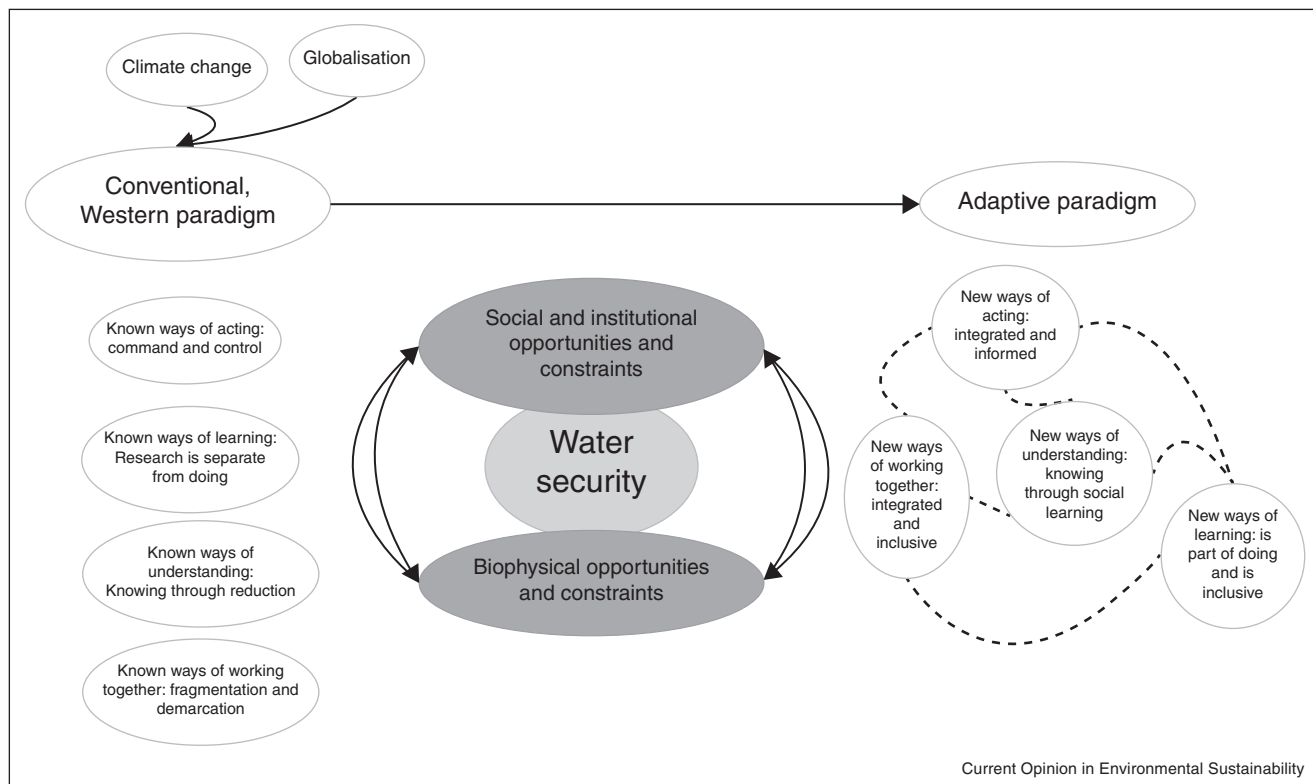
is likely to alter the availability and distribution of freshwater (and alter the impacts of water related disasters such as floods and droughts), while simultaneously increasing the demand for water from rivers [2] and impacting on groundwater availability [3]. ‘Water security’, always of human concern, has thus become a key policy area for the Anthropocene [4,5]. Whether considered initially from a biophysical or social perspective, ‘water security’ as a concept is complex, contested and dynamic, and requires complex and dynamic — that is, adaptive — thinking to be able to define and achieve it. Adaptive approaches to water management and governance have been promoted for at least three decades as part of the shift from water government to water governance [6,7]. This paper considers recent additions to discourses of adaptive management as they relate to water security, drawing on examples from China, Europe and Australia.

Water security

Water security has been described as ‘adequate protection from water-related disasters and diseases and access to sufficient quantity and quality of water, at affordable cost, to meet the basic food, energy and other needs essential for leading a healthy and productive life without compromising the sustainability of vital ecosystems’ [8]; and ‘... an acceptable level of water-related risks to humans and ecosystems, coupled with the availability of water of sufficient quantity and quality to support livelihoods, national security, human health, and ecosystem services’ [9,10]. Both definitions reflect the dual productive/destructive potentials of water, and point to the economic, social and environmental negotiations (sometimes ‘trade offs’) inherent in dealing with water generally [11] and water security in particular.

The current importance of understanding and aiming for water security is emphasised by the publication of more than 200 peer-reviewed papers on the topic since 2002 [11], but note that many of these publications are situated within the broader public discussion on how humans could or should manage natural resources. In the last quarter of the 20th century that public discourse has questioned the desirability of relying solely on the scientific rationalist approach to managing and using natural resources. Scientific rationalism was initiated by the Enlightenment and necessarily complemented and supported command and control government. Increasing recognition of biophysical and social uncertainties, evidence of managed ecosystem collapses, and policy complexities and ‘gridlocks’ (see,

Figure 1



Conceptualisation of moving water security from being conventional to adaptive.

e.g. [12]) prompted the widespread reconsideration of management and governance that continues to this day [13]. The increased recognition of impacts from climate change has fuelled this ongoing discussion and has led to a broadly supported claim for a shift towards adaptive water management [6,7,14].

Adaptive water governance and management

'Adaptive management' developed as an alternative to conventional, reductionist natural resource management [15]. Although based in, and therefore reflecting the needs of, many natural resource sectors and political jurisdictions, adaptive management has a deceptively simple idea at its core — that of learning more about something from managing that something [16]. Providing an alternative to the conventional operational paradigm that separates knowledge creation (research) and knowledge application (management), adaptive management is considered suitable for addressing complexity and uncertainty because it is holistic. This holism encourages inclusion and integration of disciplinary knowledges, and the participation of a range of people and organisations with potentially different epistemological and ontological viewpoints. For example, under an adaptive, integrative paradigm the typically Western, reductionist ideas of managing water by sector and product [17] would

be explored and augmented by, say, reflecting on the Chinese philosophy of seeing water as the source of land and energy and life.

Within an adaptive paradigm the concept of 'water security' would be continuously re-viewed and re-constructed to meet the needs of a continuously changing world, rather than considered as a predetermined goal or endpoint (see Figure 1).

Despite some superficial enthusiasm for change, and some minor blending of paradigms, the conversion from conventional to adaptive management, that is management that embraces uncertainty and complexity, has been slow and problematic in all sectors including water [18**]. Institutional inertia, due to deeply entrenched norms, professional practices and behavioral routines, appears to prevent wide-spread acceptance of adaptive management [7,15]. There have been few fundamental structural changes within managing institutions, and without these changes the complexity and uncertainty that make adaptive management necessary, also make it almost impossible to achieve at scales other than the small and local [19,20]. Attempting adaptive management without appropriate institutional support can lead to disenchantment with its more radical aspects. Thus, although the

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