Special issue on comprehensive watershed management: sustainability, technology, and policy

Peter W. J. Batey¹ · Joon Sik Kim²

Published online: 27 May 2021

© The Japan Section of the Regional Science Association International 2021

Abstract

Water is critically important to most facets of human life socially, culturally, spatially, politically, financially, and ecologically. Consequently, managing water holistically is complex and challenging. Integrated watershed management calls for scientific and engineering interventions and socio-economic considerations to improve watershed resilience to both natural disturbances and human activities. The diverse techniques and experiences toward watershed management practice can supplement more considerable experiential learning, especially in real-life implementation. This Special Issue of the *Asia-Pacific Journal of Regional Science* aims to help enhance our understanding of how integrated watershed practice can be supported by lessons from different geographic and socio-economic contexts.

Keywords Watershed management · River basin governance · Global comparisons · Planning tools · Learning from practice

1 Introduction

Over the years, debates on integrated watershed management have received considerable critical attention. There is a substantial body of literature on comprehensive watershed management and the need for collaborative effort. While an integrated watershed management approach entails a fundamental transformation of planning practice (Kim 2002; Batey 2017), debate continues about how we can implement

✉ Joon Sik Kim
joon.kim@xjtlu.edu.cn

Peter W. J. Batey
pwjbatey@liverpool.ac.uk

¹ Emeritus Professor of Town and Regional Planning, Department of Geography and Planning, School of Environmental Sciences, Roxby Building, University of Liverpool, Liverpool L69 7ZX, UK

² Xi'an Jiaotong-Liverpool University, 111 Ren'ai Road, Suzhou Industrial Park, Suzhou 215123, Jiangsu, People's Republic of China

the best strategies in a real-life context. Watershed management practice needs to reflect that context and there is no one-size-fits-all solution. Sharing best practice across different watershed cases helps provide opportunities for learning from tried and tested approaches and proven experience. However, attempts at reproducing or replicating best practices often fall short of expectations due to new challenges and unforeseen problems embedded in local watershed areas. The main challenge faced by many researchers is to find a consistent way to articulate a high level of collaboration and a cross-functional focus between diverse stakeholders at all levels. A multi-dimensional approach to reviewing watershed practice through different disciplinary perspectives plays a critical role in assisting mutual learning from watershed management experiences worldwide.

2 Watershed management: overview

Studies in watershed management may be seen to fall into three categories: watershed management as *engineering*, watershed management as *science*, and watershed management as *studies* (Fig. 1). The first category—watershed management as *engineering*—tends to be based on technical and engineering challenges such as flooding mitigation (England Jr et al. 2007), infrastructure (Anghileri et al. 2013), ecological engineering (Palmer et al. 2014), urban development (Van Roon 2005), and so on. The second category—watershed management as *science*, is concerned with scientific approaches to water quality monitoring (Smith et al. 1997), ecological assessment (Hall Jr et al. 1998), and environmental economics (Grolleau and McCann 2012), to list a few. The third perspective of watershed management as *studies* explores socio-economic perspectives on watershed management practice,

Fig. 1 Three empirical categories of watershed management

which draw upon governance (Imperial 2005), institutional arrangements (Bidwell and Ryan 2006), public participation (Webler and Tuler 2001), etc. With an emphasis on the importance and urgency of integration and collaboration among diverse interests in watershed management practice, a debate is taking place that centers on how these three categories can be merged, forged, and applied cohesively. This also happens to be the primary focus of this Special Issue of the *Asia-Pacific Journal of Regional Science*, addressing comprehensive watershed management from a range of geographic and socio-economic contexts. The discussion here draws attention to how the watershed issues and political foci have been operationalized in planning practice, rather than the success or failure of the integration among the three different views.

3 The six papers forming the special issue

The six papers presented in this Special Issue follow a case study approach to investigate the changing nature of watershed management procedure and implementation in contemporary planning practice. Different geographical regions are considered, including Europe, China, and Japan. An holistic approach is utilized; integrating actions from diverse stakeholders in a watershed region; exploring a comparative review of cross-national case studies; examining perceptions and conflicts in watershed planning practice; and, providing in-depth analysis of different evaluation tools applied to the watershed decision-making process. Taken as a whole, it is hoped that the six papers will contribute to a deeper understanding of watershed management policies and approaches in different nations, especially between the European and Asia regions. Table 1 illustrates the commonality and specificity among the six papers presented here. A common thread linking those papers is the desirability of reproducible approaches and methods that can facilitate a transformation of watershed management practice.

Kim and Batey (2020) illustrate a systematic delivery framework of watershed management by investigating the Mersey Basin Campaign, an institutional winner of an international prize in watershed management. The authors explore a government-sponsored 25-year initiative in the United Kingdom, and provide valuable insights on how watershed partnership can operate throughout its lifecycle. Their results highlight how a watershed partnership can be initiated, how its institutional arrangement can be structured, how the vision can be formed, and how partnership governance can be delivered. The work of Kim and Batey explains the mechanism of the partnership service delivery under three categories: (1) *consensus building* as a primary tool for implementing collaborative efforts in decision-making; (2) *facilitation* as a process of stimulating watershed stakeholders to act for themselves; and, (3) *open participation* as a wider involvement channel for all possible alternatives of the watershed activities. Focusing on six concrete projects implemented under these three aspects, practical lessons and recommendations are identified from each case study, which can be transferable to the wider subject areas of collaborative planning. It is worth noting that those delivery mechanisms can go beyond watershed management practice where a novel work process is required to stimulate coordination

Table 1 Commonality and specificity among the six papers

	Author(s)	Paper title	Watershed management as		Geographic context	Case study
			Engineering	Science		
1	Kim JS, Batey PWJ (2020)	Integrated watershed revitalization: the experience of the Mersey Basin Campaign	●	●	Local focus	UK
2	Kim JS, Batey PWJ, Fan Y, Zhong S (2021)	Embracing Integrated watershed revitalization in Suzhou, China: learning from global case studies	○	●	Local focus International comparison	China
3	Nolf C, Xie Y, Vannoorbeeck F, Chen B (2020)	Delta management in evolution: a comparative review of the Yangtze River Delta and Rhine–Meuse–Scheldt Delta	●	○	International comparison	China, Europe
4	Yamashita R (2020)	Exploring the process of, and potential demand for, water resource land acquisition in Japan	○	○	International comparison Local focus	Japan
5	Kagaya S, Wada T (2021)	The application of environmental governance for sustainable watershed-based management	○	●	Local focus	Japan
6	Mizunoya T, Nozaki N, Singh RK (2021)	Impact of the municipal merger on watershed management: a study of Lake Kasumigaura, Japan	○	●	Local focus	Japan

The watershed management foci of each paper are marked as (● for stronger focus, ○ for less strong focus)

between those who did not work together traditionally, such as the practice of smart city development (Kim 2015).

To address reproducible and transferable approaches in the implementation of integrated watershed management practice, Kim et al. (2021) investigate the usefulness of global case studies to empower integrated watershed revitalization in Suzhou, an historic city in China, located in the Yangtze River Delta. The paper by Kim et al. conducts a comparative study with 12 worldwide watershed institutes using the previously identified Mersey Basin Campaign's delivery mechanism: consensus building, facilitation, and open participation. The study attempts to embrace the global best practice into local political and cultural contexts in Suzhou to promote an holistic approach toward watershed management in the local river basin. The work by Kim et al. also provides useful tools and methods for evaluating local watershed environments, such as word frequency analysis for watershed-related policies to identify the policy emphasis and priority in the given geographic area. Mirroring the finding from the Mersey Basin Campaign paper discussed above, Kim et al. reveal a potential use of 'guanxi', a China's widespread business culture based on trustworthiness, as a problem-solving tool for an informal channel of delivering collaborative action. Learning from global case studies and embracing local political and cultural situations, this paper opens up a further discussion about a collaborative partnership arrangement that may well serve as a resilient model for delivering integrated watershed revitalization in China.

In line with the work by Kim et al. in bringing global insights to a local Chinese city, Nolf et al. (2020) continue their international comparative study by exploring mutual learning on spatial planning and water resource management. They focus on regional design approaches in two watershed regions, the Yangtze River Delta in China and the Rhine–Meuse–Scheldt Delta in Europe. The comparative arguments from two urban deltas highlight similarities in physical characteristics and political management approaches, at the same time, it also found distinct management foci presented in the delta plans and differences in public participation approaches. These results reflect how a long-term historical perspective in evaluating watershed management approaches can benefit from benchmarking lessons from each other. The two deltas are facing common challenges in balancing the three core systems, natural background, infrastructure networks, and occupation, which are also the evaluation framework of the study. Another important finding is related to the analysis method, the systematic use of mapping. Graphical representations of watershed analysis have visualized the primary challenges and responses in delta management practice in the two regions. The study by Nolf et al. demonstrates that mapping and visual communication are critical for the watershed management plan and implementation. It also argues that visual thinking and communication can facilitate strong interplay among wider interest groups, compared with the textual and technical languages often used in delta management policies and plans.

What stands out from the discussion by Nolf et al. is mutual learning from different social, cultural, and political paradigms. Yamashita (2020) addresses this further by emphasizing the importance of communication among stakeholders, especially with cross-national interests. The work by Yamashita uses a survey tool for mapping conflicts between Japan's public opinion and foreign

investors in acquiring land in water source areas. It investigates the local impact (on Japanese public opinion) caused by foreign land ownership (foreign investors from Taiwan and Hong Kong). Yamashita argues that almost all foreign investors involved in land acquisition consider harmonious relations with local communities as one of the important factors. While investors had no intention of undermining the concerns of local residents, public anxiety in the local areas has been raised because there has been no clear information channel. The land selection process has not been transparent to the expected standard, and the purpose of land acquisition is unknown to local residents who are concerned about profit-seeking resales. Yamashita's research finding emphasizes the critical role of public participation and involvement in the administrative process, which is also simultaneously addressed in the first three papers presented in this Special Issue (see Kim and Batey 2020; Kim et al. 2021; Nolf et al. 2020). Yamashita concludes that the procedural practice in the planning process can resolve conflicts by building the appropriate degree of consensus among stakeholders.

To deepen understanding about the planning process and work procedure, Kagaya and Wada (2021) introduce strategic environment assessment (SEA) that can be applied to watershed governance. They investigate the system of governance as a tool for assessing and determining the alternatives in the watershed planning process. With a case study of the Tokachi River basin in Japan, Kagaya and Wada explore the potential of SEA to improve transparency, participation, and inclusiveness for the integration of ecological, social, and political considerations. Their study also employs a series of quantitative and structured methods to support each stage of SEA. These are the Fuzzy Structural Modeling (FSM) technique, the contingent valuation method (CVM), the willingness to pay evaluation (WTP), and the Delphi consensus method. The earlier paper by Nolf et al. argues that visual presentation and graphical analysis can advance communication among diverse stakeholders. In the SEA study, Kagaya and Wada demonstrate the utilization of analytical techniques as communication tools supporting decision-making and consensus-building processes among multifarious stakeholders to balance visions for sustainable development.

All three papers in the Japan case studies concern strategic tools to support decision-making in watershed management practice (Kagaya and Wada 2021; Mizunoya et al. 2021; Yamashita 2020). Mizunoya et al. (2021) expand this discussion toward the use of an input–output model to simulate the ecological system of the Lake Kasumigaura Basin, the second largest lake in Japan. The work by Mizunoya et al. addresses how a dynamic extended input–output model can be applied to evaluate the quantitative impact of large-scale municipal mergers on watershed management. By analyzing a trade-off between economic activities and water pollutants, the study supports the decision-making process of environmental policy options. As environmental policy implementation requires substantial consensus from industry, Mizunoya et al. point out the value of consensus building practice learning from the Mersey Basin Campaign's experience discussed by Kim and Batey.

4 Conclusions

Taken together, the six papers collected in this Special Issue aim to raise awareness about complexity in watershed environments, providing robust knowledge to support holistic watershed management practice, and giving a valuable insight into future research. We hope that mutual learning and discussions included in this collection of papers will prove useful in enhancing our understanding of how integrated watershed practice can be supported by lessons from different geographic and socio-economic contexts.

References

- Anghileri D, Castelletti A, Pianosi F, Soncini-Sessa R, Weber E (2013) Optimizing watershed management by coordinated operation of storing facilities. *J Water Resour Plan Manag* 139:492–500. [https://doi.org/10.1061/\(ASCE\)WR.1943-5452.0000313](https://doi.org/10.1061/(ASCE)WR.1943-5452.0000313)
- Batey PWJ (2017) How can cross-sector partnerships be made to work successfully? Lessons from the Mersey Basin Campaign (1985–2010). In: Shibusawa H, Sakurai K, Mizunoya T, Uchida S (eds) Socioeconomic environmental policies and evaluations in regional science: essays in Honor of Yoshiro Higano, *New Frontiers in Regional Science: Asian Perspectives*, vol 24. Springer, Singapore
- Bidwell RD, Ryan CM (2006) Collaborative partnership design: the implications of organizational affiliation for watershed partnerships. *Soc Nat Resour* 19:827–843. <https://doi.org/10.1080/08941920600835585>
- England JF Jr, Velleux ML, Julien PY (2007) Two-dimensional simulations of extreme floods on a large watershed. *J Hydrol* 347:229–241. <https://doi.org/10.1016/j.jhydrol.2007.09.034>
- Grolleau G, McCann LM (2012) Designing watershed programs to pay farmers for water quality services: case studies of Munich and New York City. *Ecol Econ* 76:87–94. <https://doi.org/10.1016/j.ecolecon.2012.02.006>
- Hall LW Jr, Scott MC, Killen WD (1998) Ecological risk assessment of copper and cadmium in surface waters of Chesapeake Bay watershed. *Environ Toxicol Chem* 17:1172–1189. <https://doi.org/10.1002/etc.5620170626>
- Imperial MT (2005) Using collaboration as a governance strategy: lessons from six watershed management programs. *Adm Soc* 37:281–320. <https://doi.org/10.1177/0095399705276111>
- Kagaya S, Wada T (2021) The application of environmental governance for sustainable watershed-based management. *Asia-Pac J Reg Sci*. <https://doi.org/10.1007/s41685-020-00185-1>
- Kim JS (2002) A collaborative partnership approach to integrated waterside revitalization: the experience of the Mersey Basin Campaign, North West England. Doctoral dissertation, University of Liverpool
- Kim JS (2015) Making smart cities work in the face of conflicts: Lessons from practitioners of South Korea's U-City projects. *Town Plan Rev* 86:561–585. <https://doi.org/10.3828/tpr.2015.33>
- Kim JS, Batey PWJ (2020) Integrated watershed revitalization: the experience of the Mersey Basin Campaign. *Asia-Pac J Reg Sci*. <https://doi.org/10.1007/s41685-020-00146-8>
- Kim JS, Batey PWJ, Fan Y, Zhong S (2021) Embracing integrated watershed revitalization in Suzhou, China: learning from global case studies. *Asia-Pac J Reg Sci* (Forthcoming (AJRS-D-21-00020R1)). <https://doi.org/10.1007/s41685-021-00203-w>
- Mizunoya T, Nozaki N, Singh RK (2021) Impact of the municipal merger on watershed management: a study of Lake Kasumigaura, Japan. *Asia-Pac J Reg Sci*. <https://doi.org/10.1007/s41685-021-00190-y>
- Nolf C, Xie Y, Vannoorbeeck F, Chen B (2020) Delta management in evolution: a comparative review of the Yangtze River Delta and Rhine-Meuse-Scheldt Delta. *Asia-Pac J Reg Sci*. <https://doi.org/10.1007/s41685-020-00177-1>
- Palmer MA, Filoso S, Fanelli RM (2014) From ecosystems to ecosystem services: Stream restoration as ecological engineering. *Ecol Eng* 65:62–70. <https://doi.org/10.1016/j.ecoleng.2013.07.059>
- Smith RA, Schwarz GE, Alexander RB (1997) Regional interpretation of water-quality monitoring data. *Water Resour Res* 33:2781–2798. <https://doi.org/10.1029/97WR02171>

- Van Roon M (2005) Emerging approaches to urban ecosystem management: the potential of low impact urban design and development principles. *J Environ Assess Policy Manag* 7:125–148. <https://doi.org/10.1142/S1464333205001943>
- Webler T, Tuler S (2001) Public participation in watershed management planning: views on process from people in the field. *Hum Ecol Rev* 8:29–39. <http://www.jstor.org/stable/24707126>. Accessed 27 Apr 2021
- Yamashita R (2020) Exploring the process of, and potential demand for, water resource land acquisition in Japan. *Asia-Pac J Reg Sci*. <https://doi.org/10.1007/s41685-020-00169-1>

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.