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Water and Heritage: From Centralized Legacies to Integrated Futures

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Debates on sustainability and climate adaptation bring together a broad range of perspectives that are often treated as opposites: historic practices versus future-oriented interventions, technological fixes versus nature- or culture-based approaches, top-down and large-scale systems versus bottom-up and community-based interventions. These distinctions can be useful as a heuristic, but they can easily slip into a familiar rhetoric of opposing extremes. In practice, approaches overlap, depend on one another, and frequently coexist within the same landscape.

The distinctive perspective that history and heritage bring to water makes this overlapping particularly visible. It invites us to take seriously the fact that water flows are shaped at the intersection of nature, culture, and technology, not along a simple line of opposition. Water is governed through institutions and infrastructures and, at the same time, experienced through everyday practices and contested values. Thinking about water from a long-term perspective, that is in historical terms, encourages scepticism toward monocausal explanations. It reveals that societies have managed water through an inextricable entanglement of technological capacities, forms of political control, and the values embedded in governance tools.

A historical gaze also shows that the difficulty of resisting the pull of easy dichotomies is not unique to our time. Over the last two centuries, and especially through the rhetoric and tools of what has been described as the era of hydraulic modernity, the need to engage with natural systems seemed to fade as technological knowledge and capacity increased. The growth of state apparatuses and the globalisation of financial control led, albeit through different geographies and timelines, to the construction of large centralized infrastructures such as dams, canals, pumping networks, and flood defences, conceived to regulate water at scale. These served agricultural and urban expansion, secured supplies, consolidated political authority over territory, and materialized a philosophy of human–water interaction grounded in measurement, predictability, and control. They were not only technical achievements. They were also powerful symbols of modernisation and progress, whose material legacies endured beyond their technical lifespans, reshaping landscapes and collective memory.

Yet it is equally clear that the benefits of centralised systems have often come with simplifications. Large infrastructures have reorganized social relations while marginalizing local forms of management. They have reduced ecological complexity to measurable and manageable variables

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and, in doing so, obscured other forms of hydrological knowledge. Recognizing these shortcomings and their implications is a major outcome of what we might call a hydraulic post-modernity.

In recent decades, water management has increasingly drawn on logics that challenge the idea of control as the dominant mode of human–water interaction. Integrated and nature- and culture-based approaches foreground adaptation, temporality, and ecological interdependence, reflecting an epistemology that values dynamic balances with nature, society, and culture over their mastery. They seek to work with rather than against natural processes while emphasizing ecological restoration, social participation, and the incorporation of traditional and local knowledge.

It can be tempting, therefore, to frame current debates as a shift from centralized control to integrated, nature-based management. But starting from that opposition risks forcing a superficial story in which "modern" stands against "traditional," or "techno-bureaucratic" against "ecological." As a matter of fact, the ideal of "working with nature" itself can become institutionalized in policy frameworks that reproduce centralized forms of decision-making, merely translated into ecological or participatory rhetoric. Integrated water management, as promoted in international development and conservation agendas, often relies on complex forms of expertise, planning, and coordination that mirror the bureaucratic logic of the very systems it seeks to transform. Ultimately, integrated strategies do not emerge in a vacuum. They build upon, reactivate, or contest the infrastructures and institutional frameworks of earlier eras.

A more productive starting point is to examine how inherited infrastructures and institutions are changed and changing under climate pressure, and how ecological and participatory agendas are being layered onto older hydraulic regimes. This matters because many of the most consequential interventions already operate in hybrid form. Flood protection may rely on levees, reservoirs, and forecasting systems, while also requiring space for water through restored floodplains. Ports may depend on dredging and engineered channels, while experimenting with sediment dynamics and ecological corridors. The issue, then, is not which model should prevail in the abstract, but how specific combinations of expertise, infrastructure, governance, and values shape water landscapes over time and what shared values can create future opportunities. Thinking across water, culture, heritage, and sustainable development, rather than in a compartmentalised way, is therefore not an optional added layer. It is a condition for building approaches that are realistic, comprehensive, and socially legible.

Heritage and historical perspectives can play a central role in this discussion as a critical lens that makes water governance historically legible. They reveal how water landscapes are shaped by path dependencies embedded in material systems and institutional routines, from dams and canals to regulatory standards, administrative practices, and settled expectations about what water should do and how it should behave. This perspective helps trace how such layers accumulate and how they constrain, enable, or redirect knowledge and contemporary interventions. At the same time, it shifts attention away from abstract models and toward the values and power relations that water management carries.

Centralized infrastructures and integrated approaches are not neutral toolkits. They encode assumptions about what counts as legitimate expertise, which scales of action matter, and whose agency is recognized in the governance of water. By linking material systems to collective memory, symbolism, and everyday practice, heritage and history bridge what is often separated: engineering and culture, infrastructure and identity, design and lived experience. They help explain why hydraulic works persist not only because they function, but because they are embedded in narratives of modernization, progress, and territorial control, and why reworking them is as much a cultural and political task as a technical one.

The place of heritage in a Climate-Challenged Future

If heritage helps us avoid the pitfalls of simplification and abstraction, water and its challenges, in turn, prompt us to reflect on, and renegotiate, the meaning of heritage itself. The specificities of water contexts, and the pressures they face, require a reconsideration of heritage's premises and practices. As argued in depth in issue 4.2. of *Blue Papers* (Sliwinska et al, 2025), climate change introduces a fundamentally different kind of challenge, one that exceeds the frameworks of conventional conservation. Climate change matters not only because it generates material and ecological risks, but also because it reshapes the values through which societies decide what is meaningful or worth sustaining. At the same time, climate pressures can elevate the significance of other forms of heritage, particularly those associated with resilience, adaptability, repair, and sustainable interaction with water. In water landscapes, heritage cannot be approached only as something to safeguard. It must also be understood as an active process through which meanings, uses, and responsibilities are continually redefined. In this way, climate change transforms both the material and cultural dimensions of heritage, affecting not only what is at risk but also what is recognized as heritage.

Unlike threats such as war, neglect, or modernization, climate change is systemic, long-term, and deeply intertwined with human–environment interactions. It compels societies to reconsider what is worth preserving, how preservation should be carried out, and which forms of knowledge, practice, and infrastructure can support resilience. Preservation under these conditions is not a matter of maintaining a static record of the past, but of negotiating continuity, adaptation, and transformation in response to new ecological realities and emergent cultural priorities. This calls for a more dynamic understanding of heritage, one that prioritizes flexibility, learning, and responsiveness over permanence. It invites us to consider heritage not only as a record of past achievements, but also as a resource for imagining future coexistence with water. Heritage practices can demonstrate ways of living in more balanced relation with the environment, yet reviving historical practices also has limits and must be approached critically rather than romantically.

This issue of *Blue Papers* brings these perspectives into dialogue through a set of contributions that connect historical analysis, heritage practices, and climate adaptation.

A first group of articles examines how engaging with history can inform future-oriented design and governance. **Elyze Storms-Smeets** opens the issue by asking what it means to learn from the past, exploring heritage country estates in the Netherlands as spatial and social ensemble connected to broader landscapes. **Georges Gharios** brings a complementary perspective from southern Lebanon, focusing on communal pools known as *birket* as hydro-cultural heritage and as locally governed water infrastructures. **Rizki Dwika Aprilian**, **Ricky Purbaya** and **Miktha Farid Alkadri** focus on harbourmaster towers in Java's port cities as maritime symbols of power, trade, and colonisation, and reflect on their contemporary trajectories between neglect and restoration. **Meg John** and **Estere Cvilikovska**, respectively, show how water management has been used to reinforce power and centralize state functions in Iraq and Turkmenistan, tracing into the long-term effects of decades of large-scale interventions that ultimately contributed to the ecological crisis.

A second set of articles explores the relationship between heritage and nature- and culture-based approaches in contexts shaped by climate change. River port cities stand out as an understudied terrain where shipping and urban life intersect, and where climate change-driven flooding and drought are likely to have significant impacts. **Noémi Mené**, **Avicenna Tanubrata** and **José Manuel Pagés Sànchez** examine the role of heritage in maintaining and fostering identity, integration and sustainable development across four river port cities worldwide. Their contribution connects to the methodological explorations and case studies in Part II, which investigates how resilience can be fostered and rebuilt. Restoring the historical socio-cultural connections between rivers and local communities is central to the landscape biography approach proposed by **Gökhan Okumuş**, **A. Güliz Bilgin Altınöz** and **Gerdy A.Verschuure-Stuip**. Reporting on research in the Menderes Delta, Turkey, they show how water can act as a catalyst to reconnect communities to their landscape while promoting holistic heritage conservation strategies. **Shreya Sen**, using an innovative mapping methodology, examines the resilience of traditional practices by revealing how religious water practices overlap with contaminated waters in post-mining landscapes along South Africa's Klip River.

Several contributions also address the consequences of extractive development and centralised water management that ignored ecological limits. **Estere Cvilikovska** examines the Soviet-era Karakum Canal in Turkmenistan, tracing how it enabled the cultivation of vast previously arid lands while contributing to the collapse of the Aral Sea ecosystem. **Rhoda Osei-Nkwantabisa** and **Martin Larbi** explore the case of the Azizakpe island community in Ghana and its coping strategies in response to sea-level rise and flooding. **Mahendranath Sudhindranath** and **John Bosco Lourdusamy** analyze the history of disastrous flooding in Kerala, India, linking contemporary vulnerability to colonial-era extractive practices and the long-term consequences of large-scale, environmentally insensitive interventions. **Georges Gharios** presents a mixed-methods survey of *birkets* in Lebanon, combining historical cartography, satellite imagery and oral histories. Returning to Java's port cities, **Rizki Dwika Aprilian**, **Ricky Purbaya** and **Miktha Farid Alkadri** also consider how colonial-era harbourmaster towers are threatened by environmental change and urban transformation, highlighting the challenges of preserving and adapting these structures while rethinking their role today.

The issue closes with three contributions that link analysis to tools and methods for future design. **João Camelo** presents an application of the value case approach, proposing an interactive online platform to foster resilient water use and raise awareness of consumption among citizens in Alfândega da Fé, Portugal. **Maarten Kleinhans**, **Silke Baltussen**, **Eise Nota**, **Jana Cox**, **Han Meijer** and **Jasper Hugtenburg** discuss experiments on natural sedimentation in the main waterway of the port of Rotterdam, suggesting how working with tidal dynamics and sediment processes can prove beneficial in the long-run. **Leonardo Zuccaro Marchi**, **Shubham Majumder** and **Sara Sabry** conclude Volume 5.1 by elaborating a design strategy for safeguarding the socio-ecological landscapes of the Ifugao terraces in the Philippines, grounded in resilient traditional practices amid depopulation and pressure from mass tourism and urbanisation.

References

"Water, Climate and World Heritage: Navigating Threat and Opportunity". 2025. *Blue Papers* 4 (2). https://doi.org/10.58981/bluepapers.2025.2.ed.