Water Resilience

Creative Practices – Past, Present, and Future

Hein, Carola; Mager, Tino; Rocco, Roberto

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Edited by Carola Hein, Tino Mager, Roberto Rocco

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EDITORIAL

Water Resilience: Creative Practices Past, Present and Future

Carola Hein — Delft University of Technology (Netherlands) — C.M.Hein@tudelft.nl
Tino Mager — Delft University of Technology (Netherlands) — B.T.Mager@tudelft.nl
Roberto Rocco — Delft University of Technology (Netherlands) — R.C.Rocco@tudelft.nl

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Around the world people are facing urgent challenges in terms of their relationship with water—how they live with it, manage it, and how they engage with water-related cultural heritage. Some of the most pressing challenges involve climate change, rapid urbanization, environmental degradation and migration. Several of the UN Sustainable Development Goals are directly (6, 14) and indirectly (3, 13, 15) linked to water challenges.[1] Policy makers, professionals, academics and citizens are grappling with huge uncertainties posed by sea-level rise, storm surges, drought, salinization and soil subsidence, drinking water shortages, water pollution, and increased demand for agricultural irrigation.

1 United Nations, "About the Sustainable Development Goals," accessed July 20, 2019. https://www.un.org/sustainabledevelopment/sustainable-development-goals/.

A deeper understanding of the spaces and practices around water in the past, present and future is key to understanding how societies face the challenges connected to life on this planet. This understanding is also intimately linked to the development of creative practices around water that will allow societies to thrive in the future. Developing a climate-adapted water system requires collaboration and action among diverse public, private, and civic partners, as well as open and participatory practices based on a collective (rather than only a professional) understanding of water systems. Stakeholder engagement is key to creating more sustainable societies, as it allows for the building of support for policies and measures that ensure good water management, as well as the gathering of non-professional knowledge that supports effective policy-making and design. Intangible heritage in the form of cultural practices connected to how societies traditionally manage and live with water is a key element of sustainability.

This is why we pursue a research agenda based on understanding water heritage in its iterative relationship with territories, institutions, and technology, as well as cultural and spiritual practices. We believe that this multidimensional and interconnected understanding of water heritage can help us formulate new and better strategies for dealing with water-related challenges, because they are the frameworks that define our human relationship with water, beyond the crucial issues of sanitation, water provision and management. In fact, we believe that sectors that have traditionally pursued a strong disciplinary approach to water, thus constituting separate ontologies about it, could benefit from joining up their perspectives and having a more holistic understanding of our human relationship with water and how it shapes our territories, institutions, technologies, cultural practices and spiritual beliefs.

Lessons from history

Over centuries, living with water has involved the creation of a system of institutions and practices, as well as buildings, cities and landscapes that embody the lived history of water heritage and adaptations to local geographies, histories and conventions. Contemporary institutions and practices are embedded in physical structures and traditions. To paraphrase Winston Churchill: we shape the landscape and the landscape shapes us.[2] Using the lens of historical institutionalism,[3] we argue that spatial forms

2 Speaking at the House of Lords on 28 October 1943, Winston Churchill said: "We shape our buildings; thereafter they shape us."

3 André Sorensen, "Taking Path Dependence Seriously: An Historic Institutionalist Research Agenda in Planning History," *Planning Perspectives* 30, no. 1 (2015); André Sorensen, "New Institutionalism and planning theory," in *Routledge Handbook of Planning Theory*, edited by Michael Gunder, Ali Madanipour and Vanessa Watson (London, New York: Routledge, 2017), 250-263; André Sorensen, "Planning History and Theory: Institutions, Comparison, and Temporal Processes," in *The Routledge Handbook of Planning History,* edited by Carola Hein (New York, London: Routledge, 2017).

and intangible cultures create path dependencies that need to be recognized and addressed if we wish to innovate and establish more sustainable and resilient practices. To give just one example: For many centuries and in many parts of the world, the predominant approach to combatting floods has been resistance. As notably seen in the Netherlands, engineers have developed large and strong systems of coastal defenses, dykes and other engineering structures to keep water under control. In recent decades, this approach has proved increasingly ineffective and has been slowly replaced by a different type of thinking based on the concept of resilience, in which natural systems are preserved and often rebuilt in order to allow for a more harmonious integration of urban life and landscape.[4] The question of how contemporary societies are going to address water-related challenges is just one example of the complex relationship between water, institutions and tangible and intangible heritage.[5]

Beyond few case studies, the role of water shaping institutions, territories, spaces and cultural practices is still relatively understudied.[6] Historical research contributes to understanding how water management has shaped historical power structures, social biases and ethical values related to water and the role of buildings, infrastructures and landscapes. As such, it connects to various fields of inquiry, such as discussions on planetary urbanisation, deep mapping, hydro-biographies and water-related cityscapes.[7] Water-related heritage preserves and passes on forgotten best practices and the memory of catastrophic events. It harbors the long histories of water systems and safeguards our cultural memory for generations to come.

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4 Han Meyer, "Making Urbanizing Deltas More Resilient by Design," in *International Planning History Society Proceedings*, edited by Carola Hein (Delft: BK Books, 2016).

5 See http://portcityfutures.org, accessed November 8, 2019.

6 Willem Willems and Henk van Schaik, eds., *Water & heritage. Material, conceptual and spiritual connections* (Leiden: Sidestone Press, 2015). P. Huisman, *Water in the Netherlands. Managing checks and balances* (Delft: Netherlands Hydrological Society, 2004). OECD, *Water governance in the Netherlands: fit for the future?* OECD studies on water, OECD publishing, 2014, accessed July 20, 2019, http://www.oecd.org/cfe/regional-policy/publicationsdocuments/BrochureWaterNL%20.pdf. J. Janssen et al., "Heritage planning and spatial development in the Netherlands: changing policies and perspectives," *International Journal of Heritage Studies* 20, no. 1 (2014): 1–21. World Heritage Center, "Living with water," *World Heritage*, vol. 59 (March 2011). Carola Hein, ed., *Adaptive Strategies for Water Heritage – Past, Present and Future* (Berlin: Springer, 2019). Reinout Rutte and Bram Vannieuwenhuyze, *Stedenatlas Jacob van Deventer* (Hamburg: Toth, 2018). Reinout Rutte and Jaap-Evert Abrahamse, *Atlas of the Dutch Urban Landscape – A Millennium of Spatial Development* (Hamburg: Thoth, 2016).

7 Neil Brenner, *Implosions/Explosions: Towards a Study of Planetary Urbanization* (Berlin: Jovis, 2014). Neil Brenner, *New Urban Spaces: Urban Theory and the Scale Question* (Oxford: Oxford University Press, 2019). Nancy Couling and Carola Hein, "Viscosity," *Society & Space: Volumetric Sovereignty Part 3: Turbulence* (2019). David Bodenhamer et al., *Deep Maps and Spatial Narratives* (Minneapolis: Indiana University Press, 2015). Jan Kolen et al., "History matters: the temporal and social dimension of Geodesign," in *Geodesign by integrating design and geospatial sciences*, edited by Danbi J. Lee et al. (Berlin: Springer, 2014), 173-181. OECD, *Water governance in the Netherlands: fit for the future?*. Sander van Alphen, *Tidal dynamics – The hydro-biography as a guide for future water management in the Lauwersmeer* (Vrije Universiteit Amsterdam, 2018). Gene Desfor, *Transforming Urban Waterfronts: Fixity and Flow* (London: Routledge, 2013). Carola Hein, *Port Cities* (London: Routledge, 2011). Jan Kolen et al., *Landscape Biographies* (Amsterdam: Amsterdam University Press, 2015).

Future perspectives

For the purpose of this issue, we have defined water heritage broadly. Water heritage is not just related to engineering structures, buildings or landscapes, and to traditions and cultural practices. We regard water heritage as a complex system intimately connected to questions of how societies organize their socio-spatial practices, carefully negotiated over time. As such, it connects to issues of democracy, participation and power. We took this approach because we believe that history and heritage matter when we wish to design new relationships with water. Historical knowledge about more or less successful water related strategies can help to identify sustainable processes, understand their prerequisites and parameters and thus optimize future decisions. Traditional ways to govern and manage water can teach us much about harmonious coexistence between humans and the natural systems we are hoping to preserve and foster.

New investigations of water history and heritage can help us move forward with sustainable and resilient water management; they are relevant to the redevelopment, redesign, and reuse of existing and ancient water systems as well as to the design of new systems. Historical systems can make an important contribution to the resilience and quality of life of communities, and to their sense of place and identity. Finally, understanding and analyzing the diverse aspects of water-related heritage can also help us refine our understanding of heritage more broadly.

We argue that a thorough and structured understanding of centuries-old, tangible structures and intangible practices can provide insight into earlier moments of water transitions and the long-term implications of policies and structures, focusing on access as well as opportunities for the design of everyday life spaces. Of course, around the world there are many differences in terms of geography, climate, cultural and political contexts, economic and social settings, societal models and also different attitudes towards present and future threats. Scholars and policymakers must closely examine these differences to understand water politics, policy, and management, as well as future design opportunities[8]. When research into the past is closely linked to forward-looking practices in engineering, architectural design, and planning, we are able to make heritage an integral part of future solutions, and a means through which the design of future sustainable practices can be achieved. A multidisciplinary, cross-temporal, and global analysis is needed to explore the relationship between water and heritage based on thorough theoretical and methodological investigation and carefully executed case studies.

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8 Tapio S. Katko et al., "Water Services Heritage and Institutional Diversity," in *Water and Heritage. Material, conceptual and spiritual connections*, edited by Willem Willems and Henk van Schaik (Leiden: Sidestone Press, 2015), 297-312.

Water and heritage initiatives

Several initiatives are aimed at addressing these questions globally. A series of conferences has explored the issue: *Protecting deltas: heritage helps!* (Amsterdam 2013), *Water and Heritage for the Future* (Delft/Fort Vechten 2016), *The international heritage of the water industry* (Barcelona 2018), the panel 'Heritage and Water' at the *UNESCO International Water Conference* (Paris 2019) and *Water-as-Heritage* (Chiayi 2019). An international initiative, Water and Heritage for the Future, with members of leading heritage and water institutions, promotes dialogue between scientists, professionals and policy makers to make water-related heritage a helpful and inspiring part of planning and legislation. In addition, the recent entry of the Water Management System of Augsburg in the UNESCO World Heritage List reflects the increasing relevance of water-related heritage. Reports on two recent events on the topic are included in the notes section of this special issue. This special issue adds only a small piece to this large puzzle. It complements other initiatives such as the forthcoming edited volume *Adaptive Strategies for Water Heritage: Past, Present and Future* (Berlin: Springer 2019), edited by Carola Hein, that brings together articles on five areas of importance to water heritage: drinking water supply, agriculture, land reclamation, protection and defense, transport and trade. The volume is published in open access and is available here https://link.springer.com/content/pdf/10.1007%2F978-3-030-00268-8.pdf.

Many other important subjects have not been touched upon in recent discussions on water heritage. For example, the role of canals and sewerage systems in water heritage merits further examination. Other, larger themes, such as hydropower, natural, industrial and urbanized waterscapes, water narratives, legal issues, and education connected to water heritage also deserve additional attention. To date, the discussion on water and heritage has largely neglected issues of the open sea. New scholarship is emerging on the urbanization of the oceans (their increased use for shipping, raw material extraction, energy production, and the siting of pipelines, cables, and other networks). The question of whether and how to preserve drilling rigs and other sea-based construction as heritage is also being addressed.[9] These concerns all call for renewed attention to how water shapes institutions, cultural practices and territories. They also demand attention to how water related technology shapes our built environment and our relationship with water. Scholarly investigation of long-term consequences can be of help to planners and policymakers who need to integrate historical knowledge and experience into future-oriented and sustainable solutions that are resilient, socially just, and durable. In addition to the necessary deepening of these tangible aspects of water-related heritage, more intensive study of specific spiritual and also legal concerns in relation to water and its use can illuminate issues of equitable distribution and inclusion.

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9 Nancy Couling and Carola Hein, "Blankness: The Architectural Void of North Sea Energy Logistics," *Footprint* 23 (2018).

Topic of this issue

This special issue brings together five peer-reviewed main articles from both established scholars and emerging researchers with two contributions from practitioners.

The Lausanne-based New Zealand architect and urban researcher Nancy Couling, the Berlin and Santiago based German architect and urban researcher Paola Alfaro d'Alençon and the Zürich based German-Turkish architect Medine Altiok focus on water territories and the need to develop water-based methods of conceptualizing and visualizing waterscapes, their history and potentiality. They particularly emphasize the value of narrative cartography as a means to tell individual stories and to explore shared relationships with water. They analyse the potential of such cartographic experiments by focusing on two projects: Streamscapes in Germany and Mittelmeerland in the Mediterranean.

Harty den Hartog, a Dutch Shanghai-based urban designer and researcher, analyses the evolution of China's Yangtze River Delta, a region crisscrossed by natural and man-made water bodies that have all but disappeared due to rapid urbanization. He develops a critique of the recent shift toward well-manicured and visually attractive but functionally inadequate waterfronts. Den Hartog concludes with recommendations on how to reverse this trend.

The Italian urban planner Gloria Pessina investigates the case of Ahmedabad, India, where new interests in heritage and waterfront property have been intertwined with local and national politics as well as real estate development interests, leading to profound spatial transformation of the city. Although part of an effort to modernize Ahmedabad, the transformation is also connected to the growing strength of reactionary Hindu nationalism.

The Finnish civil engineers Laura Inha and Jarmo J. Hukka use the long history of adaptation and sustainable development in the city of Seattle to investigate how democratic policy-making has led to an enviable state of environmental sustainability in the city. The article considers how a specific set of policies and practices can lead to sustainable water management, and concludes by reaffirming the importance of engagement and action at the local level.

The Dutch architect Klaas de Jong, finally, uses an architectural project that formed part of his master's thesis to explore the political significance of water in the Israeli-Palestinian conflict. De Jong explores form and function in a proposal for a Temple of Water that could potentially act as a connecting space between two opposed communities. While doing so, the author explores the role of water in the ongoing conflict and describes how Israelis and Palestinians could be united in their need for sustainable water management in the region.

The practice section includes two contributions that provide practitioner perspectives. In the first contribution, the British social scientist Angela Connelly, the German based Jordanian environmental engineer and water policy expert Serene Hanania, and the French-Polish environmental engineer Joanna Kiernicka-Allavena explore how practitioners can consider both water management and heritage at a time when climate change demands greater resilience. They consider the aesthetic and social importance of water as well as its technical and economic contributions. Considering two case studies – the deculverting of the River Roch and responses to the disastrous flooding of the city of Wroclaw – the article makes recommendations for practice. In an era when climate change demands greater resilience, more attention must be paid to the intimate relationships between water and heritage.

In the second contribution, the Iranian-Dutch heritage specialist and architectural historian Arash Salek and the Dutch water specialist Henk van Schaik explore Persian Qanats, a traditional form of fresh water supply. The article focuses on the vital interaction of man and Qanat within the arid Iranian plateau and shows how inventiveness and traditions have institutionalized the interaction between water and man over thousands of years. From both a technical and a socio-cultural perspective, the article argues for the application the Actor-Network Theory as a methodological principle for revitalizing the Qanats in the Middle East and as a helpful tool for sustainable development.

This special issue is intended to promote further work on water heritage in all its forms and to contribute to a new understanding of heritage. Historical sites and practices are by no means merely objects of historical value, but can play a crucial role in meeting the challenges of our time. Here, equal cooperation between historians, engineers and politicians will play a key role. We hope that the multidisciplinary character of this issue may inspire the readers accordingly.

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Carola Hein is Professor and Head, History of Architecture and Urban Planning Chair at Delft University of Technology. She has published widely in the field of architectural, urban and planning history and has tied historical analysis to contemporary development. Among other major grants, she received a Guggenheim Fellowship to pursue research on The Global Architecture of Oil and an Alexander von Humboldt fellowship to investigate large-scale urban transformation in Hamburg in international context between 1842 and 2008.

Tino Mager is postdoc researcher at the chair History of Architecture and Urban Planning at the Department of Architecture of the Delft University of Technology. Tino's main interests include heritage conservation and cultural heritage theory. In addition, he has published on post-war modernist architecture and its preservation, on Japanese architecture and the transnational education of artists in the 19th century. As part of the ArchiMediaL project, he is working on the development of methods for the use of artificial intelligence in architectural historical research

Roberto Rocco is associate professor of Spatial Planning and Strategy at the Department of Architecture of the Delft University of Technology. He specialises in governance and sustainability, with a focus on social sustainability and spatial justice.

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MAIN SECTION

Narrative Cartography: Capturing a Holistic Perspective on Waterscapes

Nancy Couling — Delft University of Technology (Netherlands) — nancycouling@hotmail.com
Paola Alfaro d'Alençon — Berlin Institute of Technology (Germany) — dalencon@u-lab.de
Medine Altiok — RWTH Aachen (Germany) — medinealtiok@gmail.com

ABSTRACT
Water territories challenge inherited, land-based methods of capturing their history. They are a vital commons, where social, technical, political and cultural interests intertwine, potentially also causing conflict. Attention is currently focused both on the ecological importance of the water cycle for human well-being and ecosystem services, as well as on the unpredictable aspects of water through the effects of climate change. This paper argues that such interconnected challenges require new tools and methods of conceptualising and visualising waterscapes. Narrative cartography developed with citizen's input, reveals itself to be a highly inclusive methodology which can capture neglected knowledge about the past as well as propose visions for the future. This method is discussed in two different geographic contexts through the academic projects *Streamscapes* in Germany and *Mittelmeerland* in the Mediterranean.

KEYWORDS
Fluvial Environments; Citizen Science; Cartographic Representation; Narrative Mapping.

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Introduction

In the European context, water management has traditionally been steered by rational measures to control water and ensure that vital services including river and maritime transport, drinking-water supply, and cooling of industrial processes are maintained. Water spaces continue to make an important contribution to national revenues through these activities and have performed a major role within the narrative of industrial modernity.[1] But today this narrative is challenged by complex global processes such as climate change and the spread of pollution, which are intricately connected to the complete system of both large and smaller-scale water-spaces. Such processes have wide-ranging effects and elicit broad public concern.

Current tools and planning methods around water are proving themselves inadequate to address the threatening quantitative "unknowns," the complexity of interactions and to provide workable solutions for the transition to a post-industrial, post-colonial and post-oil society. The EU Water Framework Directive (2000) is aimed at the achievement of "good ecological status" of European waters by 2015, with two further management cycles until the final deadline for meeting objectives in 2027.[2] This directive acknowledged the importance of water systems as a "commons"—in terms of ground water, which recognises no legislative borders, in terms of river basins which may cross national borders and also in terms of coastal and estuarine ecosystems vulnerable to the input from river basins. "Water is not a commercial product like any other but, rather, a heritage which must be protected, defended and treated as such."

While water management is generally carried out at the regional or national administrative level, its effective execution depends on a large group of diverse actors, both professional and civil, hence the directive also recognises the importance of public participation in the updating of management plans (art. 46). An important distinction must be made between the "commons" of water itself, and the jurisdiction of the spaces it is flowing *through*. This is the property of water space which most clearly distinguishes it from *land* space and which demands different modes of representation and cartography. Fluidity, temporality and intersecting dynamics are difficult to capture through traditional, Cartesian mapping techniques. We argue that to *represent* the hidden, fleeting dimensions of water-spaces is to take the first step towards sustainable and integrative planning and management.

At the scale of the sea, Marine Spatial Planning is an example which initially largely omitted to take the marine ecosystem into consideration

1. Rania Ghosn and El Hadi Jazairy, *Geostories: Another Architecture for the Environment* (New York: Actar, 2018).

2. Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

and is now turning to a loosely-defined "ecosystem-based" management approach.[3] Awareness of the immaterial cultural value of water spaces is increasing and the development of methods with which to acknowledge these values is the subject of important research.[4]

Water heritage is therefore faced with the concurrent challenges of encouraging public involvement in managing a valuable commons and in representing the pluri-dimensional aspects of water history "in the making." Today's decisions determine tomorrow's history and to forge a pathway towards a more balanced approach to water management and governance is to begin with a more balanced input of knowledge.

How can local social and physical knowledge complete an existing technical appraisal of water territories and inform their ongoing transformations?

Historical cartography provides important references with which to imagine ways of addressing this question. Interconnected water spaces of rivers and seas embody long cultural histories and deep sociocultural meanings have developed around them, alongside the formation of towns, ports and trade networks. They have witnessed intense exchange, radical physical transformations, stagnation, crisis and conflict. While layers of physical artefacts bear witness to these events, some histories may also be swept away or submerged.

Maritime cartography was traditionally a tool used by sailors to map the geographical and cultural discoveries of seas, rivers and oceans, including narrative elements—a combination of fact and imagination. Mapping has always influenced the state of knowledge about the world and cannot be separated from scientific knowledge, therefore mapping evolved with the tools of scientific measurement, while the narrative aspects have been largely subsumed by science. However cartographic drawings can be more than techno-scientific representations of borders, mountains and infrastructure; they can interpret, review and comment.[5]

The Catalan Atlas of Europe and the Mediterranean of 1375 **[Fig. 1]** is Abraham Cresques' "visual story" of the Mediterranean consisting of a compilation of trade routes, sites of raw materials and resources, dynasties and places, including all major cities along the coastline with only a few inland features. Religious references are illustrated as well as a synthesis of the medieval travel literature of the time; "an overlapping set of information that attempts to convey a broader meaning."[6]

3. UNESCO, *Marine Spatial Planning*.

4. Gee et al., "Identifying Culturally Significant Areas for Marine Spatial Planning," *Ocean & Coastal Management 136* (2017): 139–47

5. Medine Altiok, "Poetic Sciences–Territory with a Liquid Border," *Man and Space* 58 (2011): 680-681.

6. Mohamad Ballan, "Cartography, Maritime Expansion, and 'Imperial Reality.' The Catalan Atlas of 1375 and the Aragonese-Catalan Thalassocracy in the Fourteenth Century," *Ballandalus*, August 27, 2014, https://ballandalus.wordpress.com/2014/08/27/cartography-maritime-expansion-and-imperial-reality-the-catalan-atlas-of-1375-and-the-aragonese-catalan-thalassocracy-in-the-fourteenth-century/.

FIG. 1 Map of Europe and the Mediterranean from the 19th-century copy of the 1375 Catalan Atlas, second chart, first cartography

Storytelling shapes the spaces we live in by connecting our individual experiences; narratives link socio-cultural conditions to physical spaces. Perceptions and meaning rely on the morphological aspects of a space and the cultural processes behind it, but most importantly they rely on a dynamic network producing social knowledge.[7] Within this framework, mapping opens a possibility to graphically represent storytelling by allowing collective production and the visualisation of perceptions.

Through a discussion of the two academic projects *Streamscapes and Mittelmeerland*, this paper argues that narration and cartography can play a critical role in creating new solution-led paths of knowledge production for the contemporary challenges around water spaces. In particular in finding a balance between urban production and ecological processes; narration in understanding the genealogy of water spaces and cartography in representing multiple relations. In the two case-study projects, the process of participatory narration steers the production of water-knowledge into a public direction—it is therefore a powerful tool to complete and overcome dominant narratives that may serve particular, official or corporate purposes.[8] The method of narrative cartography served both to capture the fluvial and temporal dynamics of water spaces and to incorporate local knowledge gained from interviews, hence the search for innovative forms of representation was central to both projects. Narratives enriched the territorial representation by allowing cross- and multiple readings; they visualize the collective imagination of both sites.

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7. Sophia Psarra, *Architecture and Narrative: The Formation of Space and Cultural Meaning* (London: Routledge, 2009).

8. The Geesthacht fish ramp described below (*Streamscapes*), serves as an example of a dominant corporate narrative. Individual members of civic society are keenly aware of the strategic production and dissemination of such narratives in order to dilute public unrest around contested political decisions.

The discussion of the two sites presented here enables wider geopolitical questions about the space of the sea to be addressed from two different perspectives; on the one hand, how public involvement with the sea can be encouraged further inland along its tributaries (*Streamscapes*) and on the other, how the Mediterranean can be imagined, and possibly governed as a unified territory, shaped by the central water body (*Mittelmeerland*).

The cartographic basis for the two academic projects was first established through scaled, analytical maps using open source GIS data or Google maps. In both cases, these maps were then modified and completed after site-work, during which additional territorial information and observations were gathered in interviews with local experts and communities. While this methodology was common to both cases, the focus of the two projects differs; in *Streamscapes*, the objective was to articulate and document intangible connections from the rivers Havel and Elbe to the North Sea through collaborative mapping in three regional towns. Based on the hypothesis that the design and management of the (North) sea space requires innovative concepts for greater public involvement, the project examined the network of relations and asked how far the sea penetrates inland according to local experience, and in which ways its presence is felt? Cartographic methods were used both to support communication during the information-gathering process and also as a means of presenting the results, however the project's main focus was the collection and documentation of local narratives.

At a larger scale, *Mittelmeerland* explores the future of the Mediterranean Sea as a territory of water through six distinct Mediterranean metropolises: Dubrovnik, Tangier, Beirut, Algiers, Alexandria and Izmir. The project focuses on finding innovative representation techniques that "poetically" illustrate a territory in transformation, mapping fluid and narrative aspects and using historical maps as a source of inspiration. Narrative representations were able to complete knowledge about the fluvial properties of this space and address conflicting entities through new perspectives and proposals.

The first part of this paper reviews and assesses the potential contribution of narratives in the contemporary production of space, and why current theory in the spatial disciplines is paying closer attention to this method of sourcing local and pluralistic knowledge. Part two draws on fieldwork in the *Streamscapes* project in Northern Germany to demonstrate how narratives were able to capture relations; in both natural daily or seasonal cycles and cultural (political/industrial) development cycles. Part three discusses the power of narrative mapping to analyze and visualize the dynamics of the Mediterranean's urban coastline including the collective memory, the mutual dependencies of land and water, the construction of new ports, which are often in conflict with sensitive sea ground and the transformation of society.

PART I: Narrative mapping and planning; the social background

Waterways are liquid libraries. They are the oldest systems of transport, exchange and sites of settlement hence they are vessels of stored knowledge. Water management is a type of rationality deeply embedded in the territory[9] and around which social, political and technological forces converge. Historical legacies are embedded in the water systems and their extended spaces of reference—partly visible in the construction of banks, bridges, locks and harbours, but also partly concealed from view and always transforming; "the entire river space exists in a constantly advancing, continuous process of change."[10]

According to urban researchers Brook and Dunn,[11] mapping is a critical instrument to understand the individual essences of space, place and networks. Hence, maps and narration have deepened the understanding of territories and completed technical maps of these territories with local knowledge. Narration therefore plays a critical role in understanding the genealogy of water spaces and civic participation steers the story towards greater public involvement. The concept of water resilience, for example, suggests a widespread holistic and multi-scale vision, proposing a nexus of thinking between water resources, the local built environment and the territorial scale. Water resilience calls for a conceptualization of plural spheres, acting both at ecological and socio-cultural levels and triggering a new type of dynamic understanding of water spaces. In water-sensitive urban design for adaptation and mitigation measures in climate-proof urban development, water resilience also means a shift in the relative importance of technical knowledge in favor of locally-produced knowledge.[12]

In order to exploit available potential and to support "on the ground" municipal development, the process of acquiring local knowledge requires committed people and good communication between local actors and impulse generators. Traditional planning instruments, such as master plans or urban redevelopment measures, are becoming less and less suitable for resilient forms of development due to the lack of holistic process approaches which incorporate the participation of different actors and their knowledge of the local environment.[13] An important legal precedent in this area was achieved by the New Zealand Maori in the recognition of

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9. Paola Viganò, "The Horizontal Metropolis: a Radical Project," In *The Horizontal Metropolis Between Urbanism and Urbanization*, edited by Paola Viganò, Chiara Cavalieri, and Martina Marcelloni Corte (Dordrecht: Springer, 2018).

10. Martin Prominski et al., *River.Space.Design* (Berlin, Boston: De Gruyter, 2012).

11. Richard Brook and Nick Dunn, *Urban maps: Instruments of narrative and interpretation in the city* (Farnham: Ashgate, 2012).

12. Jacqueline Hoyer et al., *Water sensitive urban design* (Berlin: Jovis, 2011).

13. Michal Kravčík et al., "Water for the Recovery of the Climate—A New Water Paradigm," Slovakia (2007).

a river as a living being. This in turn opened the door for many indigenous groups with similar worldviews.[14]

Citizen Science: direct participation and self-empowerment of civil society

The difficulty to predict urban developments in many cities and regions provides the impetus for a change of perspective on developmental governance. New forms of governing and organizing commons are playing an important role in urban debates[15] and broader sections of civil society are being activated to participate in questions of urban policy and development. The fundamental idea of the Commons is central to these debates.[16] A field of experimentation for the emergence and testing of new forms of cooperation has opened, supported by new legal regulations between the state, civil society and private-sector actors.[17] Here, the assumption is made that inclusive development is not possible without the incorporation of different types of citizen's knowledge and the trust in the respective ability of "other" members of civil society to act responsibly.

The drive for "Citizen science," which has been adopted by the German Ministry of Education and Research's "Science Year," aims for the common creation of knowledge. The participation of citizens in urban transformation processes and knowledge creation is formulated as a key-task for the future in this research and innovation agenda.[18] A civil society active in building up momentum for science and knowledge creation, in particular through successful networking and cooperation between different groups of actors, is recognized as being vital component to this process. Citizen Science was therefore particularly relevant for the German "Science Year of the Seas and Oceans"—a topic within which a large rift between scientists and the public has developed.[19] Coping with the socio-spatial transformation of water spaces requires not only interdisciplinary and transdisciplinary cooperation of experts from science, municipalities and industry, but also dialogue with citizens in the entire transformation

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14. Eleanor Ainge Roy, "New Zealand river granted same ligal rights as human being," The Guardian, 16 March 2017. Accessed September, 11 2019. www.theguardian.com/world/2017/mar/16/new-zealand-river-granted-same-legal-rights-as-human-being.

15. Elinor *Ostrom Governing the Commons: The Evolution of Institutions for Collective Action*. (Cambridge: Cambridge University Press, 1990).

16. LabGov—the LABoratory for the GOVernance of the City as a Commons, "The City as a Commons Papers: The Founding Literature and Inspiratinal Speeches," in The Co-Cities Open Book. LabGov, 2019. Accessed May 13, 2019. http://labgov.city/co-city-protocol/the-co-cities-open-book/.

17. Mary Dellenbaugh et al., *Urban Commons:Moving Beyond State and Market* (Basel: Birkhäuser, 2015).

18. "Die Wissenschaftsjahre," accessed September 11, 2019, https://www.bmbf.de/de/die-wissenschaftsjahre-229.html (German only).

19. For a more detailed discussion on Citizen Science, see Hauke Riesch and Clive Potter, "Citizen science as seen by scientists: Methodological, epistemological and ethical dimensions," *Public Understanding of Science*, Vol 23, (2014): 107-120.

process, from the problem definition to the final project.[20] These approaches aim to transfer and develop experience and knowledge which is accessible to as broad a section of society as possible. If large parts of society are considered passive consumers of knowledge, then it is unlikely that the knowledge generated will be suitable for society and its needs. This is the way in which science is called upon to produce insights and results for the development of a relevant and worthwhile future that fits the needs of the majority of citizens.

Co-creation of knowledge

The combination of methods from design, social sciences and spatial planning pursues a new interdisciplinary approach that opens up space for experimentation.[21] Design is closely linked to the task of creating knowledge that provides information about what should be (Deontic questions). In the context of design methods, it is crucial that "co-creation" is understood not as "design for user" or "design with user" but as "design by user."[22] In many projects across the globe, co-creation uses mapping as a method of representing and communicating important spatial issues, for example the community mapping lab in the US23 or Iconoclasitas in Argentina and Mexico.[24] Projects such as those undertaken by the "Counter Cartography Collective" formed by cultural studies students and activists at the University of North Carolina, focus on social relations—"the interplay between facts and perception." They produce maps of specific realities which do not appear through official channels, yet capture the critical political dimensions of space.[25] The combination of participation and design in co-creation processes offers a high potential for the generation of accepted innovations[26] and represents a promising basis for designing demand-oriented regional development scenarios. The chosen design-related, participative approach described in the following case-studies thus offers ways of representing both tangible and intangible aspects of complex water-spaces, which can then suggest directions for regional development.

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20. "Bürger schaffen Wissen, Die Citizen Science Plattform," accessed September 11, 2019, https://www.wissenschaft-im-dialog.de/projekte/buerger-schaffen-wissen/.

21. Herlo, Bianca, et al., "Participatory Design and the Hybrid City. The Living Lab Mehringplatz, Berlin, and the Project 'Community Now? Conflicts, Interventions, New Publics'" in *Hybrid City 2015: Data to the People, Proceedings of the Third International Biennial Conference* (Athens: URIAC, 2015).

22. Elizabeth B. N. Sanders and Pieter Jan Stappers, "Probes, toolkits and prototypes: three approaches to making in codesigning," *CoDesign: International journal of cocreation in design and the arts* 10, no 1 (2014): 5-14.

23. http://www.communitymappinglab.org, accessed September 11, 2019.

24. https://www.iconoclasistas.net, accessed September 11, 2019.

25. kollektiv orangotango+, *This Is Not an Atlas (Bielefeld: Transcript, 2019).*

26. Sleeswijk Visser et al., "Contextmapping: Experiences from practice," *CoDesign: International Journal of CoCreation in Design and Arts* 1(2), (2005): 119-149.

PART II: *Streamscapes*—From the Spree to the Sea—a cartographic experiment

The project "*Streamscapes*—From the Spree to the Sea—a cartographic experiment,"[27] began with the hypothesis that important social relations around water may not be captured by technical or statistical data. In particular, how individuals "sense the sea" through their local waterways, was a subject about which little existing research could be found. The exploration under discussion in this section was interested not in producing a piece of historical research, or a chronological reconstruction of events around the waterways, but how experiences are perceived by local inhabitants through the way a story is told. Hence capturing narratives was a key objective. The three sites of local fieldwork are diverse, but together they enabled us to collate a geographically-specific configuration of dynamic social relations to the sea as mediated by the space of the river.

Within the framework of German Science Year 2016*17 "Seas and Oceans,"[28] the content and methodology of this project drew the thematic of the Sea back into the German hinterland and focused on how connections and relations are understood and experienced today. In contrast to the northern Baltic coastal metropolitan centers of Copenhagen, Stockholm, Tallinn, Helsinki and St. Petersburg, after the fall of the Hanseatic League in 1534, the southern Baltic countries of Germany, Poland and Lithuania orientated their capitals inland on the river.[29] The German coastlines to the North and Baltic Seas are relatively sparsely populated, with the coastal region of Mecklenburg-Vorpommern having the lowest income in Germany.[30] To what extent do these demographic conditions contribute to widening the psychological distance and diluting a sense of civic responsibility for the state of the German North Sea—a "commons" of 28,600 km^2 and combined with the German Baltic Sea, an area equal to 10% of the land area?

The investigation chose three sites along the geographically most direct waterway from Berlin to the North Sea in a north-westerly direction from the Spree to the Havel river, the Elbe river and the North Sea. The towns of Garz on the Havel (pop 150), Geesthacht on the Elbe (pop 3000) and Brunsbüttel (pop 13,000) on the Elbe/North-Baltic-Sea-Canal, are each the site of one of the many locks or weirs along this route which testify to the technical and economical project of German river transport. During

27. See online project documentation in "story-map" format: http://www.streamscapes.de, accessed October 29, 2019.

28. *Streamscapes* is a prizewinner in the University Competition "Hochschulwettbewerb" in Science Year 2016*17 Seas and Oceans, funded by BMBF (German Ministry of Education & Research) & Wissenschaft im Dialog (Science in Dialogue). Archive project blog: https://www.hochschulwettbewerb.net/201617/spree-zur-see/

29. Wilfried Görmar and Bärbel Leupolt, "Übersicht Zu Raumstrukturellen Entwicklungen in Der Ostseeregion Aus Historischer Perspektive," *Information Zur Raumentwicklung* 8/9 (2009).

30. Statistisches Bundesamt, "Gesamtwirtschaftliche Ergebnisse im Bundesländervergleich-Ausgabe 2018."

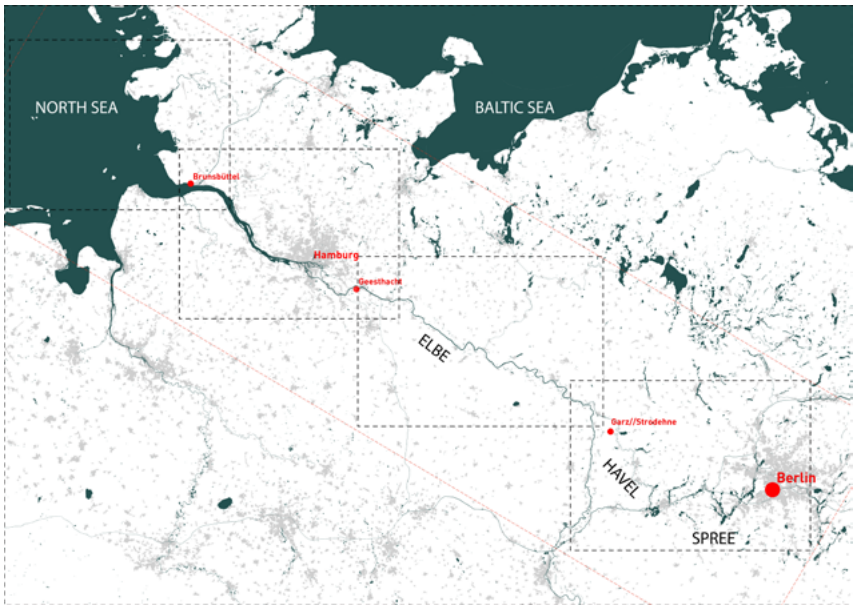

FIG. 2 Area of investigation, (northern Germany), *Streamscapes* project. The map shows a diagonal transect traced in a North-West direction between Berlin and the North Sea, which describes the area of investigation following the flow of three connecting rivers; the Spree, the Havel and the Elbe. The three towns of Garz (on the Havel river), Geesthacht (on the Elbe river) and Brunsbüttel on the North-Baltic-Sea canal, are the sites of three chosen locks where interviews and collective mappings were carried out. The map also shows four segments with different characteristics along this sequence; the Spree and the Havel close to Berlin, which are connected to lakes and renaturalised areas, the non-tidal Elbe river from Geesthacht to the Havel inflow, the downstream Elbe including Hamburg and important shipping functions, and the mouth of the Elbe into the North Sea.

fieldwork in summer 2017, the study group made direct contact with around 450 citizens in these towns, carried out interviews and gathered information through mapping [Fig. 2].

Border relations

While this most direct water route from Berlin to the North Sea had enjoyed marked importance, with towns such as Garz building ports and quays, narratives were able to reconstruct a picture of the complexity of border relations which developed around the political division of Germany and which severed local connections to the sea. While flowing through all borders, the water system was physically and psychologically rerouted through political constructions that determined interrelations between citizens, their rivers and seas. Locals described the economic and demographic decline they experienced as the route from Berlin to the North Sea through the Havel was strategically bypassed. Over 156 river kilometers of this route flowed through the German Democratic Republic (GDR-East Germany). A parallel West-German river route—the Elbe side-canal (1976)[31] then became the busiest waterway. Seamen based in Garz who had sailed both oceanic and inland water-routes carrying coal, grain and other goods through Poland, Czech Republic and from the ports of

31. Linked to the east-west Elbe-Havel canal running to Berlin over the Magdeburg river crossing.

Rostock and Hamburg as far as Australia, now worked locally as tradesmen. Rather than the North Sea, the Baltic Sea, accessible through the GDR, was the local maritime reference and the place for family holidays.

Specific sections of these rivers previously functioned as national borders. Aligned along the river's center-line, stories described how it was possible to paddle up the river on the GDR side, but not cross. Inter-state borders are now still frequently marked by the river, but tributaries from different states comprise a shared river system, bringing material results of conflicting policies, such as polluting fertilizers, downstream. Neighboring towns across the river sharing responsibility for the same ecological system, described how they are subject to differing legislative systems and are distanced by administration.

Historians are well aware of the selective nature of history-writing and how certain meta-narratives gather momentum and dominate their historical period. The effects of border construction on interactions along the river is a story with important implications, but as many experiences from the ex-GDR, has already become fainter and more difficult to hear.

River cycles of production and ecology

The economic importance of the river system for industrial production and transport was transmitted by local people—increasing as we moved downstream into the main transport routes, but the ecological space of the river is understood as a much broader, dynamic system of dykes, floodable areas, cycle paths, flora and fauna as well as bird, fish and animal life. In particular these aspects of the river system are keenly observed by local citizens. Hence making space for a frequently flooding river is an unspoken public contract. At such times, it is only through the assistance of the local community that flood events can be bought under control. Both in Geesthacht and Garz, the 100-year floods of 2013 have left a marked impression—the community in Garz were given 8 hours to build a dyke in order to avoid the environmental catastrophe of a flooded bio-gas plant.

Changes in the ecological balance are immediately sensed by citizens, who reported how, through reduction in river-side industry, "renaturalization" has taken place, encouraging rare wild species such as the wolf to return to some areas, and increasing the frequency of the previously endangered species such as the White-tailed eagle. But locals in the wetlands around Garz have also noticed climate change through increased dryness—less mosquitos, therefore less frogs and less food for the visiting stork population which rests and breeds in the region from March to August before the winter migration to Africa. Citizens cherish their annual stork visits and each village has a "stork-father," who records and monitors their movements.

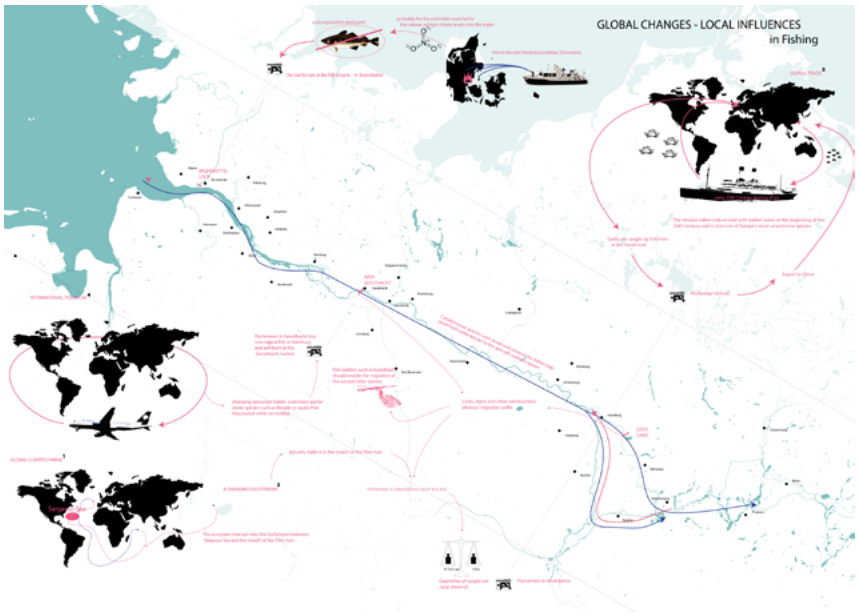

FIG. 3 Global changes—local influences in fishing. This map describes four regional changes which can be traced back to global causes:

1. Man-made obstacles (in the form of locks, weirs) and the decline of the local eel population; the eel was once plentiful in the Havel, says fisherman Schröder in Strodehne, but since the rivers were altered for navigation with channels and locks, significantly fewer eels now make their way upstream.

2. Changes in the Gulf Stream have a direct impact on local waters; eels spawning in the Sargasso Sea "ride" the Gulf Stream in order to reach Europe, therefore due to these changes, eels are arriving in fewer numbers.

3. Changed production chains; according to the fish vendor in Brunsbüttel, the recent decline of the cod supply is linked to a fire in the port of Fredericia in Denmark. The resulting release of nitrate from the fire extinction damaged the cod stock—a fact that is now reflected directly over his counter.

4. Tourism; increasing international tourism is changing consumer habits—exotic fish species including sea bream and squid, are in demand. The Chinese mitten-crab was introduced to the Baltic Sea via commercial vessels at the beginning of the 20th century and despite locks and other obstacles, the crab has made it over the Elbe and into the Havel. Garz fishermen then export them back to China!

The river system is part of, and intersected by, global migration paths. Construction works along the river for the benefit of transport, have made it difficult for fish to move through the system from the sea to fresh water and vice-versa. Fishermen upstream notice the effect of Geesthacht's weir, built in 1960. Despite the installation of Europe's largest fish ramp in 2010, financed by the energy company Vattenfall as ecological compensation for the coal-fired power-station Moorburg by Hamburg, fishermen on the Havel explain how the numbers and variety of fish species that make it through has been drastically reduced and the ecology of the river system transformed. The eel is one example—a fish which migrates annually from the Sargasso Sea to the Elbe, and previously as far upstream as Garz. Vattenfall boasts about the success of the initiative, but local environmentalists criticize the large numbers of fish from the Elbe taken in with the river-water used for cooling the power plant and the resulting rise in temperature of water re-released into the Elbe.

The tangible experience of these cycles is important for local inhabitants. These stories demonstrate how citizen's narratives about the

river and relations to the sea are able to effortlessly capture and integrate the dynamic global cycles of the water system. [Fig. 3]

The narratives move between scales, bringing cycles of time and place together in particular events and capturing the rhythm and elasticity of relations, hence the narrative map avoids contradictions of scale implicit to a Cartesian map. Both natural daily or seasonal cycles and cultural (political/industrial) development cycles are expressed and understood as being intimately interwoven, reaching far beyond Germany and the North Sea.

Intangible Qualities

The resounding appreciation of the river spaces as representing natural cycles was common to people in all three places. The tide is felt in the Elbe as far as Geesthacht (174 river km from the North Sea), where the weir prevents it from being felt further upstream. For participants in our project, the tide has multiple associations, including the uncontrollable force of nature. This implicit understanding was recorded in a "verbal map" where the river space is occupied by associations [Fig. 4].

The sounds, colors, light, movement, space and atmosphere of the river create a direct emotional connection to the sea and trigger memories of certain experiences and events. This connection is affirmed by citizens to be of great value, standing for a fundamental quality of life. Over the

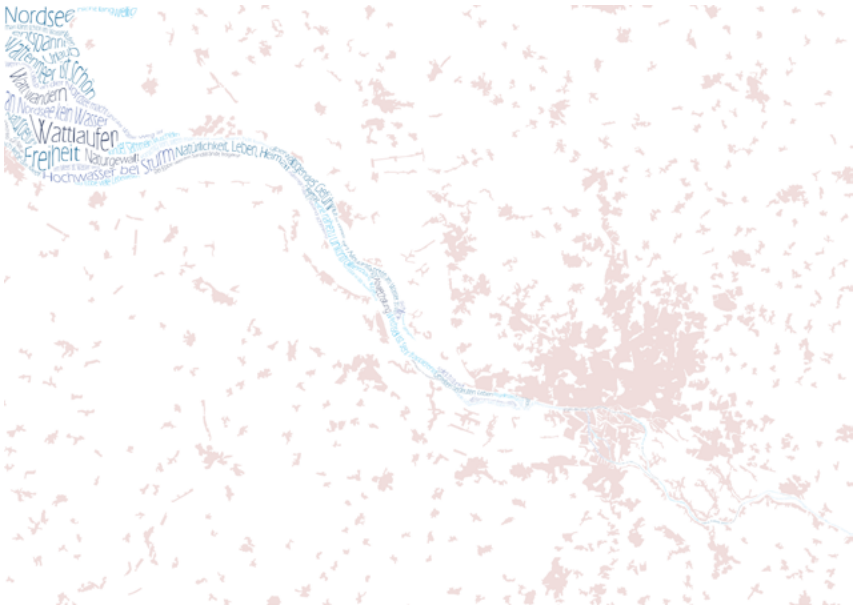

FIG. 4 Local residents described their associations with the tide, which are translated spatially inside the map. Towards the North Sea, the tide is associated with unique beauty of the Wadden Sea (Wattenmeer ist schoen, Wattlaufen), children collecting shells (Kinder sammeln Muschen), holidays and relaxation (Urlaub, Entspannung) the retreat of the water (Nordsee kein Wasser), experiencing nature and its force (Naturgewalt, Naturgefühl), flooding during storms (Hochwasser bei Sturm) and a feeling of freedom (Freiheit). Upstream, along the Elbe, the tide arouses feelings of home and belonging, (Heimat) of being overwhelmed (überwaeltiges Gefühl), of the danger of the unknown tidal movements (vorsicht) and directly feeling life itself (Leben). Observations about the cyclic exposure of beaches and the many life-forms along the Elbe are also recorded. Further upstream the tide means a new start (Neuanfang), is dynamic and associated with the moon but the change can also be striking (frappierend).

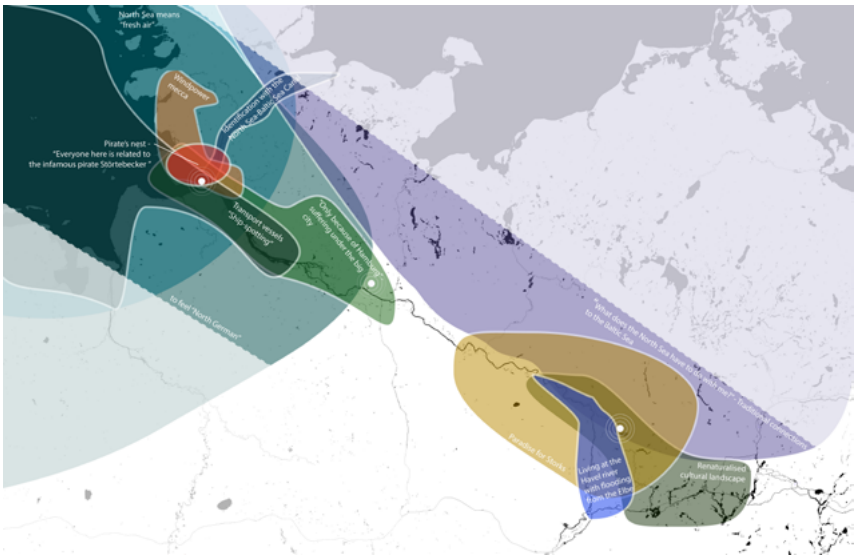

FIG. 5 Identificationscapes. On the basis of the interviewee's statements, a geography of associations can be identified which reveal different relationships along the rivers. Identities around Garz on the Havel are linked to the cultural landscape, to the potential risk of flooding from the Elbe but clearly to the Baltic Sea rather than the North Sea. The influence of the North Sea, on the other hand, reaches as far as Geesthacht. Further important factors are the pirating history around Brunsbüttel, ship-spotting at the North-Baltic Sea canal and the characteristic wind-turbines towards the coast.

"*Streamscapes*" we investigated, strong feelings of identity associated with the water emerged—identities which may not be site-specific but contribute to an expanded sense of belonging around the water and which are able to connect different sites and events of one's own personal history **[Fig. 5]**. Narratives confirm that the water systems are highly prized socio-cultural spaces contributing to a tangible effect of personal and collective well-being.

Implications for design

The *Streamscapes* investigation led to the formation of specific forms of knowledge about the region and its connection to the sea which would not otherwise be apparent from a technical analysis. Most citizens are closely linked to their river spaces, physically and emotionally, understand and observe its transformations and consider the environment of high qualitative value. Narratives tell the story of the fragmentation and division of the ecological system in the name of improved transport efficiency, which has led to increased separation and withdrawal from the sea.

Narrative cartography represents territory according to alternative knowledge sources and categories, which can serve as a basis for innovative planning processes. In the *Streamscapes* project the spatial reference system which emerged, is represented by the watershed—an ecological definition **[Fig. 6]**. How would decision—making processes be steered if the water territory was a federal "eco-state" and if citizens participated in the same level of decision-making as the national bodies of interest? It was through the process of constructing narrative cartographies, that

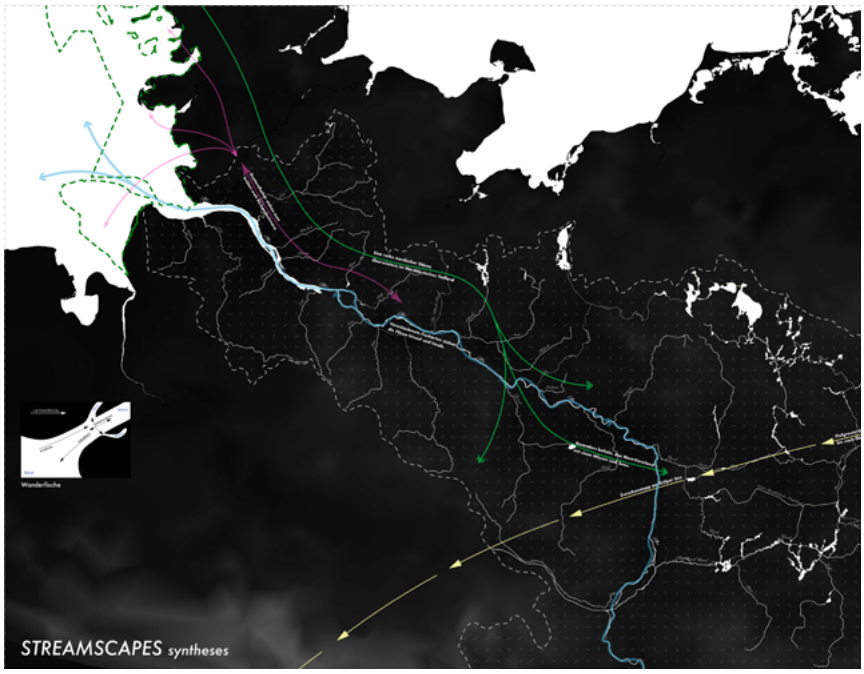

FIG. 6 The *Streamscapes* watershed--a possible ecoterritory. The ecological boundaries of the territory are established through the Elbe, Havel and Spree watershed areas (tributary rivers are indicated), however long-range bird and fish trajectories intersect the space. Different fish species (blue) travel up and down the rivers—anadromous fish live in the sea but return to rivers to spawn, whereas catadromous species such as most eel, live in the river and return to sea to spawn. Many northern geese (green line) from the grey, white-fronted and bean-goose species spend the winter in northern Germany, in particular around the western parts of the Havel river and surroundings. The flight path of the migrating cranes (yellow) passes across Lake Gülpe near Garz, where a stop is scheduled between the Baltic Lakes and Spain or the south of France.

the tangible logic and the physical outline of the Spree-Havel-Elbe ecoregion emerged as a possible future project.

This approach is closely aligned to the Bioregionalism school of thought, which considers territory itself is a common good—a good which has been transformed dramatically through globalization and the dominant "political economy."[32] Bioregionalism therefore also calls for local involvement. Our study revealed that old borders are long-lasting and deeply inscribed. The concept of a large-scale eco-territory based on the watershed, does not compete with local cultural traditions, but just as historical administrative units such as duchies, kingdoms and states reflect the concerns and power-structures of their time, so can ecoregions serve to reflect the ecological territorial concerns of our present century.

PART III: Mittelmeerland

The Mediterranean was chosen as the territorial context for the study because in the last century it has been separated through politics, religions and nation states. The Mediterranean Sea is not only situated between continents, but also acts as a historical and contemporary center and border zone. The social, economic and political dynamics of this zone

32. Alberto Magnaghi, "Draft of the Territorialists' Society Manifesto" (2010).

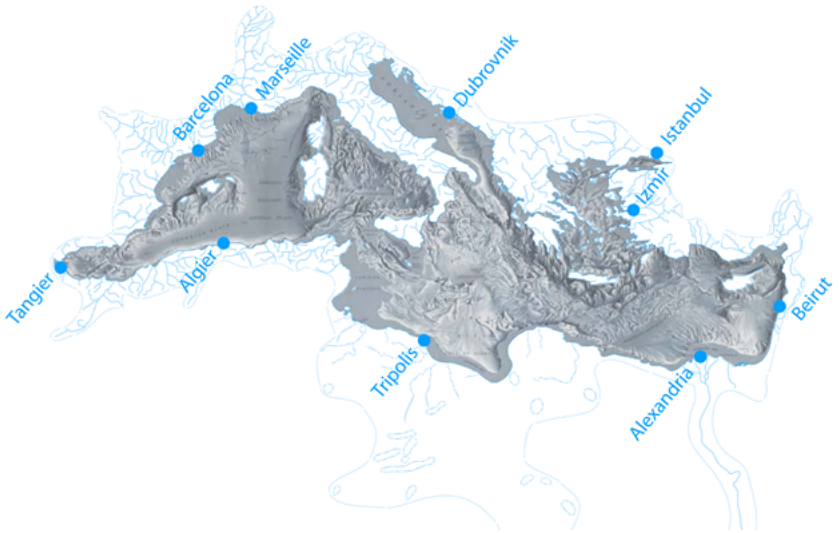

FIG. 7 *Mittelmeerland* Territory (Medine Altiok). The context and the territorial extent of the *Mittelmeerland* Project showing the topography of the Mediterranean Sea ground, major port cities and the extent of the Mediterranean water basin including the sea, the tributary rivers and water resources under the desert, which are also linked to the sea.

are complex. Contemporary political concepts such as the Union of the Mediterranean are only one example of the many dynamics that are driving spatial change in the cities. Unified by climate and the history of civilization, the Mediterranean region has the potential to be understood as a geographic unit, in particular the shared climatic conditions could form the basis for tackling shared environmental problems.

Mittelmeerland creates a territorial view which approaches the cities and coasts from the sea, therefore inverting sea and land and providing a fresh perspective. During strategic wars, the birds-eye perspective from the sea towards the land was used as means of orientation, but during the project this view served as a strategic device to erase boundaries ingrained in the territory and in the imagination.

Mittelmeerland envisions removing coastal cities from their national context and shifting them into the liquid body of the Mediterranean Sea. The sea is seen as a shared resource, a single liquid territory whose port cities function through similar networks with similar shipping routes. Applying a comparative method, the *Mittelmeerland* project conducted workshops over 5 years in the six Mediterranean metropolitan areas Dubrovnik, Tangier, Beirut, Algiers, Alexandria and Izmir. [Fig. 7] Through the study, urban centers in a phase of major transformation and development revealed themselves to be the ones richest in potential. Instead of limiting the study to renewed European Port cities like Genoa, Venice, Marseille or Valencia, the study focuses on the Southern coast of the Mediterranean, where future masterplans are still being developed. Taken out of their national context, these coastal cities stand in dialogue with one another in terms of economic liberalization and cooperation in politics, the environment and energy.

Role of Cartography and Narrative Mapping

An important objective of the project was to redraw the map of the Mediterranean in order to record flows and relationships in a new way and imagine future models of development; models which can incorporate the coexistence of diverse societal elements characteristic for each port city within an overall fluid unity. Narrative cartography was therefore an important research tool, combining investigations into abstraction and different graphical representation techniques.

In each city *Mittelmeerland* looked at the urban patterns found in five selected neighborhoods along the waterfront; an agricultural area preferably including a river, the industrial harbor and immediate surroundings, the historical center, a geographically unique area, and a run-down residential area. *Mittelmeerland* aimed to uncover unrecorded elements of the collective memory, informal interdependencies between water and land uses, incremental societal transformation caused by illegal migration and trade, and the indirect effects on climate, nature and economy caused by the construction of new ports or other coastal projects. Statistical and historical information was also consulted in order to gain a deeper understanding or to clarify questions.

Making Narrative Maps

The method of constructing narrative maps in the Mittelmeer project began with a conventional black and white topographic & bathymetric map as a base. Further information was added during the fieldwork through hand measurements, interviews, photography, writing short scenarios or critical statements. The base-map was transformed step-by-step into a narrative map by the addition of phenomenological situations, specific physical dimensions, informalities, the relationship between house, street and sea, borders, historical traces, vernacular climatic building solutions, patterns of behavior, routes, routines, traditions and the social interaction of local inhabitants.

An important aim of the investigation was to develop sustainable climatic solutions, therefore fluid climatic aspects of the landscape ecology such as the sun paths, wind directions and shadows were incorporated into the maps. Participants created a basic but distorted birds-eye perspective looking at the coast seen from the sea and inserted these features. The final step was to make proposals to improve an existing situation. For this step, imaginative collage was used as a tool to communicate an intervention or a critical statement on conflicting situations.

The resulting dynamics found in the Mediterranean coastal cities are presented through the four examples below. In each situation, narrative mapping helped to uncover and illustrate conflicting situations which lie at the root of the fragmentation and poor ecological state of the

Mediterranean, but which cannot be found assembled in traditional technical maps.

Migration and Trade

The Miniature Painting of the Fall of Constantinople, where the Turkish army of Mehmet II attacks Constantinople in 1453, **[Fig. 8]** serves as a historical reference for narrative cartography. Soldiers can be seen pointing canons to the city and others pulling boats into the Golden Horn. The painting composes the story with the main spatial features of the land, water, hills, weapons, people and ships using different scales and perspectives and exploiting both foreground and background. The narrative map of Ceuta re-interpreted these techniques to illustrate the border condition and conflicts between Ceuta, Tangier and the strategic position

FIG. 8 Bertrandon de la Broquière, Fall of Constantinople, 1453. Bibliothèque Nationale de France, MS fr. 9087 (f. 207v), made in Lille in 1455. Source gallica.bnf.fr / BnF.

FIG. 9 Border-crossing between Ceuta and Tangier, Map by *Mittelmeerland* (2011). The perspective shows the context of the well-protected border between Ceuta and Morocco by exaggerating the walls and the control towers on the hillside that prevent people from crossing. On the hill, a group is erecting the Moroccan Flag, in an attempt to reclaim the enclaved territory of Ceuta. In the background migrant boats are crossing the strait of Gibraltar towards Spain and a helicopter is controlling the sea. The foreground contains both historic and contemporary elements that refer to the flow of people and material exchanges in the area.

of Ceuta in the Straits of Gibraltar—a conflict arising since the creation of the border fence in 1993 to prevent illegal migration and trade. The narrative map shows the physical walls and the process of crossing the border, with the main activities of informal trade simplified and positioned to read from left to right. Moroccans who live in four towns close to the border do not need a visa to cross into Ceuta and can take as many goods with them as they can manually carry. In order to trade without paying taxes, this agreement is exploited and the maximum of goods are physically carried across the border by the traders. The drawing identifies the informal occupation of public space by traders and migrants and new types of spaces created for waiting, hiding and storage **[Fig. 9]**.

Collective memory

In Beirut **[Fig. 10]** the narrative map uncovers the Hotel St. George, which is resisting the construction of the new waterfront and is the last remaining sign of the collective memory. It is drawn larger than its actual size in order to emphasize this role. The new masterplan proposes luxury high-rise buildings arranged in a formal grid and a promenade along the waterfront, all occupying a huge artificial landfill situated just in front of the former Downtown Beirut. The narrative map also articulates the lack of public space and the vanishing relations between sea and land due to the privatization of the waterfront. It describes a proposal to reconnect the promenade by creating a passage directly through the hotel. While the master plan still waits to be executed, the drawing proposes to fill the

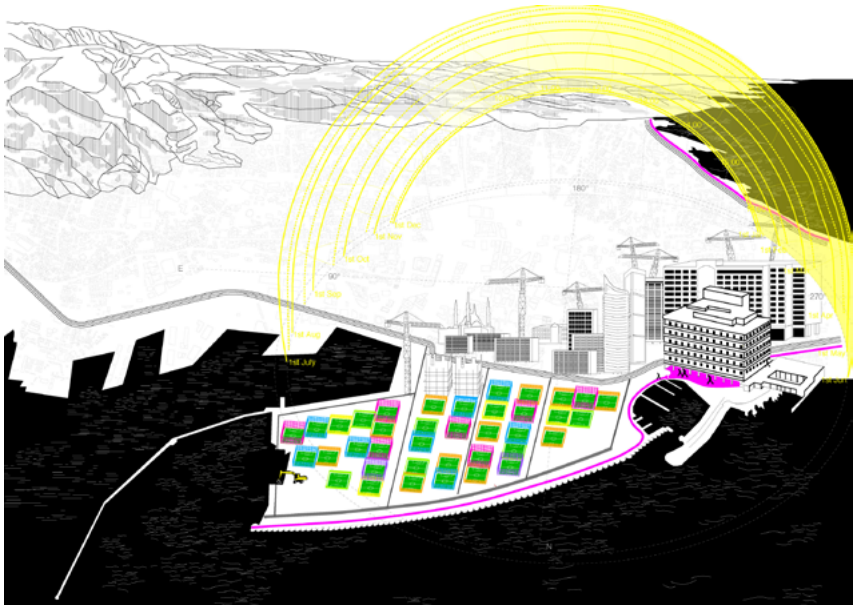

FIG. 10 Privatization of the coast Downtown, Beirut, Map by *Mittelmeerland* (2012). In the foreground, on the right-hand side, the building of the St. George hotel is exaggerated to show its isolated but important position in front of the new construction site and next to the new landfill at the waterfront. The purple line follows the public path along the shoreline to visualize the interruptions and the possibility that the St. George hotel could play a central role in connecting these areas. The drawing contains also the sun's path, shadows in the hills and shows the direction of wind and depth of water represented through the waves on the water surface.

landfill temporarily with football fields in order to create the public spaces that were forgotten in the new planning. Seen as a temporary playground, these fields could follow a dynamic concept that adapts during the construction phases.

Ecological imbalance

The Neretva River Delta in Dubrovnik [Fig. 11] and Lake of Reghaia in Algiers [Fig. 12] are examples of two protected river deltas in the Mediterranean. Both cases are in a state of ecological imbalance with conflicting interests between a protected natural area, industry and agriculture.

On one side of the Neretva River, the industrial port is expanding to connect the water-way for larger container ships into the hinterland. On the other side a tangerine plantation with small buildings and artificial irrigation channels is slowly disappearing due to the decrease of agricultural production. The sensitive river mouth is under protection and located between port, infrastructural nodes and agricultural fields. The narrative map describes how the four areas clash and cause environmental conflicts by showing all major activities simultaneously and with equal importance. Physical elements such as ships, animals, farm houses and raw material stored at the port are all represented at the same scale.

The narrative map of Lake Raghaia uncovers illegal uses in the surrounding area—an information that cannot be found in normal maps. The lake is an important place for goats and migrating birds but at the same time it is surrounded by touristic developments, settlements and farmlands, both

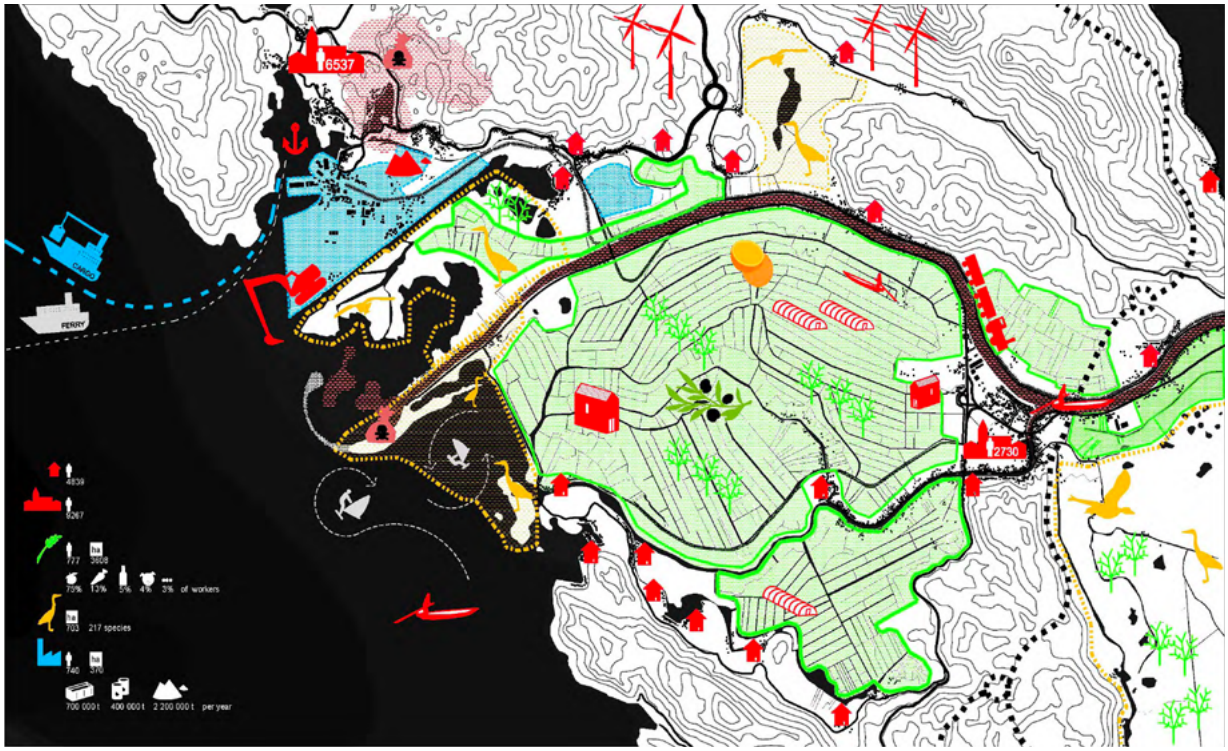

FIG. 11 Protected Neretva River Delta in conflict with the port of Ploce in Dubrovnik, Map by *Mittelmeerland* (2011). The map shows (in blue) the activities and areas of the port near the town Ploce and (in green) the agricultural sites in the Neretva River Delta near the town Opuzen, which is the major tangerine producer in Croatia. Both towns are symbolized by the red building that is sized according to the number of inhabitants. Industrial ships, surfers, trains and animals indicate different types of flows. The map also presents several proposals; to use the strong winds (windmills), to reuse existing historic farm-houses (small red buildings) and to add new conservatories for ecological tourism in order to revitalise the declining agricultural production (greenhouses).

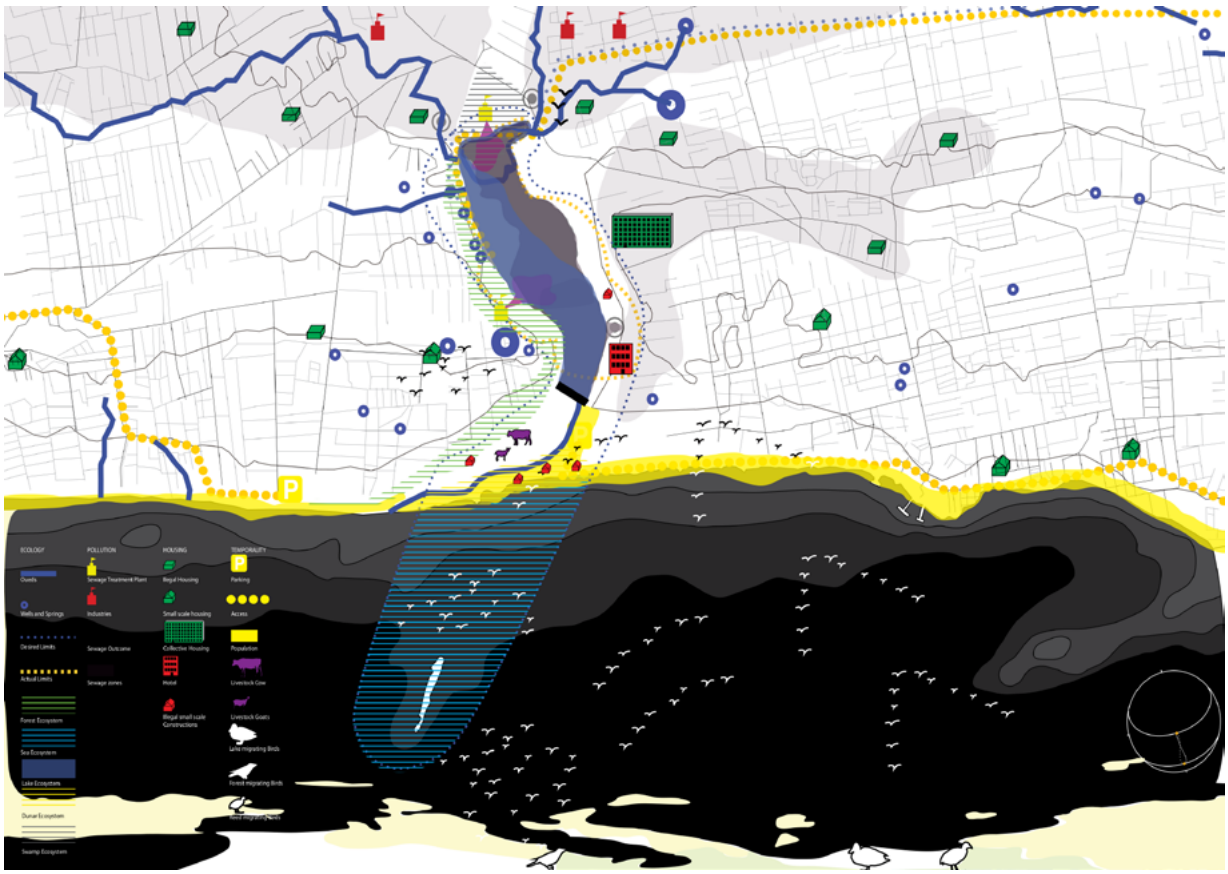

FIG. 12 Protected Lake of Reghaia (an important, Ramsar-recognized marshland) in conflict with pollution by adjacent industries, Algiers, Map by *Mittelmeerland* (2012). Elements of four themes which were observed in the area are shown in the map: ecology, pollution, housing and temporalities. Overlaps between these themes cause conflicts which also signal potential sites of improvement. The grey zones indicate industrial areas and the outline of the Mediterranean is shown in the lower part, including symbols for the larger context of bird migration.

legal and illegal, that are expanding in an uncontrolled manner, pushing into the lake-edge and polluting the water system. These developments are in conflict with the city's official plan to establish a protected nature resort. The nearby farmlands and industries are illegally releasing chemicals into the lake's tributary rivers. Between the lake and sea, the ecologically sensitive and vulnerable area is illegally used as a car park, a football field and by a hotel. Once a building is built, changes requested by decision-makers are difficult to implement. However, the population's awareness of the importance of protecting vulnerable natural areas is increasing and in future, such illegal uses will not be easily tolerated.

Conclusion

The narrative cartography discussed in this paper looked for implicit local knowledge, cultural information, past experiences and observations about changes over time. Both *Streamscapes* and *Mittelmeerland* describe fragile, complex, contested and fragmented water territories. The maps produced help to read and to understand the complexity of waterscapes and to detect locations where spatial improvements could be beneficial for citizens. They were able to link phenomenological observations and physical conditions, qualitative and quantitative research. Combining both scientific and poetic information, they serve as tool with which to tackle common environmental and societal issues and to gain a critical perspective on current urbanization processes. Through the combination of scales and a playful composition of elements, the maps communicate conflicting issues and reveal hidden potentials, which may otherwise be intangible or located beyond the visual edges of the water-basin, but however are key determinants of current conditions.

Narrative maps relate different types of findings and communicate issues and proposals, past, present and future, between a broad spectrum of citizens. They are opening up new and expanded dimensions to the relationship between water and society and are constructing a unique profile of the local space itself, thereby facilitating a holistic territorial development approach. The transition towards water resilience requires an exchange of different types of knowledge to complete existing water cartography, based on the conception of water as a common good. This is critical—both in conceptual as well as in operational terms—for a multi-level and multi-sectorial planning consultation. Narrative cartography represents territory according to alternative knowledge sources and categories, which can serve as a basis for innovative planning processes.

The combined experience gained through the two projects discussed in this paper, demonstrates a range of possible applications, outcomes and territorial perspectives which can be achieved through narrative cartography. Our interest is in promoting this method as being particularly valuable for the understanding of water regions, due firstly to their

inherent "common" nature and therefore their gravitational affect as spaces of conflicting interest and secondly their fluidity which makes them difficult to decipher. While the main principles of this method can be adapted to land-based studies, the aesthetic research into representing the multiple dimensions of water is a central motivation for this ongoing work.

Nancy Couling is a New Zealand architect who gained her B. Arch (hons) at the University of Auckland, a post-grad scholarship at Iuav, Venice and her PhD at the EPFL, Switzerland. Based in Berlin 1995-2010, she founded her own urban design practice cet-0/cet-01 with S. Schnorbusch (architect) and K. Overmeyer (Landscape architect) and taught at the TU Berlin. Currently a Marie Curie Fellowship holder at the TU Delft, she will take up an Assoc. Professorship at Bergen Architecture School in 2019.

Paola Alfaro d'Alençon is a German architect (AK-Berlin) and urban researcher; Dipl.-Ing. Technische Universität Berlin, 2000. Dr.-Ing. in Urban Studies at the Technische Universität Berlin, 2011 and PhD in Architecture, Pontificia Universidad Católica de Chile, 2013. Founding Member of the Urban Research and Design Laboratory/u Lab-Studio Berlin, awarded with the "Label Nationale Stadtentwicklung" for innovative research from the Bundesinstitut für Bau-, Stadt-und Raumforschung (BBSR). Alfaro d'Alençon has been teaching and working as a senior researcher at the Technische Universität Berlin, Visiting Professor at the Dipartimento di Scienze per l'Architettura, Università degli Studi di Genova.

Medine Altiok is a German architect, graduated from the AA London. She is founder of Mittelmeerland.org, an initiative dealing with the urban transformation in the Mediterranean territory. She has been teaching Architectural Design at ETH Zurich from 2005-10, as programme director of the Mittelmeerland-Visiting Schools at the AA London since 2011 and as Visiting Professor at Bilgi Uni Istanbul in 2016/17. She is currently researching for her PhD with RWTH Aachen and runs her own practice in Zurich.

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MAIN SECTION

Re-defining the appreciation and usability of urban watersides in the urban center and peri-urban fringes of Shanghai

Harry den Hartog — Tongji University Shanghai (China); Delft University of Technology (Netherlands)
Contact: harrydenhartog@urbanlanguage.org

ABSTRACT

Countless waterways defined both the rural and urban landscape and related daily life activities in China's Yangtze River Delta for many centuries. However, much of these bodies of water disappeared due to extremely rapid urbanization in the last three decades and this process is ongoing. This paper critically assesses how the appreciation and usability of the remaining urban watersides is currently changing drastically by examining recent waterfront projects in the Direct Controlled Municipality of Shanghai. This research mobilizes insights from the academic field of Sustainability Transitions – specifically on expectations, experimentation and innovation journeys – to explain how, in the context of extreme urban pressure, well-manicured new urban watersides are often visually attractive but functionally inadequate. The paper concludes with recommendations to reverse this trend and to create more sustainable and attractive watersides. By describing, comparing and evaluating three cases, this paper by Dutch Shanghai-based urban designer and researcher Harry den Hartog also wishes to contribute to the discourse on China's urban transition by critically examining the gap between expectations and outcomes in daily life reality.

KEYWORDS

Place-Making; Real Estate; Shanghai; Socio-Technical Transitions; Urban Delta; Urban Waterfront; Waterfront Usability; Waterfront Appreciation; Yangtze River Delta.

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Introduction

This paper describes and analyses the changing appreciation and role of living and working along waterfronts in the context of China's extremely rapid and large-scale urbanization, occurring since the end of last century.[1] The paper focuses on the Direct Controlled Municipality (equal to a province) of Shanghai and its surrounding region, with its many canal towns and rich water history. Historical continuities and recent discontinuities will be explained and assessed regarding the appreciation and usability of urbanized watersides, with one case in Shanghai's Central City and two cases in its rural fringes, all under high urban development pressure.

Resorting to Sustainability Transition theories, overarching patterns are identified and translated into broad lessons on how urbanization processes can be steered into more sustainable paths, keeping historical continuity and attractive well functioning new environments. In the next section, three key concepts are introduced (expectations, socio-technical experimentation and innovation journeys) as useful tools to help assess the promises and realities of waterside transitions. The third section elaborates on the methodological approach and the selection of the cases. The fourth section describes the dynamics for the three cases. The fifth section combines the findings and the final section concludes with some recommendations.

Theory: expectations, experiments and journeys

This paper describes and analyses tendencies in recent urbanization projects and their relationships with the water in Shanghai, China, especially regarding the functionality of new public spaces, but also regarding ecological, socio-economical, and sociocultural values, and flood risk measures. Illustrated with three cases, these changing relationships are conceptualized by resorting to insights from the field of Sustainability Transitions. In this field, scholars investigate major shifts toward sustainable socio-technical systems of production and consumption. The study of socio-technical transitions to sustainable urban development draws on a wide range of theories and lines of thought (such as neo-institutional theory, evolutionary economics and science and technology studies) and a variety of frameworks and approaches (such as the multi-level perspective, strategic niche management and transition management) to express how promising visions of a sustainable future and attractive urban realities – for example living along the waterside – can be translated into experimental development projects and how these can be empowered

1. You-Tien Hsing, *The Great Urban Transformation: Politics of Land and Property in China* (New York: Oxford University Press, 2014).

in order to transform the unsustainable current order.[2] To investigate the promises and realities of urban waterfront projects, three core concepts from the Sustainability Transitions field will serve as "sensitizing concepts" for the empirical analysis and structuration of the argumentation.[3] These concepts are: (1) expectations, (2) socio-technical experimentation and (3) innovation journeys, which I proceed to explain below.

To investigate how actors use appealing visions of the future in their urban development projects, scholars from the field of Sustainability Transitions often use *expectations* as a concept. Expectations can be defined as "statements about the future – uttered or inscribed in texts or materials – that circulate."[4] The idea that they circulate is important, because they are not merely descriptive statements, but they are especially "performative," which means that they help to create a new reality by providing heuristic guidance[5], by coordinating roles and activities amongst actors[6] and by legitimizing certain investments.[7] Expectation is one of the key processes in facilitating sustainable innovation journeys, and to do this successfully, expectations should be robust (shared by multiple actors), specific (if expectations are too general they do not give guidance), and of high-quality.[8]

To turn visions into reality, actors engage in a process of *socio-technical experimentation*. Ideas that look appealing on paper and sound good in words are applied in real-life settings to be tested and developed further. In this context, experiments can be seen as seeds of change that may eventually lead to a shift in urban planning approaches.[9] Opposed to the experimentation in the natural sciences that usually take place under strictly controlled conditions to find hard objective truths, the experimentation in the field of sustainability transitions take place in a real-world environment with a wide variety of societal actors and other influences. To deal with this, it is more accurate to talk about a "socio-technical experiment,"

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2. John Grin, et al., *Transitions to sustainable development: New directions in the study of long term transformative change* (New York: Routledge, 2010). Jochen Markard, Rob Raven, and Bernhard Truffer, "Sustainability transitions: an emerging field of research and its prospects," *Research Policy* 41 (2012): 955–967.

3. Herbert George Blumer, "What is wrong with social theory?" *American sociological review* 19, no.1 (1954): 3-10.

4. Harro van Lente, "Navigating foresight in a sea of expectations: lessons from the sociology of expectations," *Technology Analysis & Strategic Management* 24(8) (2012): 769-782.

5. Arie Rip and René Kemp, "Technological change," in *Human choice and climate change* (Columbus: Battelle, Rayner and Malone, 1998), 327–399.

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8. Johan Schot and Frank Geels, "Strategic niche management and sustainable innovation journeys: theory, findings, research agenda and policy," *Techonoly Analalysis & Strategic Management* 20(5) (2008): 537–554.

9. Frans Sengers, "Cycling the City, Re-imagining the City," *Urban Studies* (2016): 1-17.

which can be defined as: "an inclusive, practice-based and challenge-led initiative, which is designed to promote system innovation through social learning under conditions of uncertainty and ambiguity."[10]

Experimentation in the urban environment is an unfolding *innovation journey*[11] and in particular a "sustainable innovation journey."[12] A journey also implies open-endedness and uncertainty.[13]

Case study selection and methodological approach

This paper describes and analyses two different situations of a changing relationship between city and waterside: one urban case along the Huangpu River in downtown Shanghai with a transition of industrial waterfronts into recreational waterfronts, and two rural (now peri-urban) cases with "Long Island" on Chongming Island and "New Venice" in neighboring Nantong [Fig. 1]. In the latter two cases, agricultural functions and wetlands have been transformed into speculative residential and recreational property. By conducting this comparative case study research[14] also qualitative methodological approaches for geographers[15] are used.

Both the Huangpu Waterfront case and Chongming Island (exclusive Long Island and New Venice) were during their initial planning process appointed as National Demonstration zones. The urban and peri-urban cases are chosen because they are complementary to each other (urban vs. rural, high-density vs. low-density, etc.), because they are related to each other (same target group: the new middleclass), and because they are representative for many waterfront developments in the wider context of the Yangtze Delta (and to some extent even for China as a whole).

The Direct Controlled Municipality of Shanghai and surrounding Yangtze River Delta Region are China's economical engine and "Head of the Dragon" for centuries, thanks to a strategic location for trade, efficient waterways, and fertile soil. Many experiments and projects in Shanghai function as model for projects elsewhere in China.[16] Shanghai's new urban waterfronts form one of the main planning strategies in this city's attempt to become an "Excellent Global City" according to the Shanghai

10. Frans Sengers, Anna Wieczorek, and Rob Raven, "Experimenting for sustainability transitions: A systematic literature review," *Technological Forecasting and Social Change* 145 (2016): 153–164.

11. Andrew Van de Ven, Douglas Polley, Raghu Garud, and Sankaran Venkataraman, *The Innovation Journey* (New York: Oxford University Press, 1999).

12. Frank Geels, Marko Hekkert, and Staffan Jacobsson, "The dynamics of sustainable innovation journeys." *Technology Analysis & Strategic Management* 20(5) (2008): 521-536.

13. Raghu Garud, Joel Gehman, and Antonio Paco Giuliani, "Contextualizing entrepreneurial innovation: A narrative perspective," *Research Policy* 43 (2014): 1177–1188.

14. Robert K. Yin, *Case study research: Design and methods* (Sage: Thousand Oaks, 2003).

15. Melanie Limb and Claire Dwyer, *Qualitative methods for geographers* (London: Arnold, 2001).

16. Harry den Hartog, *Shanghai New Towns - Searching for community and identity in a sprawling metropolis* (Rotterdam: 010 Publishers, 2010).

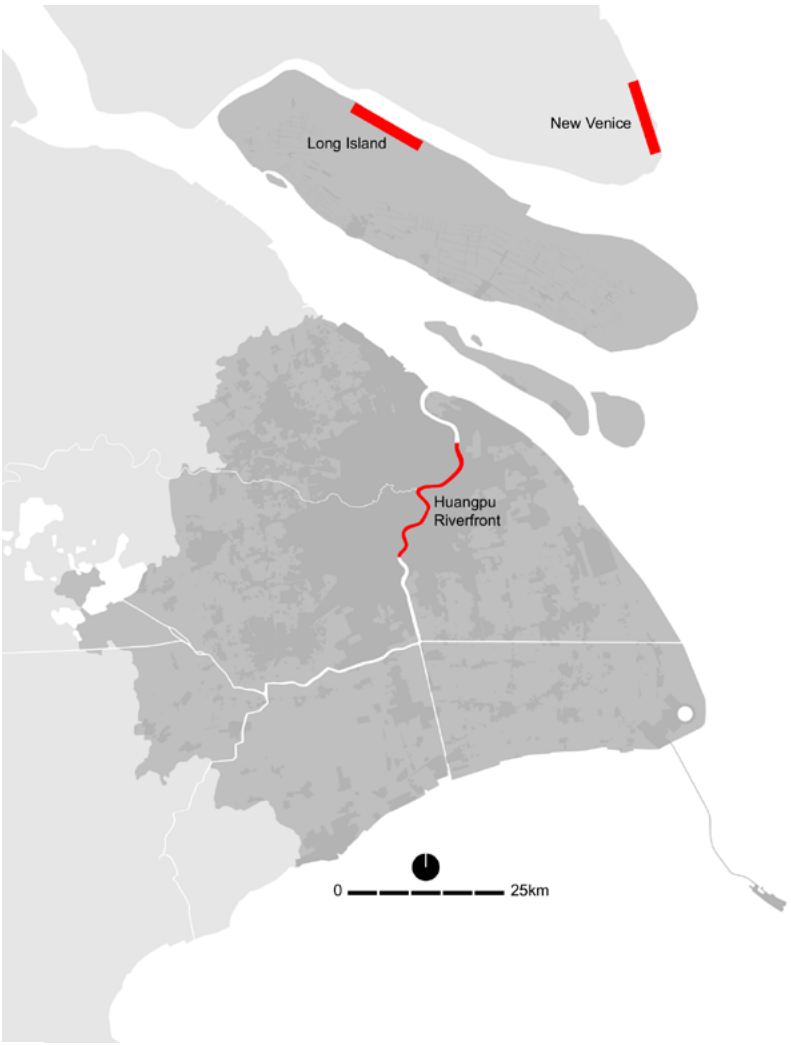

FIG. 1 Huangpu River with more than 45 kilometers of new waterfront in the Central City of Shanghai's Direct Controlled Municipality. The cases Long Island and New Venice at Shanghai's rural fringes are under the administration of Nantong, in Jiangsu Province (map by author, 2019).

Master Plan 2017 – 2035.[17] Since 2018 the Huangpu Waterfront is earmarked as a "demonstration zone for the development capability of the global city of Shanghai"[18] to determine the image and brand of Shanghai and to improve the quality of life in megacities. Chongming Island was appointed as National Ecological Demonstration Zone in 1996.[19] Both demonstration zones function as sample for similar situations elsewhere in China, according to the Shanghai Master Plan 2017 – 2035.

17. Shanghai Planning and Land Resource Administration, *Shanghai Master Plan 2017 – 2035*, public version (2018) www.shanghai.gov.cn/newshanghai/xxgkfj/2035004.pdf, accessed May 17, 2019.

18. Shanghai Planning and Land Resource Administration, *Striving for a world-class waterfront area - Shanghai Huangpu River and Suzhou River planning*, public version (2018). Accessed May 17, 2019, https://mp.weixin.qq.com/s/6R9DCl4xFSGjvCRnXSioqg.

19. Julie Sze, *Fantasy islands: Chinese dreams and ecological fears in an age of climate crisis* (Berkeley: University of California Press, 2015). Xin Ma, Martin de Jong, and Harry den Hartog, "Assessing the implementation of the Chongming Eco Island policy: What a broad planning evaluation framework tells more than technocratic indicator systems," *Journal of Cleaner Production*, 172 (2017): 872–886. Harry den Hartog et al., "Low-carbon promises and realities: Lessons from three socio-technical experiments in Shanghai," *Journal of Cleaner Production* 181 (2018): 692–702.

Within the context of Chongming Island the case of Long Island is described in this paper because it illustrates the loopholes of the National Ecological Demonstration Zone. Chongming is an experiment to realize a more sustainable and balanced (but still urban-centered) society. The real estate development of Long Island illustrates what would probably happen on Chongming as a whole when the Eco Island policy is absent. Inherently related to this the case of New Venice shows the extreme consequences of what will go wrong if the waterfront landscape is approached as a mere investment object.

Scientific research that focuses on recent developments at the waterfronts in Shanghai and the Yangtze River Delta region is still limited. The Huangpu Waterfront redevelopment and the ambitions for Chongming Island are both to a high degree experimental within the Chinese context. The degree of experimentalism is illustrated by the fact that dozens of international design competitions have been launched during the past two decades for the Huangpu Waterfronts and Chongming Island as a whole and also for subareas, e.g. Chongming Island Master Plan in 2004, Dongtan Eco-City (on Chongming) in 2005, North Bund in 2010, Suzhou Creek redevelopment plan in 2016, the 22-kilometer long Huangpu River East Bank in 2016, and many others. This has generated an enormous amount of plans and ideas. Subsequently, new plans were compiled by picking and reassembling the – in the eyes of decision makers – most attractive elements in a very opportunistic way. This method is very common in China's spatial planning and design but very unusual in Western countries in terms of copyright and prestige. This "shopping" among design competition entries and "use" (or misuse) of international input is rejected with great suspicion and distrust in the international discourse of architects and urban developers in the West.[20] Nevertheless, this is still daily practice in China, sometimes resulting in success, sometimes in failure, like in an experiment.

Although the cases have many similarities, there are also significant differences, in scale, in economic-geographic position, in policies, and in functioning. However, they clearly illustrate the recent dramatic shift in the relationship between the urban environment and the water, focused on the role and appreciation of urban watersides. The main goal is to give recommendations and suggestions to overcome future mistakes in planning and practices and to mitigate their effects. The findings in this paper are based on a series of site visits, observations and interviews (see table 1 for an overview of the data collection process). The author is very familiar with all cases and has done related research and design projects in this region during the last ten years. [TAB. 1]

20. Den Hartog, *Shanghai New Towns*.

	Interviews	Grey literature	Site visits
New urban waterfronts Central City of Shanghai	Residents (50+) Urban planners and architects (10) Local government officials (5) Developers (3) Real estate agents (5) Knowledge institutes (1)	Official policy docs (3) Governmental website (1) Expert meetings (3) Knowledge institute reports (1) Workshops (3)	Hongkou Creek (25+) Suzhou Creek (25+) North Bund (25+) East Bund (15+) South Bund (15+) West Bund (15+)
New peri-urban waterfronts (Chongming and Nantong)	Home-owners and residents (25+) National government officials (1) Master plan expert committee (3) Shanghai government officials (2) Local government officials (3) Urban planners and architects (8) Developers (2) Real estate agents (3) Knowledge institutes (6)	Official policy docs (3) Governmental website (3) Expert meetings (4) Knowledge institute reports (5) Workshops (3)	Chongming Island (35+) Nantong (7)

TAB1 Figures on data collection

New urban waterfronts in the central city and peripheries of Shanghai

Shanghai's rich historical relationship to the water during the years

Shanghai, and its wider urban region with neighboring cities and towns, used to be crisscrossed by waterways [Fig. 2]. The city's name literally translates as "upon the sea," since the coastline has been shifting eastwards due to sedimentation processes of the Yangtze River and tributaries. Water is not only a means of transportation and trade but also a source for stories, local myths and cultural practices. The classic Chinese painting *Qingming Shanghetu*, from the early 12th century, is the perfect

FIG. 2 There used to be a more direct interaction between urban life and water, also for washing laundry and cleaning food (photo by author, 2013)

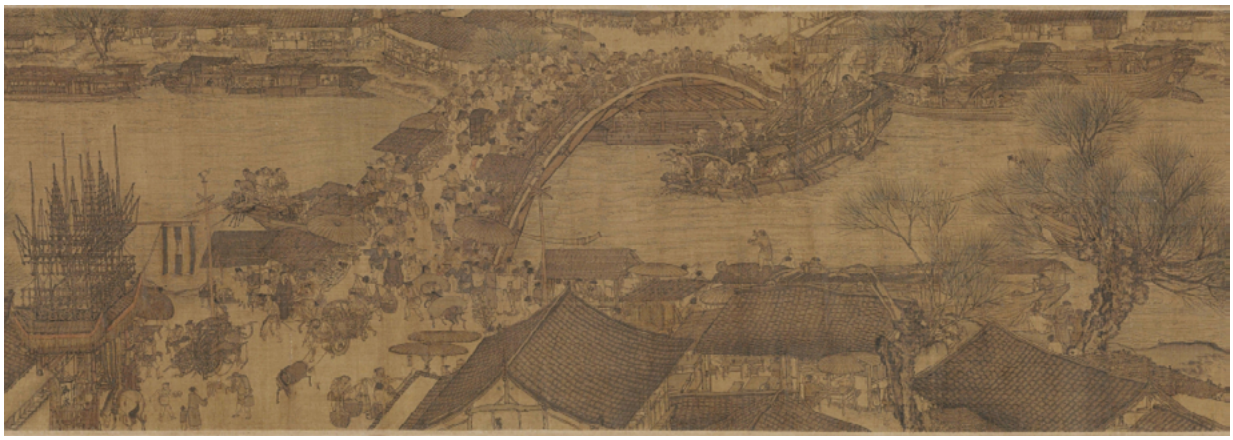

FIG. 3 Fragment of the classic painting Qingming Shang He Tu – original painting by Zhang Zeduan. Twelfth century, Handscroll, 24.8 x 528.7 cm (Source: Beijing, Palace Museum).

illustration of the importance of water in Chinese urbanization [Fig. 3]. The *Qingming Shanghetu* depicts the rich mix of economic activities on the urban waterside and embankments, symbolic for the vitality of a relative compact city clearly defined within its city walls.)

Until the middle of the twentieth century, the spatial and economic development of the Yangtze Delta was propelled by an efficient network of waterways and canal towns.[21] In "Farmers of Forty Centuries" F.H. King describes how more than 3,000 kilometers of waterways provided an ingenious transport system that simultaneously supported soil fertility and irrigation. To improve the fertility of the land, a great deal of mud was dredged from the canals and creeks and spread across the fields. At the same time, night soil from the cities was transported to the fields by boat to be used as natural fertilizer, even until the late 1990ies (author's own observation). To a large extent, these techniques contributed to the self-sufficiency and economic growth of China.

Later, under Mao's leadership, the Chinese government adopted policies that imposed a technocratic engineering on the surrounding landscape: "Man must conquer nature."[22] Natural capital and rural values around Shanghai (and elsewhere in China) have been largely neglected since then. Current planning practices are consequently based on a tabula rasa approach and steered by GDP-oriented motives, with a lot of collateral damage for ecosystems and livability. During the last few decades many natural waterways in this region were transformed into canals, while others were dammed or filled in completely. The eastward shift in the world's economic center of gravity at the end of last century has made highways, railroads, and airports the new flywheel of Shanghai's development — a process accelerated by mass migration to the city from rural

21. Franklin Hiram King, *Farmers of Forty Centuries: Or, Permanent Agriculture in China, Korea and Japan* (Madison, Wisconsin: Democrat Printing Co., 1911). Philip Ball, *The Water Kingdom: A Secret History of China* (Chicago: University Of Chicago Press, 2017).

22. Judith Shapiro, *Mao's War against Nature: Politics and the Environment in Revolutionary China* (Cambridge: Cambridge University Press, 2001).

areas. The few remaining canal towns are revalued now and more and more exploited as tourist attractions and investment opportunity, hence still loosing their original population and character due to gentrification processes. Simultaneously, many remaining waterways around Shanghai are currently transformed into scenic landscapes due to experimental landscape "beautification" policies, which resulted in the planting of many flowers along roadsides and canals. The long and fruitful relationship between the urban landscape and its water systems is changing drastically. The water system seems to be degraded from a transportation and urbanization backbone into a decorative element to brand real estate projects, without much sense of its historical importance and former usages. Countless street names still pay homage to the former canals and creeks that disappeared. Today, the reality is completely the opposite to the former water-rich landscape, with multiple new towns, high-tech industrial parks and other new phenomena sprawling at the fringes of Shanghai and other megacities connected by asphalt and rails.[23] Since late last century Shanghai is transforming itself from an industrial and agricultural – large parts of the Direct Controlled Municipality are still mainly agricultural – dominated city into a service-oriented metropolis. New real estate projects aim for a rising upper middle class, and in the rural fringes especially also on the wealthier elderly who are in search for leisure and luxury. Shanghai is "Striving to become an Excellent Global City" according to the credo on the first page of the Shanghai Master Plan 2017 – 2035. To facilitate this in the Central City, a large number of waterfronts has been transformed from a mainly industrial usage into a recreational and commercial use with abundant public recreational space, offices, shopping and hotels, offering a welcome and pleasant relief of the urban congestion for many.

Simultaneously – but not directly as a result of policies but more as a result of greedy developers that know how to exploit loopholes in regulations –more and more recreational and luxurious settlements are popping-up in the rural fringes. The latter ones are located on often-questionable locations – e.g. in conflict with existing natural and social-cultural values, vulnerable[24] to flooding, inaccessible to common people – as observed during fieldtrips and also learned from interviews with multiple stakeholders.

Because of ongoing transformation, the role and experience of water have changed, especially in daily life usage **[Figs. 4-6]**. In the past, living by the waterside in Chinese cities was rarely an attractive option. Industrial developments, especially since the 19th century, made many of them very dirty and smelly, while others became repositories of household waste. However, since about a decade ago, real estate developers and policy-

23. Den Hartog, *Shanghai New Towns*.

24. Stefania Balica, Nigel George Wright, and Frank van der Meulen "A flood vulnerability index for coastal cities and its use in assessing climate change impacts," *Natural Hazards* 64, no. 1 (2012): 73–105.

FIG. 4 Most creeks disappeared and the few remaining ones, such as Hongkou Creek, are often disconnected from urban life by floodwalls (photo by author, 2018).

FIG. 5 Most creeks disappeared and the few remaining ones, such as Hongkou Creek, are often disconnected from urban life by floodwalls (photo by author, 2018).

FIG. 6 The Cool Docks as depicted was shortly after its redevelopment in 2010 disconnected from the city by new floodwalls and parking, resulting in the closure of many restaurants in the old warehouses. Since 2018 this area is under redevelopment again (photo by author, 2018).

makers are increasingly rediscovering watersides as an added value. For example, along the new highway that connects Chongming Island and Nantong to Shanghai, huge real estate sales advertisements promise living close to nature and along watersides. Also in many shopping malls and metro stations in downtown Shanghai, real estate companies are adverting investment in real estate in the rural periphery around Shanghai aggressively, using flyers, model houses and virtual reality presentations. These locations are advertised as relatively cheap, not too far if you own a car, and away from urban congestion.

Regeneration of urban waterfronts in the Central City of Shanghai

Following the development plan "Striving for a world-class waterfront area"[25] the Huangpu River and Suzhou Creek will have 120 kilometer of continuous accessible riverside zones in 2020. The expectation is to bring a large-scale continuous greenery and public space in the city (a "people-centered focus on creating a shared space"), to preserve some historical (industrial) buildings, and "to extend the spirit of the Expo by building a global city of excellence to be able to compete with waterfronts such as in New York and Paris."[26] Since end of last year more than 45-kilometer of renewed riverfronts are now open for pedestrians and cyclists, with a very positive impact on the quality of life for the city as a whole.

During the last decade the local authorities have made a very serious effort to clean up the riverbanks to improve Shanghai's image as a city along the river. It started with the 2010 World Expo, which played a key role in redefining Shanghai's relationship with its waterfronts. The promise (*expectation*) was to reconnect the city with the water starting with the Expo. Wharfs and accompanying industries have been relocated, to decrease pollution in down town areas and to create space for industrial growth elsewhere. The planning authorities located Expo 2010 in a relatively central place, deliberately aiming to further densify the city instead of contributing to the suburban sprawl. However, today, more than eight years after the event, the more than 5 square-kilometer large Expo site is yet to realize its oft-quoted slogan: "Better City, Better Life." Only a small part has been redeveloped. The central park on the river's south bank especially built for the Expo is now partly walled off and poorly maintained, attracting only a handful of daily visitors. Some exceptions are buildings owned by the Propaganda Bureau[27] such as the Power Station of Art, a former power

25. *Striving for a world-class waterfront area*, public version.

26. *Shanghai Master Plan 2017 – 2035*, public version.

27. Yawei Chen, Qiyu Tu, and Ning Su, "Shanghai's Huangpu Riverbank redevelopment beyond World Expo 2010," *AESOP Annual Conference* (2014). Lingyue Li, *Urban Planning and Mega-Event Projects: Lessons from Expo 2010, Shanghai* (2018). Accessed May 17, 2019 at https://www.intechopen.com/books/an-overview-of-urban-and-regional-planning/urban-planning-and-mega-event-projects-lessons-from-expo-2010-shanghai.

plant that became home to one of China's most avant-garde galleries. Also, the China Art Museum and the Mercedes Benz Arena still play host to popular events. Nevertheless, most other buildings have been demolished, and on the south bank of the river, a few dozen office towers have been constructed since three years ago, but these developments remain devoid of any sign of urban street life until today.

For municipal officials, mega events are a great excuse for revitalizing and rebranding cities.[28] But too often, the vitality of the host city is undermined by a lack of long-term strategy. The ambitious promise to give the Expo site back to the city seems to have failed for the time being, with only a few dozen sparsely used new office towers and one huge shopping mall on the site, instead of the urgently needed (affordable) housing. Meanwhile, on the fertile agricultural lands outside Shanghai, huge residential and commercial areas are sprawling.

However, with a series of design competitions between 2013 and 2018 more than 45-kilometer stretch of new waterfront along the Huangpu River has been redeveloped now as recreational and commercial spaces: South Bund, West Bund, North Bund, and East Bund **[Figs. 7-9]**. All of them refer with their name to the international image and ambition of the classic Bund. According to the before mentioned development plan "Striving for a world-class waterfront area" the Huangpu River must become "the public living room in the city" to create continuous open urban space in the dense urban fabric.

Shanghai rediscovered itself as a city "above" or along the water. This creates big spinoffs for the local economy. For example, the Yangpu District used to be a rundown part of town with many industries and working-class inhabitants but promotes its waterfront now on their website as a "World Class Waterfront Development Belt" aimed to attract foreign investors (including Fortune 500 companies) and the creation of 50,000 new jobs before 2020.[29] The square meter prices for real estate along the Yangpu Districts waterfront today are on some locations already up to more than $12,000 (2019). The project is nicknamed by McKinsey "from rustbelt to brainbelt." Also the redevelopment of Suzhou Creek, a branch of the Huangpu and until recently one of China's most polluted waters is an indicator of change in appreciation of watersides amongst developers and policymakers. Extremely luxurious new housing complexes (up to $16,000 per square meter, 2019 – visited by author) have sprung up along the banks of Suzhou Creek, overlooking the newly odor-free river.

To make the Huangpu waterfronts attractive, a multitude of cultural facil-

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28. Tim van Vrijaldenhoven, *Reaching Beyond the Gold* (Rotterdam: 010 Publishers, 2007).

29. Katrina Lv and Ivan Wang, "Yangpu waterfront: From rustbelt to brainbelt," *Global Infrastructure Initiative*, December 2017, accessed May 17, 2019 https://www.globalinfrastructureinitiative.com/article/yangpu-waterfront-rustbelt-brainbelt. Jian Yang, "Nod for world-class waterfront area," *Shanghai Daily*, August 24, 2018. https://www.shine.cn/news/metro/1808240997/.

FIG. 7 One of the regular positioned marinas with decorative new yachts for rent along the new waterfronts of the Huangpu River. The yachts are rarely used (photo by author, 2019).

FIG. 8 Today there is more than 45 kilometer of combined cycling and pedestrian routes along the Huangpu's new waterfront (photo by author, 2019).

FIG. 9 Multiple new cultural institutions opened their doors in reused industrial relics. Here Tank Space, a center for contemporary art installations and performances (photo by author, 2019).

ities have been implemented such as reused industrial buildings mainly aiming for creative industries, museums and exhibits [Fig. 9]. Multiple playgrounds for children, including skating parks and climbing walls, have been built along the riverbanks. To create a lively attractive "image," even a dozen marinas have been constructed on eye-catching locations. They are filled with luxurious yachts to suggest vibrant water tourism. However, the yachts are seldom used and most of them are not privately owned –it is very hard to get a permission to use a yacht on the busy Huangpu River since there is a lot of freight transport – but are available for rental by a development company to be used for special occasions like weddings or company activities. Another still-unaddressed issue is the fact that most of the above mentioned waterfront projects have so far taken the form of offices, hotels and high-end apartment buildings, and most of them remain empty since they are used as investment objects only. Most of the ground floors – which are usually used for public services, shops and restaurants – are still empty. According to some respondents, the Feng Shui – a traditional Chinese philosophy that was been illegal during the heydays of communism, but is in a process of revival nowadays. Feng Shui aims to bring harmony between people and their surroundings – is not good here, especially along the North Bund.

Except for the West Bund part most of the new constructed boardwalks and cycling routes are not used intensively yet. Although they are visually very attractive large parts are often relatively inaccessible for daily life use, according to field observations and a number of interviews with residents, being far away from residential areas and difficult to reach by public transport [Fig. 10-12]. It is often hard to find a place to sit and enjoy the view on the water (except for the West Bund and East Bund). Dozens of cameras and security guards stop people from taking spontaneous actions, so as to prevent the local authorities from being held liable if someone falls into the water. While the dangers of swimming are clear, even fishing is prohibited in most places – but some people neglect this limitation and still go fishing. Additionally the construction of multiple barriers against a rising water level means that in many places the water is not visible. The Cool Docks for example, a promising redeveloped area along the South Bund that opened in 2010 is one example of an area where glitzy restaurants, hotels, and penthouses remain relatively empty and unfilled by virtue of their remoteness for pedestrians [Fig. 6]. Currently this Cool Docks area is already undergoing an intensive redevelopment, less than ten years after its completion.

The expectation for the Huangpu Waterfront was that it would become an international first-class public "sitting room as well as an"ecological corridor" according to the master plan. These very ambitious promises have already been partly achieved today. More than 45 kilometers of waterfront is realized almost continuously, for pedestrians and cyclist (less than 3 years ago most of these areas were inaccessible). Especially large tracks

FIG. 10 Figure shows a partly privatized part used for docking small cruise ships, but seldom used.

FIG. 11 Figure shows a partly privatized part used for docking luxurious yachts for rent, but seldom used.

FIG. 12 Figure shows a sign with the text "If you love me, don't touch me!" to prevent people sitting on the grass lawns (photo by author, 2019).

of the newly constructed West Bund became a very dynamic and attractive public space and also some parts of the North Bund and East Bund, although most of the waterfront still lacks users. The promised cultural facilities and historical linkages with the industrial past are established in multiple museums and galleries in reused and renovated warehouses, and the integration in the new landscape of cranes, rail tracks, anchor piles, and other artifacts. The low carbon promises are achieved through the replacement of industries and abundant green space for recreation, although the ecological connection is not optimal since there is no continuity for animals and plants in their natural settings. The new green spaces are mainly decorative grasslands and trees. Although parts of the embankments have a green character the waterfronts are still dominated by long stretches of concrete former industrial embankments and this seems unlikely to change soon. The promise to attract investment is also lacking, most new real estate projects (mainly offices and commercial spaces) are missing tenants. Tourism is limited to the Old Bund area and the new creative centers at the West Bund, which is less than 5% of the

total new waterfront space.

The short timespan and high-quality outcomes can be seen as a successful result of socio-technical experimentation, although according to many interviewees the usability is not optimal yet. However, more and more places show spontaneous adjustments and creative use of the waterfront spaces such as picnicking and various sport activities on places that were not meant for this. Meanwhile there also is an improvement visible when we compare the first implemented parts and the later implemented parts, especially also the redevelopment of the Cool Docks area, which proves to a certain extend a sustainable innovation journey. Coming years more improvements are expected, especially when more and more people will start using the spaces.

The current transition of China's society and economy is perhaps reflected in the controlled transition of public spaces and urban settings along the watersides. All is aimed on economic prosperity and improving the public image and status. But the real potential of urban watersides seems unnoticed, and space for spontaneous usage (fishing, kiting, playing) is strictly limited. Many buildings along the waterside are still not turning their front to the water; they are oriented with their entrance and main façade towards the roadside. Shanghai's new relationship with the water seems slightly platonic here.

New role and usage of watersides in the peri-urban periphery of the Direct Controlled Municipality of Shanghai

The rural parts of the direct controlled municipality Shanghai (equal to a province) transformed drastically in last two decades. For this paper, two segments of the waterfront in the Yangtze estuary are examined, both bordering to Shanghai but administratively belonging to Nantong (Jiangsu Province). The first case is on Chongming Island; the second one is just north of it at the other side of the Yangtze River. In 1996 Chongming Island has been appointed as China's National "Green Eco-Island," a pilot project for sustainable development[30], in the latest master plan this status been upgraded to a National Ecological Demonstration Zone, it is expected to be an experiment to realize a more sustainable and balanced (but still urban-centered) society. Chongming and also large parts of Nantong are still rural in appearance and land use, although this is changing due to new infrastructures. Shanghai's Chongming Island is located in the middle of the Yangtze River Estuary and is still far behind on the general development of Shanghai, due to its isolation. At the same time, it has high ecological values, especially for

30. Harry den Hartog, "Rural to Urban Transitions at Shanghai's Fringes, Explaining spatial transformation in the backyard of a Chinese mega-city with the help of the Layers-Approach," *International Review for Spatial Planning and Sustainable Development* 5, no. 4 (2017): 54-72.

migratory birds (at the east end of the island there are even two zones that are according to Unesco's Ramsar Convention on Wetlands of international importance). It also has rich agricultural resources, since this alluvial land is extremely fertile.

However, the urban development pressure is alarming, especially since the completion of a new tunnel-bridge in 2009. This resulted in rapid increasing real estate values and ambitious plans aiming to attract Shanghai's new middle class.[31] A range of new real estate projects and infrastructures does not appear to be eco-friendly at all. Chongming's new infrastructure and urban developments brings new opportunities and prosperity for the local population, but simultaneously it also forms a threat for traditional lifestyles, existing spatial qualities, the water system and ecological system. Also in terms of governance there are conflicting interests. Although the national government desires the island to become a national sample for sustainable development, the local government seems especially keen on stimulation of new real estate developments, such as high-end housing and business parks, as an opportunity to gain more income and to catch up economically. The current ambition is to connect the island with Shanghai's metro system before 2020, although this seems not feasible. Simultaneously the Shanghai Direct Controlled Municipality considers the island as a backdrop for day-tourism as a release for the urban congestion. Recently a series of senior housing complexes are under construction, aiming fore wealthy elderly. However, they do not come, and the apartments remain empty and are used for investment only.[32]

A clear illustration of what could go wrong if there is no strict supervision is the township of Haiyong, at the northern tip of the island. As a result of the natural sedimentation process over the years, this township belongs to the Jiangsu province and drops outside the National "Green Eco-Island" policy. This part is under the jurisdiction of the City of Nantong, north of the river, who saw this as an opportunity to develop a new town for 100,000 inhabitants, named "Long Island" **[Figs. 13-25]**. This water sport and leisure-oriented project is under construction on top of reclaimed wetlands and tidal flatlands since 2013. Most of the already erected 40-floor-skyscrapers and villas are acquired by individual buyers from Shanghai, who use this location as an investment opportunity, and certainly not for living, resulting in a dramatic situation of empty real estate on top of former wetlands.[33] This is socio-economically, culturally, and especially ecologically a grand failure. Last year national officials were revising this case and ordered a temporary "halt" on construction. After considering the possible demolition of the high-rises the decision was made to still continue constriction but limit the building height to 6 floors.

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31. ibid.
32. ibid.
33. ibid.

FIG. 13 Fragment of the Long Island development project (image from http://www.fang.com).

FIG. 14 Empty real estate for investment on Long Island. According to real estate agents and spoken residents almost 100% of the units are owned by Shanghainese (photo by author, 2019).

FIG. 15 Empty real estate for investment on Long Island. According to real estate agents and spoken residents almost 100% of the units are owned by Shanghainese (photo by author, 2019).

FIG. 16 Scale model of New Venice in Nantong (photo by author, 2018).

FIG. 17 Billboard of New Venice in Nantong (photo by author, 2018).

FIG. 18 Privatized new beach in New Venice, Nantong (drone photo by author, 2018).

Another, even more extreme situation can be found at the Nantong side of the estuary, just north of Chongming [Figs. 15-18]. After opening of the Chongqi Highway Bridge in 2011, the travel time from Qidong to Shanghai dropped from 4 to 1 hour. This fact, in combination with the strategic location at the northern side of the mouth of the Yangtze River, led the Nantong authorities to prepare this location for investment, with the hope this could give a positive spin-off to the economically rather poor surrounding areas.

The local economy used to be mainly based on agriculture (aquaculture) and a few outdated shipyards with related industries. To diversify the economy and attract higher income groups, the decision was made to focus on water related tourism and housing. To brand this new town and attract investors the name "New Venice" was chosen. A water-rich plan was made for the first phase of the development, with a five star hotel, conference venue, commerce, and housing for 100,000 new citizens on top of reclaimed land, formerly tidal flats and wetlands. A dam was made in 2011 to improve the water quality, especially its color, near the coastline: the sediments in the water will sink to the bottom and increase the transparency of the water a bit. In 2012 the first apartments completed and quickly sold to mostly Shanghainese individual investors, according to interviewed real estate agents. Hence this site became an investment vehicle. Today this project remains still empty, five year after its completion, similar to many so-called Chinese ghost towns.[34] The beach – one of the only two beaches in a 60-kilometer radius from the center of Shanghai – is walled of and only accessible after payment of sixty Chinese Yen, which is more than a day salary for local people in neighboring villages. Due to the wall also the visual relation towards the water is absent. Only hotel guests on higher floors can see the water. Public transport is missing and the available shops and even the hotel and conference venue are sparsely used. Though the local authorities and developers made a lot of money by this development also this case can obviously be named a mismatch in socio-economic terms: (1) almost no new jobs are created for locals; (2) the project is a waste of space and resources; and (3) it is an ecological tragedy since former wetlands are gone. This project showcases another clash between promises and reality, and moreover a mismatch with what is really needed.

Discussion

Periods of rapid economic growth and urbanization frequently go hand in hand with innovation. Contemporary Chinese cities fulfill all the conditions for experimenting with architectural typologies, building technologies, and planning concepts: economic prosperity, a vast and relatively cheap labor

34. Wade Shepard, *Ghost Cities of China* (London: Zed Books, 2015).

force, a growing educated middle class, and a financially strong government that legally owns all the land. Experimenting means to try something new, evaluating the results, and repeating the experiment if necessary. While outcomes may vary, the spirit of experimentation is something to be celebrated. China is home to its fair share of failed architectural experiments, but it has also seen many promising results, especially regarding new urban transportation systems.

Although the process of collecting inspiration and innovative ideas through "shopping" under international design competition entrees[35] appears to be highly experimental, it remains sometimes unclear if the decision makers learn during their "innovation journey." Nevertheless multiple adjustments during the process of design and implementation suggest that there is at least an intention to learn and discuss. The Cool Docks area for example has been used for tests with various typologies of integrating a flood barrier into the public space, and also there was a pilot to activate this remote area by implementing an artificial beach (between 2010 and 2017). Currently a new boardwalk is under construction to improve visibility of the water. In the case of Chongming we see that new versions of the general master plan include updates and improvements to steer the eco-island development into a more desirable direction.[36] Especially also the building halt of the Long Island development indicates willingness for adjustments and radical changes (even complete deconstruction of the high-rises was for a moment a serious option).

Testing out different ways of making better cities are supposed to be a key to this strategy of improving the quality of live and stimulating the economy. The scale and speed of China's transformation in the last two decades could not have happened without embracing innovation and the energy for change. Unlike relatively small-scale urban labs[37] in the Western context, the Chinese approach has been much more pronounced, albeit with often-severe collateral damage to the environment. An increasing uncertainty in terms of climate change and also the national economy call for a paradigm shift in architecture and urban planning. Policymakers, developers, architects and urban designers across the country should articulate a more coherent vision for the readjustments that will have to be made to our living environments sooner or later. Hopefully more thoughtful experiments will follow and result in trendsetting inspiring samples that transform China into a world-leading urban lab for sustainable building and urban innovation.

Though lot has been changed in a positive way the new relation between city and water is still a platonic one. That is really a pity. Many samples

35. Den Hartog, *Shanghai New Towns*.

36. Ma, "Assessing the implementation."

37. James Evans, Andrew Karvonen, and Rob Raven, *The Experimental City* (London and New York: Routledge, 2016).

worldwide – Barcelona, London, New York, and Rotterdam, etc.[38] – prove that a wider range of design solutions is possible to bring people closer to the water safely. However, with kilometers of waterfronts still waiting to be (re-)developed in the area of Shanghai, there will be new opportunities for real "place making."

Conclusions

This paper uses basic insights from the academic field of Sustainability Transitions, especially about expectations, socio-technical experimentation and sustainable innovation journeys. Paragraphs 4.2 and 4.3 describe how drastic spatial and economic measures do not automatically result into realization of expectations. Although the general quality and appearance of the implemented projects is very high, these attributes are not accompanied by the expected improvement of the quality of daily life. The cases promise to go beyond conventional projects and have to a certain extent an experimental character, but in the end after implementation they are not that much different and the promises are mainly used for branding[39] and investment.[40] The new watersides have a high decorative character, yet fail to fully utilize all the potentials offered by their prime locations along the water. It seems that "numbers," "size" and especially "image" matters for local developers and authorities. However, the adjustments in the described cases also prove that lessons are learned, though usually after damage is done. China is rapidly shifting from a production economy towards a consumption society. Its unique situation of large-scale and extremely rapid transformation is unavoidably accompanied by trial and error.

Based on the findings of this paper some recommendations can be made, aimed to make the discrepancies between expectations and needs for daily life reality smaller. Although the quantity and quality of the implemented new public spaces are highly attractive visually, there is a discrepancy between form and needed functions: accessibility, space for spontaneity [Figs. 19-21], proximity of (affordable) housing, and more places to rest (especially in the North Bund area). *By involving more stakeholders and end-users in the planning and design process, and by implementing "needs assessment" in advance, more usable, attractive and vibrant spaces can be realized* (recommendation 1).

In the first part of this paper, an experiment is defined as an "inclusive, practice-based and challenge-led initiative, which is designed to promote

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38. Han Meyer, *City and Port; Urban Planning as a Cultural Venture in London, Barcelona, New York, and Rotterdam: Changing Relations Between Public Space and Large-Scale Infrastructure* (Utrecht: International Books, 1999).

39. Martin de Jong et al., "Explaining city branding practices in China's three mega-city regions: The role of ecological modernization," *Journal of Cleaner Production*, 179 (2018): 527–543.

40. Den Hartog, "Rural to Urban Transitions."

FIG. 19 Spontaneous use of watersides in new towns near Shanghai (photo by author, 2010 - 2019).

FIG. 20 Spontaneous use of watersides in new towns near Shanghai (photo by author, 2010 - 2019).

FIG. 21 Spontaneous use of watersides in new towns near Shanghai (photo by author, 2010 - 2019).

system innovation through social learning under conditions of uncertainty and ambiguity."[41] The cases that are analyzed in this paper teach us that China's extreme development speed in combination with the present political vigor (financial strong, quick changes and decisions are possible, all landownership belongs to the government) also requires social learning and connection with all stakeholders and their needs to be able to realize a more sustainable innovation journey. The three cases described show mismatches and partial failures in their promises (expectations) and what they delivered in terms of socially, economically and environmentally sustainable development. Another recommendation to planners and policymakers is *to foster a more "experimental mindset" without fixed end goals, and to look beyond their own projects and seeking to learn from other practices. Moreover it is essential to be aware of societal and environmental challenges and uncertainties* (recommendation 2).

Even more needed is a transition in worldviews: the earth is not an empty sheet, a tabula rasa, but a palimpsest of multiple layers in which multiple factors come together. By searching a better connection with the existing landscape, ecological and sociocultural values a stronger identity and sense of place could be realized (recommendation 3). This third recommendation is practiced in the case of the Huangpu Waterfronts, but is absent in both rural cases. The supervision in the central city is obviously stronger than on Chongming.

The relation of urban settlements with the water used to be very direct in this region. This shifted during the period of industrialization since late 19th century. Nowadays there is a new shift taking place, geared toward service industries, recreation, and tourism. To be able to facilitate this shift and steer it in the right direction, more awareness of the place-making possibilities of watersides is needed, in line with already existing local values (historical, ecological, and socio-economical). This will certainly result in a less platonic relation: a more dynamic, functional and pleasant urban life, as a reinterpretation of the classic Chinese painting *Qingming Shanghetu*.

Harry den Hartog Faculty member at Tongji University Shanghai, China, and PhD candidate at Delft University of Technology, The Netherlands.

41. Sengers, "Cycling the City."

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MAIN SECTION

The Brand-new Riverfront and the Historical Centre: Narratives and Open Questions in Contemporary Ahmedabad, India

Gloria Pessina — Politecnico di Milano (Italy) — gloria.pessina@polimi.it

ABSTRACT

In 2002, the city of Ahmedabad (India) was profoundly shaken by severe interreligious riots. Subsequent years saw deep transformations in the image of the city and the consolidation of the right-wing Hindu nationalist party in the local and supra-local political arena. This article investigates some of the spatial manifestations of an urban transformation involving the valorization of historical heritage. The article focuses in particular on the large-scale Sabarmati Riverfront Development Project, which began in 2005 and remains ongoing, and on the inclusion of the historical center of Ahmedabad in the World Heritage List in 2017. The two developments have profoundly reshaped the image of the city and its river. The article offers an analysis of the city's transformations and of the related rhetoric promoted by the local governing coalition. It highlights the city's role in shaping a vision of a global, sustainable and historic metropolis.

KEYWORDS

Water Heritage; Displacement; Riverfront Development; Unesco World Heritage.

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1 Introduction

In 2011, the Indian city of Ahmedabad celebrated its 600th anniversary and announced initiatives to valorize the history of the city, including heritage walks, theatre shows celebrating the city's past, and publications on Ahmedabad's history. The city was experiencing the most radical transformation since its industrial decline, both in economic and spatial terms. The largest riverfront project of India, the Sabarmati Riverfront Development Project, was under construction, extending for around 10 kilometers in the core of the city, and several new residential and industrial developments were being built, mostly by private actors in the outskirts of Ahmedabad. It is in this context that the city center, located on the eastern side of the river, was proposed for inclusion in the UNESCO World Heritage List by a local governing coalition led by the Ahmedabad Municipal Corporation and supported by local professionals. UNESCO added the area to the list in 2017 [Figs. 1-2].

Drawing on recent theoretical work in critical geography and sociology of valuation, the article explores the simultaneous attention to the conservation of heritage and the development of large-scale projects promoted by the local governing coalition. The article analyzes how the governing coalition developed a new identity for the city after a period of traumatic events that included interreligious riots and attacks against the Muslim population. That violence has been extensively studied and this article includes a brief review of that literature in section 4.[1]

What image of the city has emerged from the combination of new large-scale developments and the simultaneous recognition of the historical significance of the city center? Who can find a place in this new vision for the city and who is excluded? In addressing these questions, the article focuses in particular on the period between 2010 and 2013. This was the period in which the main transformations of the riverfront took place and when the city celebrated its history to mark the 600th anniversary of its foundation in 1411. The article elaborates on part of the materials collected during two periods of fieldwork conducted in Ahmedabad in 2010-2011 and in 2012-2013, drawing in particular on in-depth interviews with architects, academics, lawyers, historians and public officers.

The article does not investigate the reasons behind the apparent absence of an organized conflict around the creation of the Sabarmati River Front

1. The 2002 pogrom has been the object of a report by the Human Rights Watch, *"We have no order to save you": State Participation and Complicity in Communal Violence in Gujarat* (New York: Human Rights Watch, 2002). An explicit accusation was written by the Gujarati lawyer Girish Patel, "Narendra Modi's One-Day Cricket Match", *Economic and Political Weekly* 37, no. 48 (November 2002): 4826-4837. The violence was recalled also in the following years by Indian and international scholars, e.g. Achyut Yagnik and Suchitra Sheth, *The shaping of modern Gujarat* (New Delhi: Penguin Books India, 2005). See also, Tommaso Bobbio, "Making Gujarat vibrant: Hindutva, development and the rise of subnationalism in India," *Third World Quarterly* 33, no. 4 (Spring 2012): 657-672.

FIGS. 1-2 *Localization of Ahmedabad and of its city center (source: Google Earth, Image © 2019 Digital Globe).*

Development Project, which was the focus of a previous publication. [2] The photographs included in the following pages highlight the physical transformation of the riverfront and of the surrounding spaces between 2010 and 2013; not included are the visual materials that can be easily found on the UNESCO reports,[3] in numerous history of architecture and

2. Gloria Pessina, "The 'Missing Conflict' of the Sabarmati Riverfront. Authoritarian Governance, Neoliberalism and Water in Ahmedabad, India," *PA.CO. Partecipazione e Conflitto* 11, no. 3, special issue *Ten years of PA.CO*, edited by Alice Mattoni and Louisa Parks (December 2018): 692-716.

3. UNESCO World Heritage Centre, "Historic City of Ahmadabad" (2017).

conservation studies,[4] as well as in the promotional materials of both the heritage city[5] and the riverfront.[6]

The next section lays out the theoretical framework used to answer the research questions, highlighting the complementarity between theories of critical geography and of sociology of valuation and introducing the theory of "heritigization" elaborated in the anthropological debate by the English anthropologist Michael Herzfeld and others.[7] The third section focuses on the specific case of Ahmedabad, describing the context in which a new vision for the city was elaborated and how it was translated into development and conservation projects. The conclusion highlights Ahmedabad's particularities with respect to other waterfront development projects, which are the object of recent and forthcoming studies. The conclusion also reflects on the ways in which the theories explored in the second section are helpful for understanding similar cases. It emphasizes the need to integrate theoretical perspectives in urban and heritage studies.

2 Theoretical framework

A city vision encompassing new large-scale projects and valorizing part of the existing heritage in Ahmedabad can be read from different perspectives. In critical geography, the American geographer David Harvey[8] and the American urban theorist Neil Brenner[9] see urban space as the "spatial fix" needed for the perpetuation of capitalism, that is, "a relatively fixed and immobile basis upon which capital's circulation process can be extended, accelerated, and intensified."[10] In the sociology of valuation, the French sociologists Luc Boltanski and Arnaud Esquerre (2015, 2017) develop the notion of an "economy of enrichment," by which the authors mean "the act of improving the value of something" and "the economic exploitation of the past."[11]

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4. Rabindra Vasavada, "Evolving Scenario of Architecture in Gujarat: an overview", *Seminar (India) Magazine* (1998). Yatin Pandya and Trupti Rawal, *The Ahmedabad chronicle, imprints of a millennium* (Ahmedabad: Vastu Shilpa Foundation for Environmental Design, 2002). Riyaz Tayyibji, *AMD. Ahmedabad* (New Delhi: Bloomsbury India, 2017). Priyanka Sheth, Tanvi Jain, Riyaz Tayyibji, *Stepwells of Ahmedabad – Exhibition at Yale Architecture* (Ahmedabad: Anthill Design, 2018). Jigna Desai, *Equity in Heritage Conservation. The Case of Ahmedabad, India* (Abingdon and New York: Routledge, 2019).

5. Ahmedabad Municipal Corporation, "World Heritage City Amdavad" (2017).

6. Sabarmati River Front Development Corporation Ltd (SRFDCL), "Sabarmati Riverfront. Reconnecting Ahmedabad to its River" (2014).

7. Michael Herzfeld, *Evicted from Eternity: The Restructuring of Modern Rome* (Chicago: Chicago University Press, 2009). Id., "Engagement, Gentrification, and the Neoliberal Hijacking of History." *Current Anthropology* 51, no. S2 (October 2010): 259-67.

8. David Harvey, *The urbanization of capital* (Oxford: Blackwell, 1985). Id., *The condition of postmodernity. An enquiry into the origins of cultural change* (Oxford: Blackwell, 1990).

9. Neil Brenner, "Global Cities, Glocal States: Global City Formation and State. Territorial Restructuring in Contemporary Europe", *Review of International Political Economy*, 5, no.1 (Spring 1998): 1-37. Id., *New state spaces. Urban governance and the rescaling of statehood* (New York: Oxford University Press, 2004).

10. Id., "Global Cities," 34.

11. Luc Boltanski and Arnaud Esquerre, "Grappling with the Economy of Enrichment", *Valuation Studies*, 3, no.1 (Fall 2015): 76. Id., *Enrichissement: une critique de la merchandise* (Paris: Gallimard, 2017).

Harvey recalls the theories by the French philosopher and geographer Henri Lefebvre[12] in his work on the condition of postmodernity[13] and stresses that the "production of space" should be considered both in material and immaterial terms. Drawing on Karl Marx's classic works, Harvey describes the production of space as a necessity within capitalism, since its survival depends on the existence of a variety of physical and social infrastructures. Moreover, the built environment itself, defined by Harvey as a "capital spatial fix,"[14] guarantees profits to those with privileged access to it, by providing opportunities to direct the surpluses of the capitalist economy to further spatial development and thus avoiding the crisis towards which capitalism would tend, i.e. the over accumulation of capital followed by devaluation. Each socio-spatial configuration is therefore constantly dynamic, as Harvey explains in his book *The Urbanization of Capital*: "the inner contradictions of capitalism are expressed through the restless formation and re-formation of geographical landscapes. This is the tune to which the historical geography of capitalism must dance without cease."[15]

In line with Harvey's theories, Brenner has also focused on the built environment and in particular on science parks, financial centers, waterfronts, Special Enterprise Zones and other large-scale developments, defined as "new state spaces"[16] in order to underline the relevant role played by government authorities in their creation. Even though much of the literature about globalization and world cities has tended to depict states as weak actors losing their power in a growing "space of flows,"[17] Brenner argues that the state is actually just "re-scaling,"[18] that is, changing its (spaces of) action, as suggested by Lefebvre[19] and as further elaborated by the Belgian geographer Erik Swyngedouw.[20] In Brenner's view, "cities throughout the world economy are being promoted by their host states as locational nodes for transnational capital investment"[21] and the case of Ahmedabad is not an exception to this trend.

Critical geographers mostly refer to new spatial developments promoted by local and national governments as exceeding capital flows. To understand a case in which the creation of new urban spaces goes hand in

12. Henri Lefebvre, *The production of space*, translated by Donald Nicholson-Smith (Oxford: Blackwell, 1991).

13. Harvey, *The condition of postmodernity*.

14. Id., *The urbanization of capital*.

15. Ibid., 150.

16. Brenner, *New state spaces*.

17. Manuel Castells, *The Rise of the Network Society* (Oxford: Blackwell, 2002).

18. Brenner, "Global Cities."

19. Lefebvre, *The production of space*.

20. Erik Swyngedouw, "Authoritarian governance, power, and the politics of rescaling", *Environment and Planning D: Society and Space*, 18 (2000): 63-76. Id., "Globalization or 'Glocalization'? Networks, Territories and Rescaling", *Cambridge Review of International Affairs*, 17, no.1 (2004): 25-48.

21. Brenner, "Global Cities," 3.

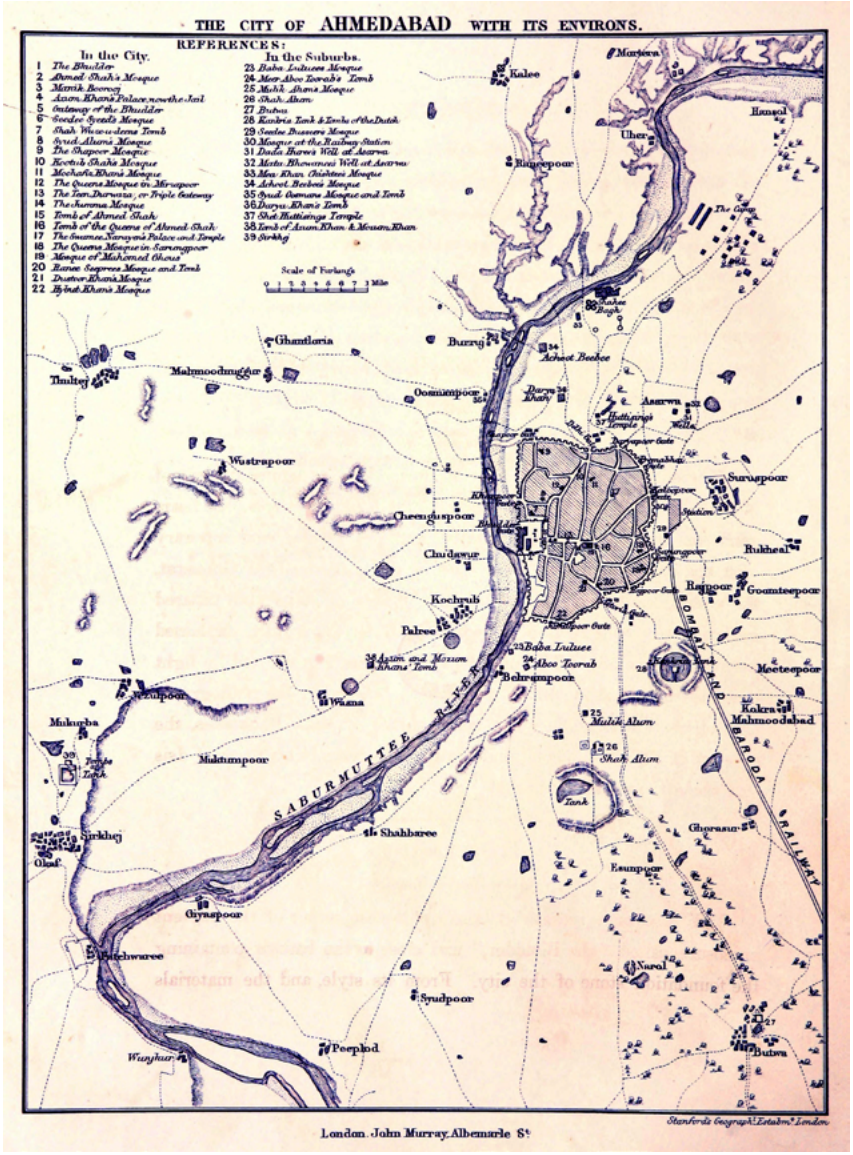

FIG. 3 *Map of Ahmedabad and of its surroundings in 1866 (source: The British Library @ Flickr Commons. File from the "Mechanical curator collection").*

hand with the valorization of heritage, it is also helpful to consider works by Boltanski and Esquerre on the economy of enrichment, including the social construction of the value and the price attributed to objects, including the built environment, as well as the impact of such an economy on different social classes.

The economy of enrichment is the term used by the authors "to refer to the forms of wealth creation that are based on an economic exploitation of the past, in the form of craft, heritage, tradition, identity or, more largely, culture."[22] Following the approach of the Indian-American anthropologist Arjun Appadurai to the "social life of things,"[23] the authors reflect on the social construction of value, highlighting the relationship between critical socio-economic moments and the simultaneous need to valorize the past

22. Boltanski and Esquerre, "Grappling with the Economy of Enrichment," 76.

23. Arjun Appadurai (ed.). *The social life of things. Commodities in cultural perspective* (Cambridge: Cambridge University Press, 1986).

(e.g. creation of a "France" brand, made of castles and expensive wine and cheese in a moment of crisis in the late 1980s and again at the beginning of the 21st century). Interestingly, Boltanski and Esquerre observe that the promotion of "the memorial force of things," including that of historical buildings and urban areas, depends on the creation of "value narratives focused on traditions, genealogies, identities and pedigrees",[24] which can be appropriated and promoted by nationalist parties in the political arena, as seems to have happened in Ahmedabad [Fig. 3].

Boltanski and Esquerre highlight different social actors taking advantage of the past and marketing it, or, on the other end of the spectrum, being affected by such actions, through gentrification, for instance. In their view, a rising "patrimonial class" has an interest in recognizing the value of their historical assets with the support of experts such as historians, architects, art critics and communication specialists. Meanwhile, the part of the population traditionally active in historical centers tends to be displaced and dispossessed of its own past through processes of gentrification and eviction.

Similarly, the Italian anthropologist Chiara De Cesari and the Macedonian anthropologist Rozita Dimova[25] highlight the increasingly close relationship between heritage valorization - or heritigization, as defined by Herzfeld[26] - and gentrification, stressing how such processes tend to affect the most vulnerable members of the population (in terms of class, religion, race and gender), who often end up being displaced and losing their main sources of livelihood. Even though the controversial effects of heritigization have been already shown by some scholars,[27] De Cesari and Dimova notice that the simultaneous processes of heritage valorization and gentrification, as well as the role of various institutional, private and professional actors within these processes, have not been adequately studied, especially by urban and heritage scholars.

Helping to fill the gap in the urban studies literature on the relation between heritage valorization and increasing urban inequalities, this article considers the relationship between the creation of new state spaces[28] such as the Sabarmati Riverfront Development Project, and the economy of enrichment[29] resulting from the valorization of the historical center. These

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24. Boltanski and Esquerre, "Grappling with the Economy of Enrichment," 79.

25. Chiara De Cesari and Rozita Dimova, "Heritage, gentrification, participation: remaking urban landscapes in the name of culture and historic preservation", *International Journal of Heritage Studies*, 25, no. 9 (2019): 863-869.

26. Michael Herzfeld, "Engagement, Gentrification," 259-67.

27. Richard Florida, *The New Urban Crisis: How Our Cities are Increasing Inequality, Deepening Segregation, and Failing the Middle-Class—And What We Can Do about It* (New York: Basic Books, 2017). Herzfeld, Michael. *Evicted from Eternity*. Id., "Engagement, Gentrification." Salvatore Settis, *If Venice Dies*, translated by André Naffis-sahely (New York: New Vessel Press, 2016). Sharon Zukin, *Naked City: The death and life of authentic urban places* (Oxford: Oxford University Press, 2010).

28. Brenner, "Global Cities."

29. Boltanski and Esquerre, *Enrichissement*.

two processes, which resulted in gentrification and displacement for the most marginal parts of the local population, proved to be part of the same political vision, a vision promoted mostly by the right-wing Hindu nationalist party (BJP) not only for the city but also for the whole state of Gujarat and, more recently, for the entire Indian nation, ruled since 2014 by Narendra Modi. The BJP leader, who was confirmed as the guide of the nation in 2019, started his career in Gujarat and became known across India for making Ahmedabad an aspiring global city with a historic heart, gaining the support especially of the rising Hindu middle class. How the two processes of development and heritage conservation have been intertwined in Ahmedabad and who has been excluded from such processes will be the object of the next section of the article.

3 A "new state space" at the heart of Ahmedabad: the Sabarmati Riverfront Development Project

The governing coalitions have justified the development of the Sabarmati riverfront and the valorization of the historic city center of Ahmedabad with a variety of narratives, including those about a need for development to compete with other global cities, about a need to protect the population from both natural hazards and social disorders, and those involving purity and cleanliness, which has been strongly bound to tradition, heritage valorization and religion. Such narratives contributed to a new image for Ahmedabad, but also were promoted on a larger scale. Narendra Modi, who served as Gujarat's Chief Minister from 2002 to 2014, drew on these narratives in initiatives such as the Vibrant Gujarat biennial summit. The summit, aimed at mixing "culture with commerce, trade with tradition, enterprise with entertainment,"[30] was imagined since its inception in 2003 as a showcase of investment opportunities and heritage valorization, [31] both in material and immaterial terms, and it took place during Uttarayam, one of the most important Hindu festivals of Gujarat.

Around the time the Vibrant Gujarat summit started, the state also began promoting new investment opportunities through the creation of Special Economic Zones, Special Investment Regions and other new state spaces.[32] In Ahmedabad, the narrative around development and global competition was materializing in a major urban infrastructure: the Sabarmati Riverfront Development Project. Conceived in the early 1960s by the

30. The sentence is taken from the Vibrant Gujarat website managed by the government of Gujarat. The website makes reference to the first summit, in 2003, quoted in Desai, "The Globalizing City in the Time of Hindutva: The Politics of Urban Development and Citizenship in Ahmedabad, India," PhD dissertation (Berkeley: University of California, 2010): 73.

31. Renu Desai, "Entrepreneurial Urbanism in the Time of the Hindutva. City Imagineering, Place marketing, and Citizenship in Ahmedabad," in *Urbanizing Citizenship. Contested spaces in Indian cities*, edited by Renu Desai and Romola Sanyal (London: SAGE Publications, 2012b), 31-57. Mona Luxion, "Nation building, Industrialisation, and Spectacle: Political Functions of Gujarat's Narmada Pipeline Project," *Water Alternatives* 10, no. 2 (June 2017): 208-232.

32. Brenner, *New state spaces*.

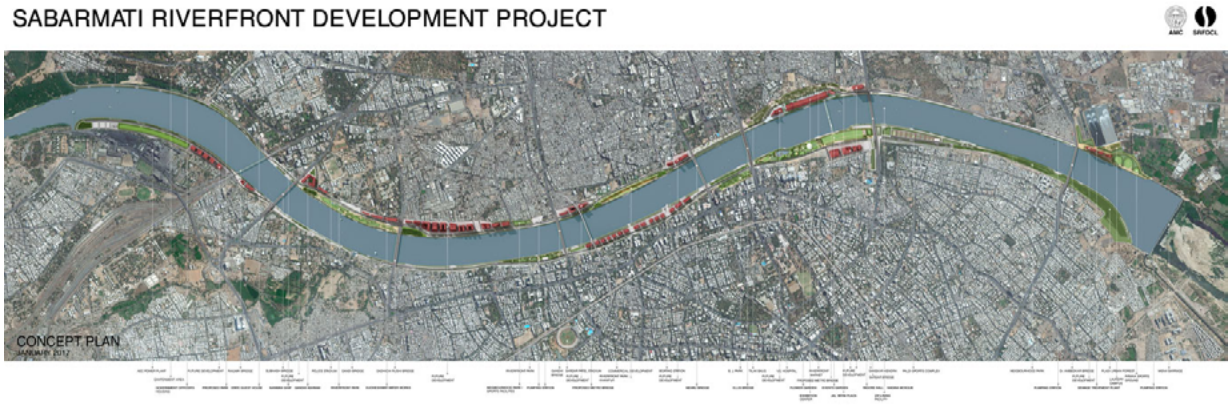

FIG. 4 *The Concept Plan of the Sabarmati Riverfront Development Project* (source: www.sabarmatiriverfront.com)

French architect Bernard Kohn, the project was redesigned at the end of the 1970s by the office led by the Indian architect Hashmuk Patel (HCP), based in Ahmedabad. Both proposals remained on paper until the late 1990s, when a special governing body—the Sabarmati River Front Development Corporation Ltd (SRFDCL)—was created by the Ahmedabad Municipal Corporation (AMC) to manage an updated and extended version of the riverfront's project.[33]

The new project was elaborated by the Environmental Planning Collaborative (EPC), a team of experts involving several members of the HCP Design, Planning and Management Pvt. Ltd and led by the architect Bimal Patel.[34] The proposal consisted in a ten-kilometer long redesign of the portion of the river within Ahmedabad's boundaries. Concrete embankments would be created to protect the city from floods and the river bed would be narrowed (from 600-300 m to 275 m), resulting in the reclamation of vast amounts of land (160 ha., later increased to 200 ha.) to allow the development of new private buildings and public facilities [Fig.4].

The main narratives behind the proposal elaborated by EPC between the end of the 1990s and the beginning of the 2000s revolved around development, sanitation and safety against floods. Rhetoric related to the valorization of culture and heritage was introduced in subsequent years, when the major infrastructural works were already at an advanced stage. In particular, the protection against flood risk has been highlighted as the main reason behind the design choice to construct RCC diaphragm walls (10-20 m depth) and anchor slabs (10 m), sustaining the lower promenade and RCC retaining walls (2.5 - 9 m), on top of which the upper promenade could be developed. The construction of the riverfront, which started in 2007, was anticipated in 2005 by the creation of a syphon north of Ahmedabad,

33. For further information about the contents of the earlier versions of the project and the context in which they were formulated see: Gloria Pessina, "Sustainable for whom? Projects and opinions on the Sabarmati river in Ahmedabad", final report, Movin'UP/GAI and Vastu Shilpa Fellowship (Ahmedabad: Vastu Shilpa Foundation for Studies and Research in Environmental Design, 2011), and id., "The 'Missing Conflict'," 692.

34. EPC, *Proposal for the Sabarmati Riverfront Development* (Ahmedabad: Environmental Planning Collaborative, 1998).

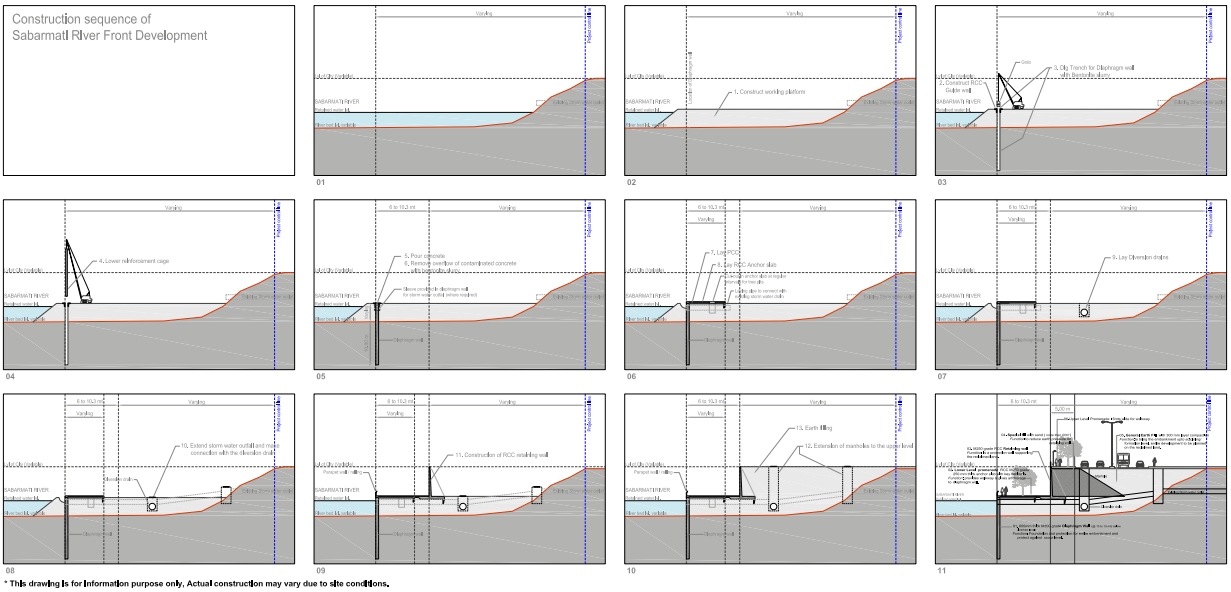

FIG. 5 *The construction sequence of the Sabarmati riverfront, highlighting the changing section of the river (source: www.sabarmatiriverfront.com)*

through which part of the water from Gujarat's main canal (Narmada Canal) was diverted to the once almost dry riverbed of the Sabarmati, thus deeply transforming the river and its possible uses[35] **[Fig.5]**.

The legitimacy of the project, which officially was aimed at reducing flood risk, was questioned by several experts, such as Prof. Rabindra Vasavada, Head of the Centre for Conservation Studies at CEPT university, interviewed by the author of this article in January 2011: "Floods are unlikely to happen but in case they will take place the covering of the riverbanks with concrete will affect the capacity of a large part of the city to absorb water and let it percolate in the soil. Moreover, the channelizing of the river for such a long stretch will affect negatively the areas both upstream and downstream of Ahmedabad where the flood will be more violent. Ultimately such sort of canal will act as a funnel."[36] This opinion, shared by other urban studies scholars, designers and landscape architects,[37] is mostly based on the recognition of the shifting riverbed, previously characterized by a varying breadth between 600 and 300 meters, and of the inconsistent nature of the Sabarmati, fed by uneven amounts of rain during the monsoon and dry for much of the year, especially after a dam was erected in the 1970s to regulate the river's flow **[Fig. 6]**.

35. Gloria Pessina, "'Società idrauliche' contemporanee: uno sguardo sul Gujarat, India," in *Acqua universale. Promesse e prospettive di una risorsa*, edited by Bianca Dendena (Milan: Fondazione Giangiacomo Feltrinelli, 2018). Id., "The Missing Conflict."

36. Id,, "Sustainable for whom?," 31.

37. CEPT University, "CEPT Interactive Workshop. Final Report" (CEPT University, 2009). Piyas Choudhuri, "Re-structuring the development along a non-perennial river. Case: Sabarmati river", MSc thesis (CEPT University, 2009). Mohan S. Rao, "Sabarmati Riverfront Development. An Alternate Perspective", LA Journal of Landscape Architecture, 36 (2012): 70-73. Amruta Pradhan, "Riverfront Development Project in India: Cosmetic Make-Up on Deep Wounds", SANDRP (17 September 2014).

FIG. 6 *Land reclamation and construction of RCC retaining walls along the Sabarmati river. View from Gandhi bridge towards the South (photo: Mariana Félix Paisana, 2013).*

The reclaimed land was meant to have been used in part as private residential and tertiary developments (15-20%) to pay back the public investment by national and local authorities, as well as for the creation of two major roads (30%), gardens (26%), promenades (6%) and for other public facilities.[38] As stated by arch. Bimal Patel in an interview in December 2010: "Most people in Ahmedabad don't have open spaces to go to. And they say that the few parks that we have are really crowded by people, you know, using them. Basically, we are adding the number of open spaces."[39] The need for open space was justified by the designer of the project through a variety of past and present models of riverfront developments: "Paris of course, New York and Cheng Du in China and Shanghai and lots of places [...]. If you take a look at the sort of problems that they had in London in the 1850s [...], gutter flowing into the river, sewage, no space to walk, etc. Things like these are what made them transform their cities."[40] [Figs. 7-8]

38. Recent data show how the project was mostly financed by public bodies, i.e. the Housing and Urban Development Corporation (HUDCO) with US$69 million and the Ahmedabad Municipal Corporation (AMC) with US$74 million. The remaining US$40 million were sold by the SRFDCL in share capital, see also: Chirayu Bhatt, "Reclaiming the Sabarmati Riverfront," in *Regenerating Urban Land. A Practitioner's Guide to Leveraging Private Investment*, edited by Rana Amirtahmasebi, Mariana Orloff, Sameh Wahba and Andrew Altman (Washington: The World Bank, 2016), 251.

39. Pessina, "Sustainable for whom?," 48.

40. Ibid., 54.

FIG. 7

FIG. 8

Fig. 7 and 8 Picture taken at the inauguration of the exhibition of the Sabarmati Riverfront Development Project at CEPT University on December 18, 2010. The visualizations show the nature of the public spaces imagined along the riverfront, e.g. gardens and promenades in a context of rapid real estate development (photo: Gloria Pessina, 2010).

According to Shirley Ballaney, Senior Principal Planner of EPC/HCP Design and Project Management Pvt. Ltd, the design of public spaces of that kind (parks, gardens, promenades etc.) is part of the British colonial legacy in Indian cities such as Ahmedabad: "When the British came, the idea of parks and gardens came with them. Having a park was not a notion in Indian culture. Perhaps in the past it was the bazaar or the street or whatever, but we have inherited modern British town planning and the parks are part of it."[41] Other voices, such as Yatin Pandya, former director of the Vastu Shilpa Foundation for Studies and Research in Environmental Design and director of Footprints E.A.R.T.H. at the time of the interview (November 2010) underlined the inner contradictions of such assumptions and on their translation in the design of public spaces along the new riverfront: "I have a problem with the idea that the riverbanks were an unattended backyard. Actually, even if there was no water, several activities took place there: a circus, cultivation, dying of clothes, markets etc. Just

41. Ibid., 48.

FIG.9

FIG. 8 *Fig. 9 and 10 The Sunday market continued to take place during the construction of the riverfront and was one of the main economic activities for the poorest strata of the population (photo: Gloria Pessina, 2011).*

look at the pictures of Henri Cartier Bresson![42] Now the riverbanks are claimed as public, but actually there isn't any form of appropriateness to culture"[43] **[Figs. 9-10]**.

The dominant rhetoric of the initial phases of the Sabarmati riverfront project - composed by a mix of narratives around global competition, national interest, urban development, security, and accessible public spaces - was translated into powerful images (Figure 6 and 7), publicly displayed when

42. The French photographer Henri Cartier Bresson documented the city of Ahmedabad and the Sabarmati river in 1966. Some of his shots can be found in "Henri Cartier-Bresson – INDIA. 1966", available online at: https://pro.magnumphotos.com/Catalogue/Henri-Cartier-Bresson/1966/INDIA-1966-NN146183.html, accessed June 10, 2019.

43. Pessina, "Sustainable for whom?," 48-49.

FIG. 11 *One of the last slum pockets left along the Sabarmati during the construction of the riverfront in 2011. The land was reclaimed soon after (photo: Gloria Pessina, 2011).*

the works were already at an advanced stage. The aim was to give "a memorable identity to Ahmedabad,"[44] through "strong visuals that don't need any words."[45] What such images tended not to show was the impact of a "new state space"[46] such as the riverfront on the weakest strata of the population, even though the initial plans made explicit reference to the slum dwellers who were not only living, but also working, in the informal economy in the proximity of the river. The narrative around security encompassed also the life of the slum dwellers who, on one hand, would have been exposed to flood risk, and on the other hand, would have contributed to the pollution of the river through their activities.

Even though some alternative design projects tried to show the possible coexistence between the presence of informal housing or informal economic activities and a non-perennial riverbed,[47] the AMC, the Ahmedabad Urban Development Authority (AUDA) and the SRFDCL took the chance to relocate part of the former slum dwellers in new public housing compounds financed through the national Basic Services for the Urban Poor (BSUP) program which was included in the first edition of the Jawarlahal Nerhu National Urban Renewal Mission (JNNURM 2005 – 2012). The standard housing unit consisted of 28 sq. meters with water supply, sewerage and electricity connections,[48] but posed some issues in terms of

44. S. Ballaney in ibid., 48)

45. Patel, "Narendra Modi."

46. Brenner, "Global Cities."

47. Choudhuri, "Re-structuring the development." Rao, "Sabarmati Riverfront Development."

48. MHUPA (Ministry of Housing and Urban Poverty Alleviation, Government of India), "Modified Guidelines for Sub-Mission on Basic Services to the Urban Poor (BSUP), Jawaharlal Nehru National Urban Renewal Mission (JNNURM)" (New Delhi: Government of India, 2009).

uses of the domestic space, of distance from the initial housing location and of affordability.[49] [Fig. 11]

As recalled by one of the most engaged advocates of the weakest strata of the population, the lawyer Girish Patel, main promoter of a Public Interest Litigation against the displacement of the urban poor,[50] "even if slum dwellers and the poor in general are considered also in the dominant rhetoric, often to justify the project, we want to stress the issue of livelihood beyond mere housing provision. Once you commercialize the river, the poor will be incongruous with the surroundings, that's why the slum dwellers got displaced. So, our prayer was very limited: don't displace them without providing them with alternative adequate accommodation. But the point is: what type of accommodation are you giving? What about the animals they have? You cannot ask them to stay at the fourth floor, as they cannot take their goats and sheep upstairs. Another issue regards the price of these houses: why should they make people beggars? And finally: if you displace them and relocate them in an area inhabited by poor people and far from the river they will not work, at all."[51]

As shown in an in-depth study of the condition of the urban poor in Ahmedabad,[52] the displacement of slum dwellers due to the construction of major development projects affected a large number of the local population: 11.000 families were displaced due to the construction of the Sabarmati riverfront and around 3.000 for other large scale projects in the city (Kankaria Lakefront project; BRTS; further road widening works). Most of the relocation sites were located at a distance between 4 and 9 kilometers from their original sites of the slums and in former industrial areas in the East [Fig. 12]. These areas were often contaminated and presented issues regarding water availability and quality, thus leading to what the Indian urban planner and theorist Renu Desai[53] defined "infrastructural violence", which adds to the loss of informal jobs for many former slum dwellers, especially women, when relocated far away from any job opportunity.

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49. The BSUP financing pattern is the following: Central Government (50%), State Government (20%), AMC/AUDA and the beneficiaries (30%). The beneficiaries share cannot exceed 12%, see also: MHUPA, "Modified Guidelines."

50. For more information about the engagement of Girish Patel, who died at 85 in 2018 and was one of the main promoters of the Public Interest Litigation against the displacement of the slum dwellers in Ahmedabad see the various works by Renu Desai on the issue listed in the references. More on the topic can be found in Navdeep Mathur, "On the Sabarmati riverfront: Urban planning as totalitarian governance in Ahmedabad." *Economic and Political Weekly* 47, no.47/48 (December 2012): 64. Darshini Mahadevia, Renu Desai and Viyas Suchita, "City Profile: Ahmedabad." Working Paper, n.26 (September 2014), Centre for Urban Equity, CEPT University (2014).

51. Pessina, "Sustainable for whom?," 45.

52. Mahadevia et al., "City Profile: Ahmedabad."

53. Renu Desai, "Urban Planning, Water Provisioning, and Infrastructural Violence at Public Housing Resettlement Sites in Ahmedabad, India," *Water Alternatives* 11, no.1 (2018): 86-105. Id., "Municipal Politics, Court Sympathy and Housing Rights: A Post-Mortem of Displacement and Resettlement under the Sabarmati Riverfront Project, Ahmedabad." Working paper, n. 23, Centre for Urban Equity, CEPT University (May 2014).

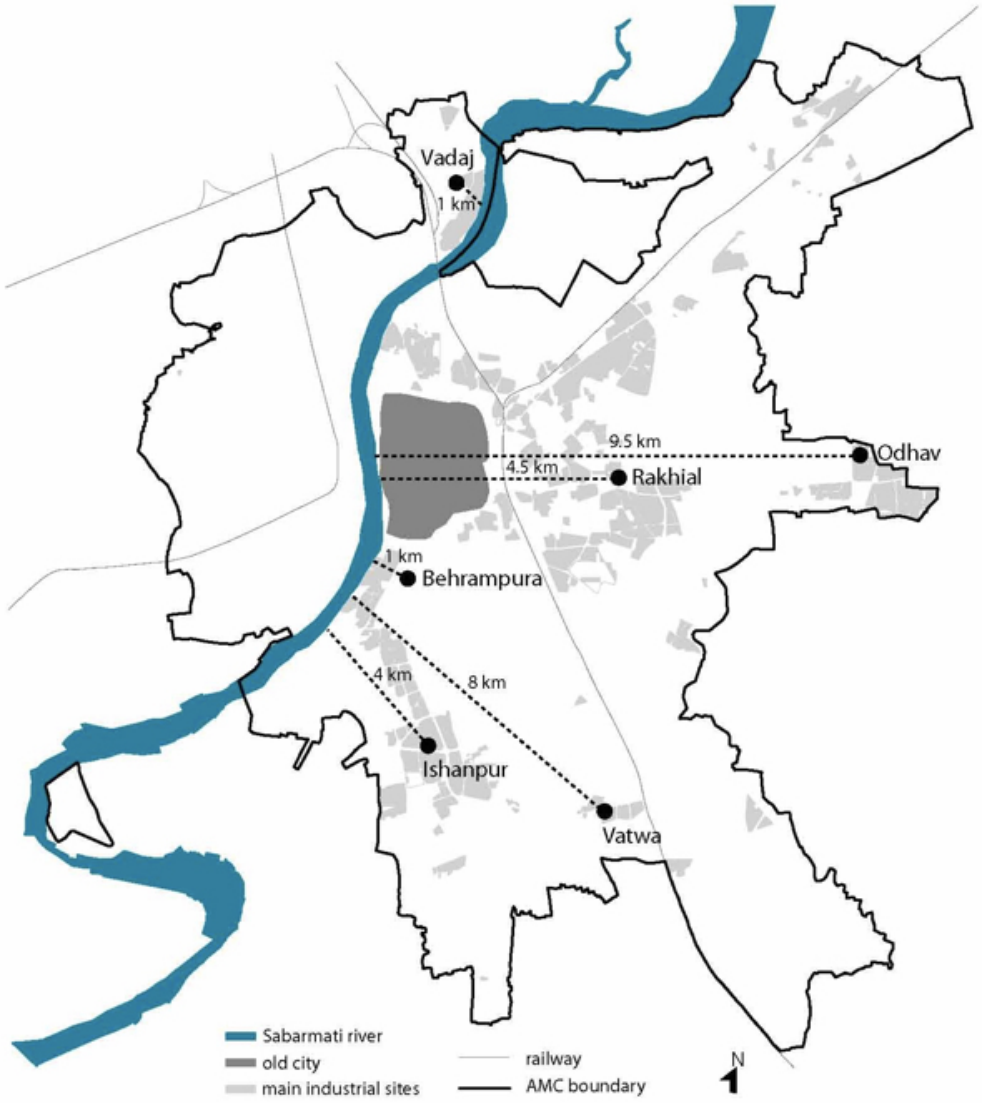

FIG. 12 *Main relocation sites of some of the displaced slum dwellers once living on the riverbanks (map: Gloria Pessina, 2011).*

The transformation of the riverfront in the heart of one of the fastest growing cities of India after the liberalization of the economy (1991) shows the reality of the theories elaborated by Brenner,[54] and even before by Harvey, about the capital spatial fix:[55] the surplus of the capitalist economy is used for spatial development, thus ensuring profits to those with privileged access to the spatial fix and discrimination against those with little access. In fact, Ahmedabad has been promoted by the state and national governments as one of the "locational nodes for transnational capital investment",[56] both through direct private investment in the real estate developments along the riverfront and through a form of public funding of the major infrastructural works based on indebtedness towards international banks and investors.[57] The Sabarmati riverfront

54. Brenner, "Global Cities." Id., *New state spaces*.

55. Harvey, *The urbanization of capital*.

56. Brenner, "Global Cities," 3.

57. Christophe Jaffrelot, "No Model state", *The Indian Express* (6 September 2013).

FIG. 13 Former slum dwellers on the western side of the Sabarmati riverfront under completion, while touristic activities start taking place along the river filled with water diverted from the Narmada canal (photo: Gloria Pessina, 2011).

became the flagship project of a transforming state, while large parts of Gujarat were offered at the Vibrant Gujarat biennial summit to Indian and foreign investors for industrial and real estate developments with very low taxation and little planning restrictions. [Fig. 13]

4 The heritigization of Ahmedabad's city center

While the riverfront development was taking place, the city promoted a "Brand Ahmedabad" at the international level, that is to say "a marketing program to encourage investment from India and abroad 'in an attempt to reinvent, rediscover and repackage the 600-year-old city'",[58] in line with the Vibrant Gujarat biennial summit organized at the state level to attract international investments. During the celebrations of the 600th anniversary in 2011, various supra-local (Archeological Survey of India) and local institutions (AMC, CEPT university, Ahmedabad National Institute of Design) emphasized the conservation of the built environment and in particular of the city center, traditionally considered the main location for trade in Ahmedabad, hosting the main markets, shops, the stock exchange and the *pols*, that is, dense residential blocks with inner courtyards, where traders of different castes and religions once lived side by side.

Through the centuries, the city center has also hosted various religious buildings, including the old Jama Masjid mosque built during the reign of Ahmed Shah, the founder of the city, and the more recent Swaminarayan Mandir, a Hindu temple built in the 19th century in the city center's Kalupur area, as well as a variety of Jain religious buildings. The 600th anniversary celebrations included events such as heritage walks through the monuments, as well as projects to restore the *pols*, important religious

58. Howard Spodek, Ahmedabad: Shock City of Twentieth-Century India (Bloomington: Indiana University Press, 2011), 269.

FIG. 14 *The ancient city walls around the city center, on the eastern side of the river (photo: Mariana Félix Paisana, 2013).*

buildings, some of the dense market areas and the remains of the city walls, especially in the section located between the old city and the river. [Fig. 14]

In the early 2000s further narratives were elaborated, in addition to those presented in the previous section (global competition, development, safety, access to public spaces etc.). Among the different discourses, purity and sacredness had a central role and were soon translated as the need to create a safe and clean urban environment, where vices would be banned. It is in this context that the dense old center started to be described as dirty in moral terms: "Over time, the old city grew into a symbol of dysfunctionality in Ahmedabad […]. It was as if the old city enclosed a form of moral pollution that had to be presented as a way of underlining the relative purity of the remainder of the city."[59]

Such a narrative[60] has been supported with references to Hinduism and Jainism, which strongly condemn impure practices in Gujarat, such as the consumption of non-vegetarian food, which is part of the everyday life of the Muslim community living in the city center and beyond. As emphasized by the Indian sociologist Dia Da Costa in her writings about

59. Christophe Jaffrelot and Charlotte Thomas, "Facing ghettoization in 'Riot-city': Old Ahmedabad and Juhapura between victimization and self-help," in *Muslims in Indian Cities: Trajectories of Marginalisation*, edited by Christophe Jaffrelot and Laurent Gayer (Oxford: Oxford University Press, 2012), 66.

60. The relation between powerful narratives and religious connotations is further strengthened by the symbolic meaning attributed to water: the transfer of water from one of the seven sacred rivers of India according to the Hindu religion (the Narmada) to feed the previously dry Sabarmati has been advertised by the promoters of the project as a way to purify the places touched by the liquid. Such rhetoric has been particularly evident in the public speeches of the former Chief Minister of the State of Gujarat and current Prime Minister of India, Narendra Modi. The head of the Bharatiya Janata Party (BJP), the Hindu right-wing nationalist party, has been among the most active supporters and promoters of the project for its salvific value.

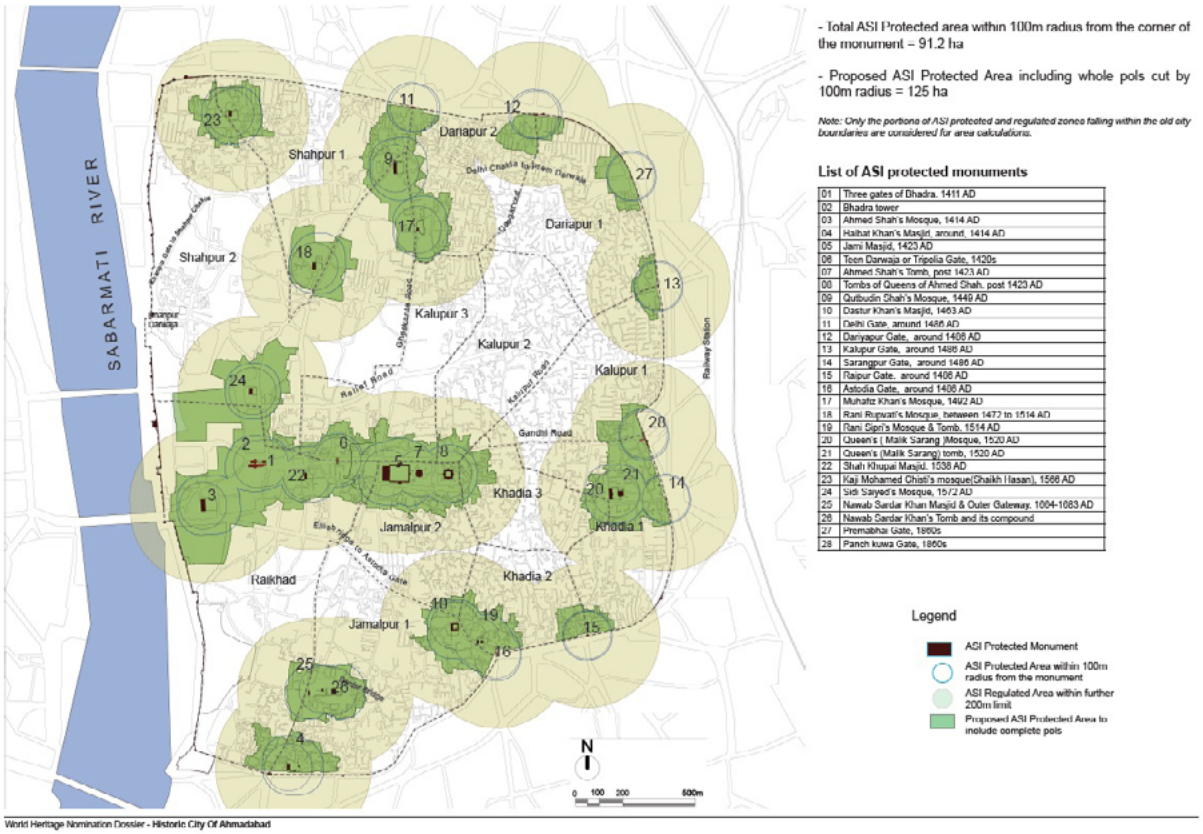

FIG. 15 *Map showing the old walled city of Ahmedabad and the protected monuments of the area. The walled city coincides with the site inscribed in the World Heritage List. Its buffer zone extends around the walls Source UNESCO. "Historic city of Ahmadabad" (2017).*

the politics of heritage in Ahmedabad[61] and in particular about the redevelopment plan of the Bhadra Plaza in the old city, "this plan reimagined the stretch between Teen Darwaza and Bhadra Fort […] as a pedestrian zone. This stretch has long been a densely-populated, largely Muslim-area, bustling with traffic and vendors, and notably, many fish and meat shops. No doubt the logic of"cleaning up" and decongestion rhetorically invokes accessibility for citizens, heritage and reduced pollution, but it equally expresses classist definitions of pedestrian access, cleanliness and vegetarian tastes of Jains and upper caste Hindus. In so doing, it further normalizes the ordinary exclusion and violence against Muslim life, culture and work in the process of revaluing real estate via the creative economy discourse."[62]

To understand the significance of such observations, and how they relate to heritigization[63] and displacement,[64] it is helpful to consider one of the city's greatest shocks at the beginning of the 21st century,[65] that is, the

61. Dia Da Costa, "Sentimental Capitalism in Contemporary India: Art, Heritage, and Development in Ahmedabad, Gujarat," *Antipode* 47, no. 1 (Winter 2015): 74-97. Id., *Politicizing Creative Economy. Activism and a Hunger called Theatre* (Champaign: University of Illinois Press, 2016). Id., "'Heritage City' Ahmedabad Was Built Through Violence and Exclusion." *The Wire India* (August 11, 2017).

62. Id., "Sentimental Capitalism."

63. Herzfeld, *Evicted from Eternity*. Id., "Engagement, Gentrification."

64. De Cesari and Dimova, "Heritage, gentrification, participation."

65. Howard Spodek, *Ahmedabad*.

FIG. 16 *Land reclamation and monument valorization on the eastern side of the Sabarmati showing also few remained shack houses (photo: Gloria Pessina, 2012)*

"pogrom"[66] of the Muslim population by Hindu radicals in particular in the city center of Ahmedabad and in various parts of Gujarat. In 2002, this series of traumatic events resulted in the deaths of around 1000 Muslims and in the loss or damage of thousands of Muslims' properties, especially in the city center.[67] These events were followed by the migration of Muslims to other parts of the city, where they could feel safer. This phenomenon gave rise to an increasing process of social and spatial segregation in the city of Ahmedabad, which became "a city of many borders."[68] [Fig. 16]

In 2017, the historical center of Ahmedabad was inscribed in the World Heritage List by UNESCO as the only Indian Heritage City for its Outstanding Universal Value. It was said (ii) "to exhibit an important interchange of human values over a span of time […] on developments in architecture or technology, monumental arts, town-planning or landscape design" and (v) "to be an outstanding example of a traditional human settlement […] or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change."[69]

The UNESCO heritage site, composed of the old city center and a buffer zone of 300 meters around the ancient city walls, comprised also the

66. Human Rights Watch, "We have no order to save you." Patel, "Narendra Modi."

67. Yagnik and Sheth *The shaping of modern Gujarat*. Bobbio, "Making Gujarat vibrant." Pessina, "The 'Missing Conflict'."

68. Darshini Mahadevia, "A city with many borders: beyond ghettoisation in Ahmedabad," In *Indian Cities in Transition*, edited by Annapurna Shaw (Orient Longman: New Delhi, 2007).

69. UNESCO, "Historic city of Ahmadabad."

central portion of the riverfront **[Fig. 15]**, and became mostly a site for monument preservation and folklore showcasing in the global context of the rising cultural tourism industry.[70] UNESCO recommended the reconnection of the city center and the waterfront through a "Historic Urban Landscape" approach,[71] i.e. through in-depth surveys on the natural, cultural and human resources of the city, through participatory planning and stakeholders' consultation as well as through the integration of the conservation activity in the wider city development framework.[72] Nevertheless, several local and international observers have been noticing the ongoing relation between heritage conservation in the center of Ahmedabad and the displacement of the weakest strata of the population in the center itself, and along the river.[73] Interestingly, many of the creative practices (fabric production and dying, pottery, jewelry, food processing and sale etc.) now showcased in the market areas in the center (Bhadra square) and along the riverfront (Sunday market) originated from those who were displaced from these areas and barely have access to them now. Heritage valorization in this case fits the description of an economy of enrichment in which those with privileged access to heritage benefit, while those without that access are displaced.

5 Conclusion

Much has been written about the Sabarmati riverfront development project and about the transformations of Ahmedabad in recent years, but an article in an international landscape architecture journal is especially telling: "Whatever the outcome, the project is a leitmotif in the context of river and waterfront redevelopment projects now popping up in Indian cities like Mumbai, Delhi, Calcutta and Lucknow. Ahmedabad is breaking new ground, both literally and figuratively, in the redevelopment of Indian cities."[74] The authors highlighted the influential role played by Ahmedabad in the Indian context, being the first Indian city with such an ambitious riverfront project, which could be replicated throughout the continent. They emphasized the project's sustainability, its valorization of Ahmedabad's unique heritage, and growing development opportunities for a historic city attempting to become global.

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70. Marco D'Eramo, *Il selfie del mondo. Indagine sull'età del turismo* (Milan: Feltrinelli, 2017). Settis, *If Venice Dies*.

71. Heleni Porfyriou and Marichela Sepe, *Waterfronts revisited. European ports in a historic and global perspective* (London: Routledge, 2016).

72. UNESCO, "Recommendation on the Historic Urban Landscape" (2011) Accessed June 10, 2019.

73. Da Costa, "Sentimental Capitalism." Id., *Politicizing Creative Economy*. Id., "Heritage City." Desai, "Entrepreneurial Urbanism." Mahadevia et al., "City Profile: Ahmedabad." Spodek, *Ahmedabad*. Yagnik and Sheth, *Ahmedabad. From Royal City to Megacity* (New Delhi: Penguin Books India, 2011).

74. Anne-Katrin Fenk, and Karsten Scheffer, "Sabarmati Riverfront Development Project", *TOPOS*, 68 (2009): 42-45.

The narratives around the transformation of the city via new developments and conservation promoted by the local governing coalition were also convincing to the local and national Hindu and Jain rising middle class and were further promoted by influential media, not only locally or nationally, as part of a precise political agenda, but also internationally. As Renu Desai noticed, "as a gateway for pursuing investment and profit opportunities in Gujarat, Ahmedabad's re-imagining became an integral part of re-imagining and promoting Gujarat"[75] especially after the 2002 *pogrom*. In this re-imagining, water served as a powerful element to give the city a new identity and partly erase the previous one, recalling what the Austrian philosopher Ivan Illich called "waters of forgetfulness."[76]

Exceptional spaces such as the Sabarmati River Front Development Project, mainly managed by newly appointed institutions, seem to represent the spatial fix for the production of capital and power at multiple scales, not excluding the state, often neglected in the literature about globalization.[77] The case of Ahmedabad shows the fundamental importance of the valorization of the heritage in an economy of enrichment, or as Da Costa would also put it, a powerful and hard-to-resist "sentimental capitalism," in which not everybody's heritage counts.[78] The transformation of the city of Ahmedabad into a global city with a historic heart involves the increasing segregation, exclusion and repression of the part of the population whose heritage and contemporary lives are considered less valuable[79]—a fact that a few critical local voices have tried to highlight in the past decades.[80]

Initially, the Sabarmati riverfront development project relied on a rhetoric of global competition, development and safety from floods. In a subsequent phase a new narrative around the valorization of heritage and culture was introduced, which resulted in the conservation of the city center and in the cultural valorization of the riverfront stretch comprised in the buffer zone of the UNESCO site. This narrative change reflected both a renewed interest in tradition and religion in the BJP-ruled Gujarat,[81] as well as in the cultural dimensions of global waterfront development.[82]

Compared with other cases of waterfront development, Ahmedabad presents a mix of elements from different models: for its large-scale infrastructural development and for the detachment from a large part of the city, it follows a waterfront development model elaborated in the

75. Desai, "Entrepreneurial Urbanism," 42.

76. Ivan Illich, *H2O and the Waters of Forgetfulness. Reflections on the Historicity of 'Stuff'* (Berkeley: Heyday Books, 1985).

77. Brenner, *New state spaces*.

78. Da Costa, "Sentimental Capitalism."

79. Herzfeld, *Evicted from Eternity*. De Cesari and Dimova, "Heritage, gentrification, participation."

80. Desai, "Governing the Urban Poor." Id., "Entrepreneurial Urbanism." Mahadevia, "A city with many borders." Mahadevia et al., "City Profile: Ahmedabad." Navdeep Mathur, "On the Sabarmati riverfront". Tagnik and Sheth *The shaping of modern Gujarat*. Id., Ahmedabad.

81. Desai, "Entrepreneurial Urbanism."

82. Porfyriou and Sepe, *Waterfronts revisited*.

1980s and 1990s in the West (e.g. Baltimore, Boston, London), especially because the project initially foresaw a combination of leisure, tourism and tertiary functions.[83] For its combination of large developments and the valorization of culture and heritage, it resembles some Eastern Mediterranean port cities such as Beirut, a city that was defined in the early twenty-first century as "an ancient city for the future."[84] Another model for Ahmedabad's development is Shanghai, which shares a colonial past with the Indian city and is currently exploiting that past in the cultural tourism industry, while urbanization is booming.

To conclude, I argue that the Sabarmati riverfront combines a variety of waterfront development models from different periods and various parts of the world, often reproducing their contradictions and falling short of dealing effectively with the local specificities of Ahmedabad, both in socio-economic and in spatial terms.

Gloria Pessina is an Italian urban planner, PhD and adjunct professor in Analysis of the City and the Territory at Politecnico di Milano (Italy). She is currently working as Postdoc researcher at the same university in the framework of the research project on "Territorial fragilities" of the Dpt. of Excellence of Architecture and Urban Studies.

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83. Hein, Carola (ed.), *Port Cities: Dynamic Landscapes and Global networks* (London: Routledge, 2011). Porfyriou and Sepe, *Waterfronts revisited*. Stephen V. Ward. "Port Cities and the Global Exchange of Planning Ideas", in *Port Cities: Dynamic Landscapes and Global Networks*, edited by Carola Hein (London: Routledge, 2011).

84. Porfyriou and Sepe, *Waterfronts revisited*.

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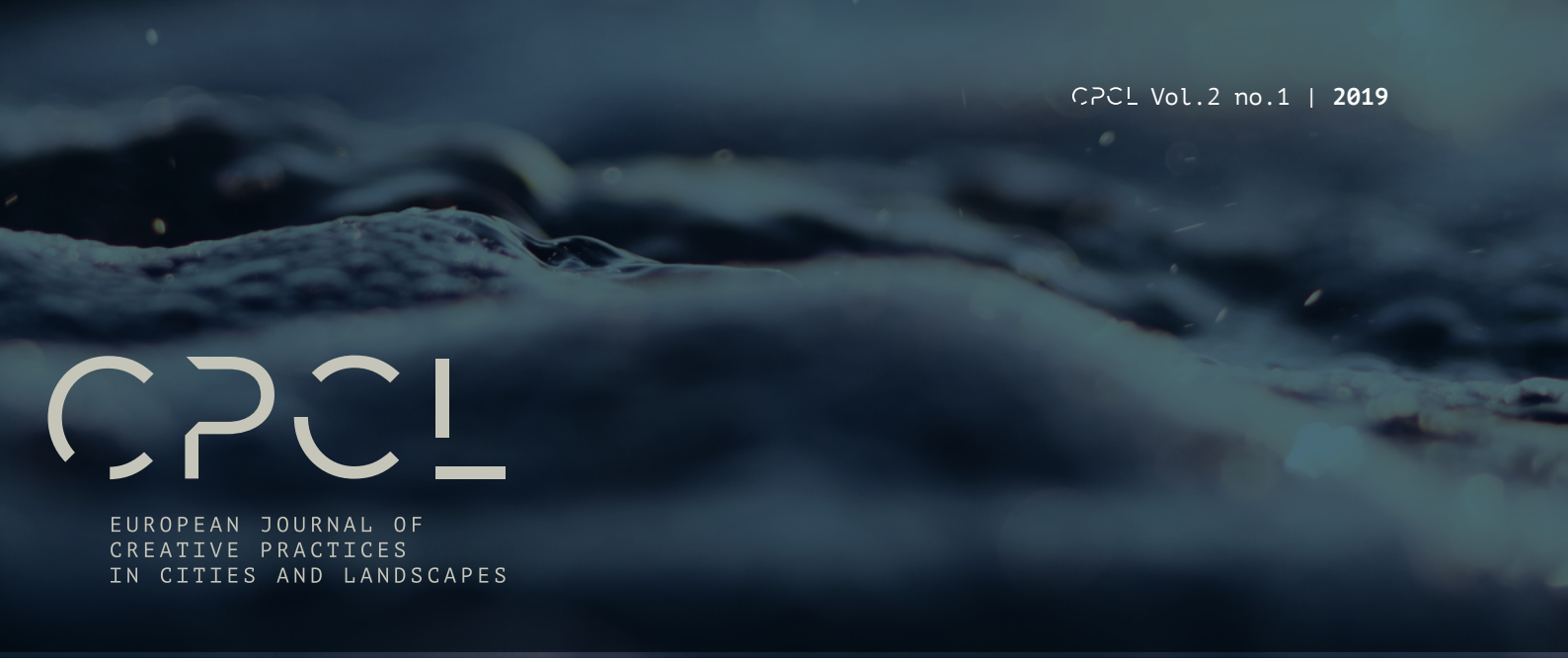

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MAIN SECTION

Policies enabling resilience in Seattle's water services

Laura M. Inha — Tampere University, Civil Engineering (Finland) — laura.inha@gmail.com
Jarmo J. Hukka — Tampere University, Civil Engineering (Finland) — omraj@jarmohukka.fi

ABSTRACT
The combined impact of diverse transitions, such as climate change, population growth, rapid urbanization and ageing infrastructure are expected to affect the quantity, quality, accessibility and affordability of water globally. Water demand and competition for water are likely to increase. Addressing these changes and hazards requires societies to be resilient, i.e. flexible and adaptive instead of only resistant. Seattle, Washington USA, has a long history of sustainable development and adaptation to changes and hazards such as population growth, water pollution, droughts and floods. Based on a literature review and semi-structured interviews among twelve selected local water professionals, this paper a) defines development steps and policies that have led to the current situation; b) explores key policies that are important to the resilience of Seattle's water services; and c) examines challenges in and recommendations for improving resilience in the future. The results reveal the importance of specific policies and practices in enabling resilience for each water service: water supply, wastewater and stormwater. They also reveal governance levels where resilience is most powerfully implemented. The paper concludes that policies that were found to build and improve the resilience of Seattle's water services are diverse and most effective when implemented at a local level. In advancing resilience, it is important to acknowledge also informal rules, including mindsets and habits.

KEYWORDS
Water Supply; Wastewater; Stormwater; Water Services Management; Water Resilience.

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1 Introduction

The United Nations and the World Economic Forum, among others, have listed water as one of the most crucial issues in the future.[1] The availability and quality of water and water services are affected by diverse coinciding transitions, such as climate change, population growth, rapid urbanization and ageing water infrastructure. These multiple developments are expected to intensify water demand and competition for water,[2] and can threaten physical water infrastructure, such as water networks and treatment facilities, and their operation. [3]

Responding to the above-mentioned transitions, scholars have introduced the concept of resilience, which, in brief means an ability to resist, adapt to and recover from disturbances.[4] However, the majority of the existing research discusses water resilience in terms of technical aspects and there has been relatively little research on the institutional, policy, and governance aspects,[5] even though scholars and practitioners have recognized the importance of policies of water resilience.[6] Additionally, according to a search in Scopus database[7], water services – i.e. water supply, wastewater, and stormwater – have been researched less than water resources.

To help address these research gaps, we focus on the resilience of water services from the policy point of view in the case of Seattle, Washington, in the USA. We chose Seattle mainly because of (i) its long history in developing its water services management in a more sustainable direction, (ii) its location and climate, which cause a variety of challenges, and (iii) its current efforts in developing resilience. To provide the reader a sufficient backdrop for the research, the following section (1.1) presents an overview of Seattle's water services and their challenges.

Our objective for this paper is to identify the type of policies local water professionals consider important for building and enhancing resilience in water services in Seattle. In addition, we are interested in discovering not only the challenges that water professionals see as hindering water resilience, but also what could be done to avoid and to respond to those challenges. Furthermore, the study determines the governance levels at which

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1. World Economic Forum, *The Global Risks Report 2018* (Geneva: World Economic Forum, 2018), fig. I-IV, 61-62.

2. Core Writing Team, Rajendra K. Pachauri and L.A. Meyer, eds., *Climate Change 2014: Synthesis Report.* (Geneva: Intergovernmental Panel on Climate Change, 2015), 2-26.

3. World Bank, "World Bank Disaster Risk Management Hub, Tokyo: Knowledge Program, Resilient Water Supply and Sanitation Services", *World Bank* News, October 21, 2016.

4. Åsa Johannessen and Christine Wamsler, "What does resilience mean for urban water services? "*Ecology and Society* 22(1):1 (2017). Carl Folke, "Resilience (republished)," *Ecology and Society*, 21(4), 1–30 (2016).

5. Lucy Rodina, "Defining"water resilience": Debates, concepts, approaches, and gaps", *WIREs Water* 6, no. 2 (December 2018).

6. Johannessen and Wamsler, "What does resilience mean for urban water services?"

7. Scopus database, www.scopus.com.

resilience is most powerfully implemented. Our research methodology is explained in more detail in section 3.

An analysis of the development of water services management policies through a lens of resilience is useful to policy makers in Seattle. It should clarify the most fundamental elements that contribute to resilient policy design and water services management. Policy makers and water professionals can consider these elements, combined with the envisioned challenges and suggestions, in future planning.

1.1 Background – water services and their challenges in Seattle

Since at least the late-19th century, Seattleites have developed their water services as a response to various societal, institutional and environmental changes and needs. For example, in 1889, the Great Seattle Fire forced the rebuilding of the entire downtown sector, including the water infrastructure, and in 1896, the Klondike gold discovery in Canada led to the rapid growth of Seattle's population, thereby increasing water demand, and triggering massive water engineering projects in mountainous terrain.

The construction of the initial water infrastructure, which lasted for decades, has been described as "taming nature"[8]. It was more a matter of conquering nature than adapting to it, but the infrastructure forms the foundation for the more resilient and sustainable water services in Seattle today. Another part of that foundation is Seattleites' responses to some unintended consequences and environmental changes. Worsening surface water quality between the 1940s and 1960s generated water quality research, environmental awareness, and regulation. To cope with water

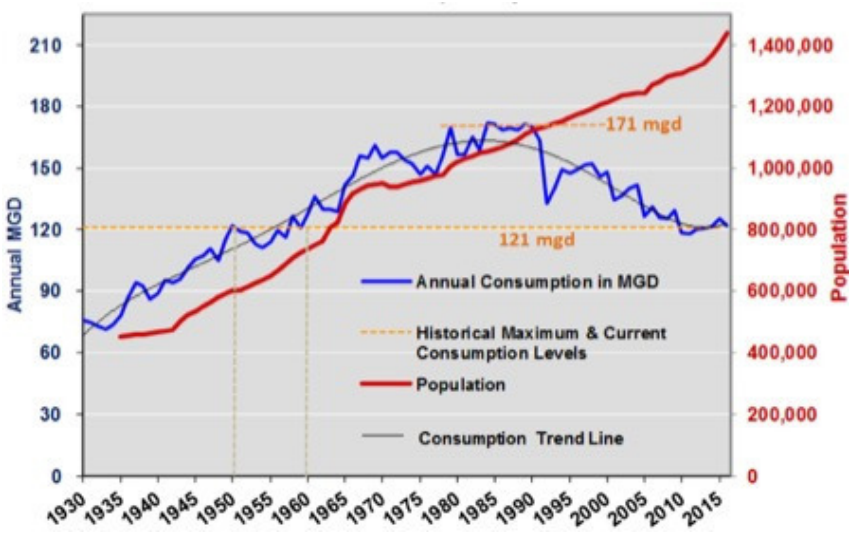

FIG. 1 Seattle region annual water demand in millions of gallons per day (MGD) and population growth 1930-2016. From Seattle Public Utilities, "Volume 1 – 2019 Water System Plan," Figure 2-3. Population Growth and Water Consumption from SPU Sources, p. 2-9.

8. Andrew Karvonen, "Metronatural™: Inventing and Reworking Urban Nature in Seattle," Progress in Planning Vol. 74, 4 (November 2010): 1-2.

scarcity during several droughts, water conservation was successfully implemented by using awareness campaigns and increased water pricing since 1980s, and thus in 2015 the water demand decreased to the level of the 1950s. [Fig. 1].

With an active citizenry and community-based politics, Seattle has been one of the leading cities in sustainability since the 1980's, and has even branded itself Metronatural™, a city in harmony with nature.[9] Our interview results in section 4.1 reveal the most fundamental development steps, creative practices, and policies that have led to the present moment. Some of these socio-economic and environmental impacts alongside selected development steps of water services are presented in Figure 2. [Fig. 2]

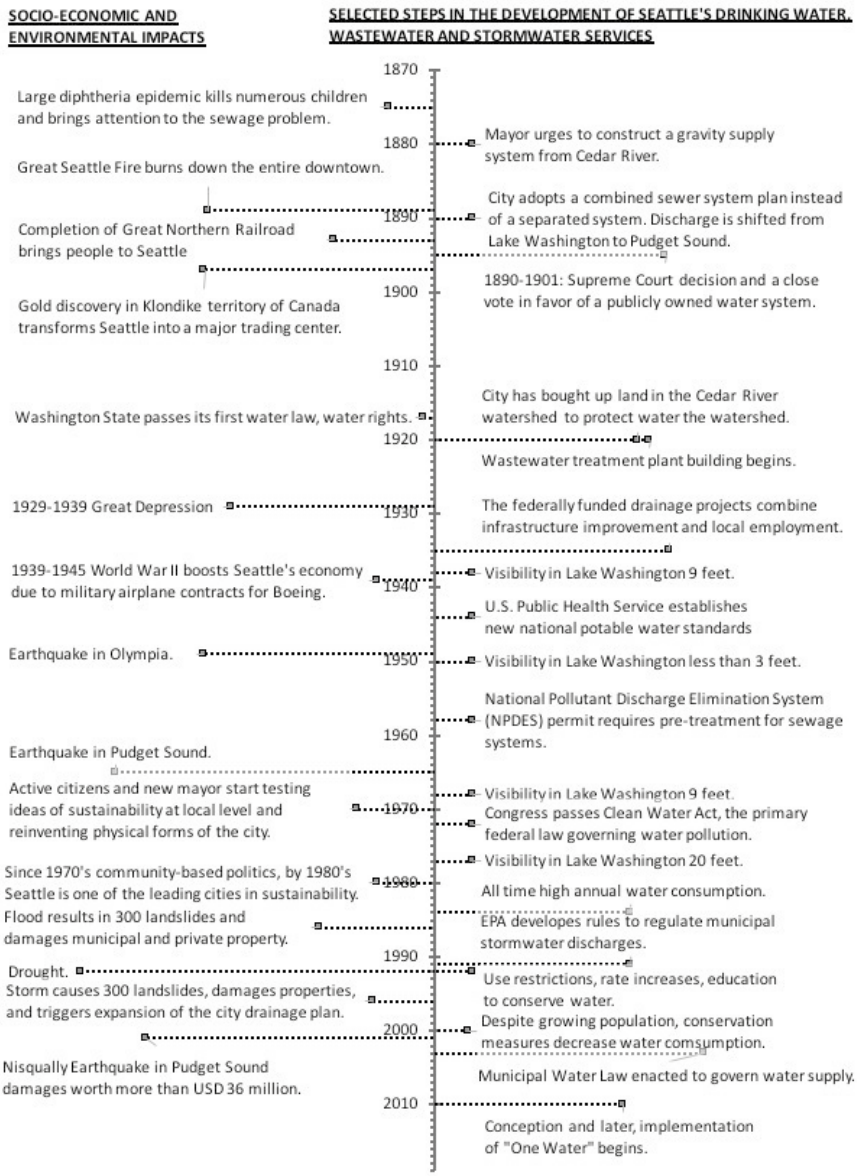

FIG. 2 Selected socio-economic and environmental impacts and development steps of Seattle's water services, 1870-2018. Compiled by the authors from Karvonen, "Metronatural™: Inventing and Reworking Urban Nature in Seattle." and Ott, "City of Seattle adopts plan to build a combined sewer system, to handle sewage and stormwater, on November 30, 1891."

9. Ibid.

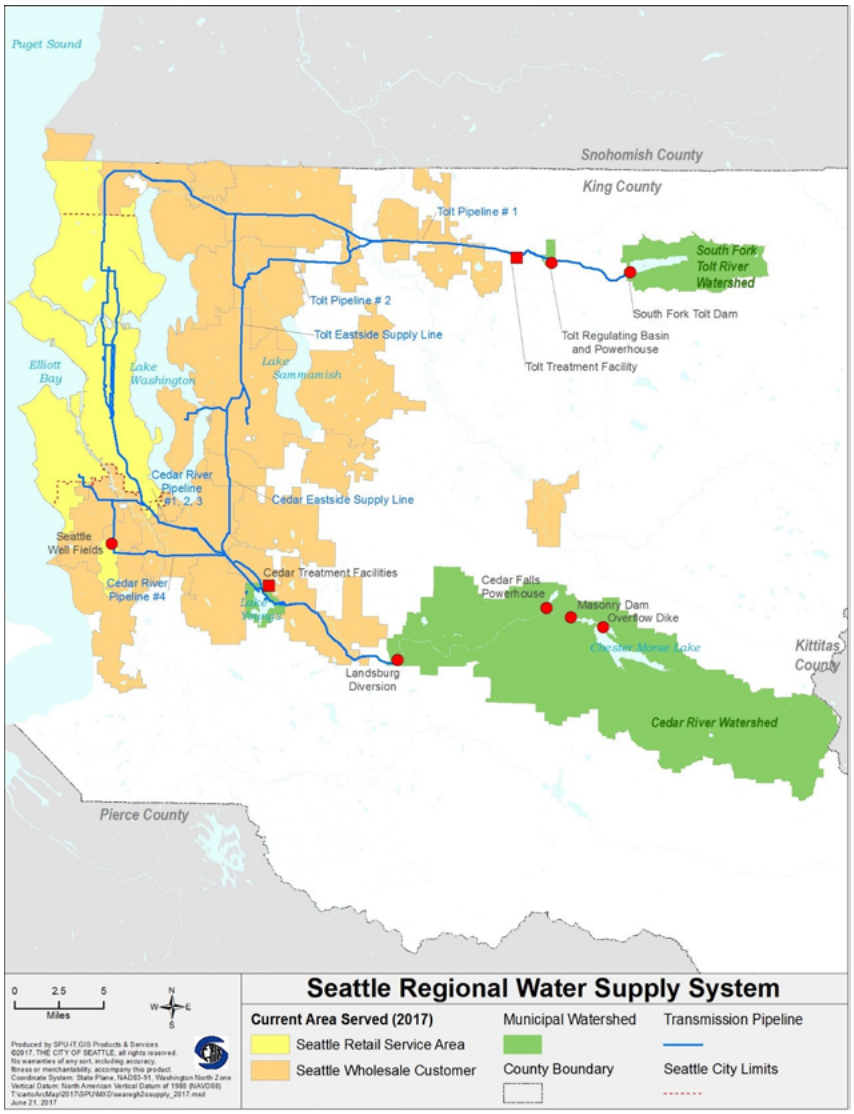

FIG. 3 Seattle regional water supply system. From Seattle Public Utilities, "Volume 1 - 2019 Water System Plan" Figure 1-1. Seattle Regional Water Supply System, p. 1-3.

The present-day water services in Seattle are managed by a city department, Seattle Public Utilities, and a county agency, King County Department of Natural Resources, Wastewater Treatment Division. Their responsibilities include providing clean drinking water, collecting and treating wastewater, and managing stormwater for 1.4 million people in the greater Seattle metropolitan region of King County and parts of southern Snohomish County.[10]

Seattle's water supply and wildlife rely mainly on two reservoirs in Cedar River and Tolt River watersheds owned by Seattle Public Utilities [Fig. 3]. Since the reservoirs depend on precipitation and snowpack and hold enough storage for approximately one water cycle year, climate change is a considerable stressor for the region. In the City of Seattle, there is one large regional wastewater treatment plant and four combined sewer

10. Seattle Public Utilities "Volume 1 – 2019 Water System Plan," 1-1.

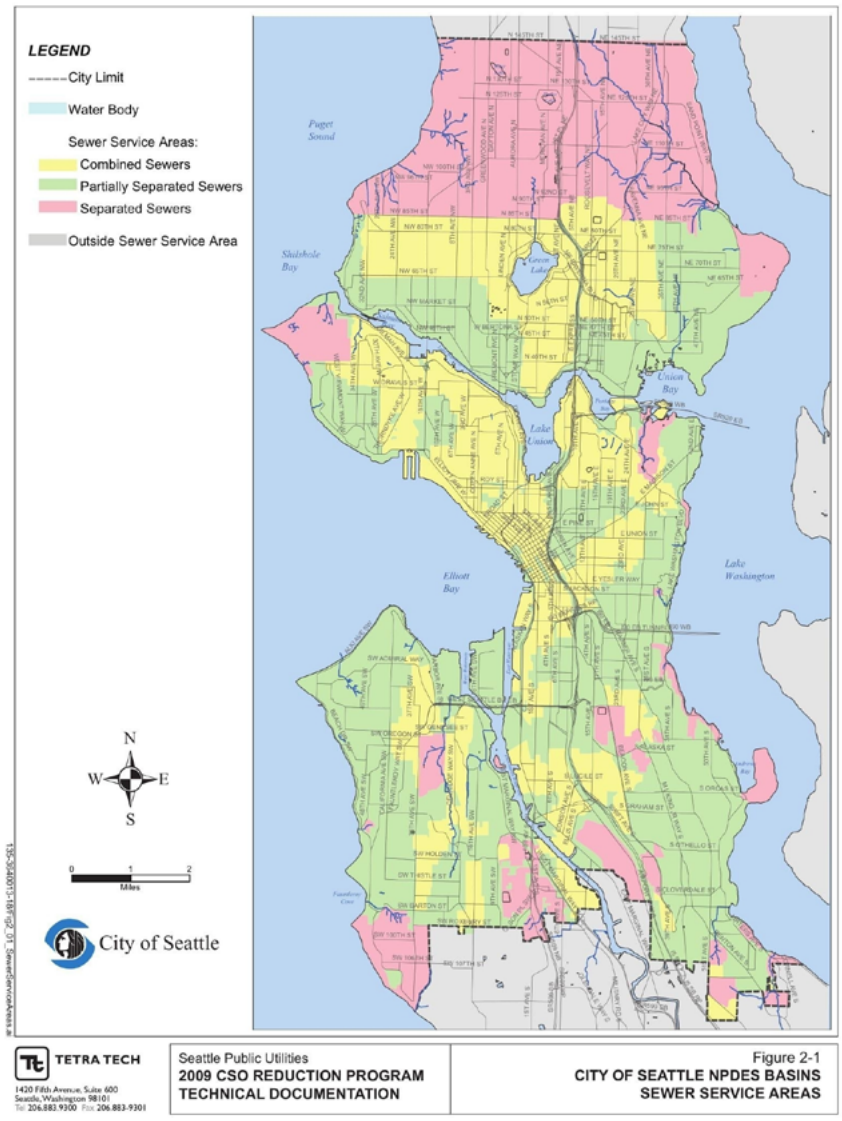

FIG. 4 Seattle sewer service areas. From Seattle Public Utilities, "Stormwater Management", map of Sewer Service Area. Accessed September 10, 2019 at http://www.seattle.gov/util/cs/groups/public/@spu/@usm/documents/webcontent/02_008214.pdf.

overflow (CSO) treatment facilities.[11] Stormwater in Seattle is conveyed partly combined with sewage and partly in separated sewer systems, but increasingly, green stormwater infrastructure is used **[Fig. 4]**.[12]

A challenge to the sewer systems are the increasing rainfall intensities, which are expected to add to urban and tidal flooding, as well as to sea level rise, resulting in, for example, increased combined sewer overflows and water quality issues in local water bodies[13]. Additionally, assessing the magnitude of the change is challenging, especially concerning

11. "King County's regional wastewater conveyance and treatment system", King County Wastewater Treatment Division, last updated December 19, 2016

12. "Stormwater Management", Seattle Public Utilities, accessed November 13, 2018 at http://www.seattle.gov/util/EnvironmentConservation/Projects/SewageOverflowPrevention/StormwaterManagement/index.htm.

13. "Adaptation: Preparing for Climate Change Impacts", Office of Sustainability & Environment, Seattle Government, accessed November 13, 2018 at https://www.seattle.gov/environment/climate-change/climate-planning/adaptation.

precipitation. Seattle's complex geography increases uncertainty and variability in future scenarios, making planning more difficult.[14]

Other great risks for Seattle are posed by earthquakes, which require seismic hazards to be addressed in infrastructure. In addition, ageing water infrastructure requires renewing, which brings the prioritization of water investments and the affordability of water into question. In 2015, the combined price of water, sewer and stormwater in Seattle was the second most expensive among the thirty major cities in the United States. Yet, compared to many European countries, water prices in the United States remain low.[15]

Along with the increasing population, the city faces pressure to densify already built-up areas. Seattle has the fastest population growth rate –18.7 percent from 2010 to 2017 – among the fifty largest US cities. [16] Additionally, Seattle's ageing and retiring workforce holds the risk of reduced numbers of professionals working in the water sector and a loss of institutional memory, knowledge, and skill.[17]

To respond to the transitions and challenges, Seattle Public Utilities aims for long-term sustainability and excellent, affordable service.[18] To achieve its goals, Seattle already has policies, plans and programs in place, for example the Seattle Public Utilities' Risk and Resiliency Assessment and Framework, which describes the efforts Seattle is planning to improve its resilience.[19]

In section 4.2, we present which current policies are the most important for resilience according to the interviewed water sector professionals. In section 4.3, we present professionals' own views on the challenges hindering resilient development as well as their suggestions on how to respond to those challenges. In the following section, we define resilience and other relevant frameworks.

2 Conceptual framework

The main conceptual framework of this paper is resilience. While there are many definitions of resilience, we chose two that ensure sufficient broadness and include consideration of temporal aspects. First, we define resilience for water services according to the United Nations Office for Disaster Risk Reduction as "the ability of a system, community or society

14. "Projected Climate Changes", Seattle Public Utilities, accessed November 13, 2018 at http://www.seattle.gov/Util/EnvironmentConservation/ClimateChangeProgram/ProjectedChanges/index.htm.

15. Sarah Frostenson, "America has a water crisis no one is talking about," *Vox* (March 2018).

16. Gene Balk, "114,000 more people: Seattle now decade's fastest-growing big city in all of U.S.", *The Seattle Times*, (May 24, 2018).

17. Seattle Public Utilities, *SPU's Risk and Resiliency Assessment and Framework, 2018 Status Report* (Seattle Public Utilities, 2018), 6.

18. "Strategic Business Plan, Update – 2018-2023", Seattle Public Utilities, accessed 13 November 2018 at http://www.seattle.gov/util/AboutUs/StrategicBusinessPlan/index.htm.

19. Seattle Public Utilities, *SPU's Risk and Resiliency Assessment and Framework, 2018 Status Report.*

exposed to hazards to resist, absorb, accommodate to and recover from the efforts of a hazard in a timely and efficient manner".[20] We borrow the second definition from Ofwat, the economic regulator of the water sector in England and Wales, which describes resilience as the ability to "anticipate trends and variability in order to maintain services for people and protect the natural environment, now and in the future".[21] These definitions were also provided for the interviewees to ensure mutual agreement about resilience.

While the definitions we selected cover different aspects of resilience, both are also vague and controversial. For example, they lack any mention of when to transition from resisting to accommodating change. Additionally, while it is important to anticipate trends, in reality it is difficult to know which scenario should guide planning. Despite the shortcomings, we still consider these definitions useful for this research.

Another important conceptual framework for this paper relates to policies, which are part of a larger framework of institutions and institutional change. According to Nobel Laureate and American economist D.C. North, "institutions are humanly devised constraints that structure political, economic and social interaction".[22] North divides institutions into informal rules, such as guidelines, norms and traditions, and formal rules, such as laws and regulations.[23] Policies consist of changes in formal institutions, but the outcomes, according to Mantzavinos, North, and Shariq, are results of changes in both formal and informal rules.[24] The institutional change does not happen at once but evolves incrementally, connecting the past with the present and the future.[25] In the next section, we introduce the methodology of this study and discuss research limitations.

3 Methods

The research methods used in this paper are a literature review, policy analysis, and semi-structured interviews. The interviews were individually conducted in 2018 with twelve selected water professionals familiar with water services and resilience in the Seattle area. These methods have been used in similar research studying long-term decisions and their

20. "Terminology," United Nations Office for Disaster Risk Reduction, UNISDR, accessed 28 February 2019 at https://www.unisdr.org/we/inform/terminology.

21. Ofwat, *Towards resilience: how we will embed resilience in our work*, (Birmingham, UK: Ofwat, 2015), 6.

22. Douglass C. North, "Institutions," The Journal of Economic Perspectives, Vol. 5, No. 1. (Winter, 1991): 97

23. Ibid.

24. C. Mantzavinos, Douglass C. North, and Syed Shariq, "Learning, Institutions, and Economic Performance," *Perspectives on Politics*, Vol. 2, No. 1. (2004): 77-79,

25. North, "Institutions," 97.

importance in water services management[26],[27] and future challenges for water services[28].

The literature review, policy analysis, and the structured part of the interviews provide an overview of the development of water services and highlight the importance of certain decisions and policies, which further understanding of different elements involved in building resilience. The open-ended interview questions allowed the interviewees to freely express their insights on the challenges in improving resilience and provide suggestions for how to overcome those challenges. Asking open-ended questions allowed us to explore informal rules, rather than only policies, which are considered formal rules.

To respond to our research questions, five interview questions were devised drawing on similar research on the importance of long-term decisions and future challenges. The first two questions concentrated on current policies: interviewees were asked about the relevance of the selected policies and asked to rank the five most fundamental current policies enabling resilience in Seattle's water services. The lists of selected policies were curated from the literature review and included only the most significant policies which enable water services and their resilience. In the third question, interviewees were asked to rank the ten most defining development steps in water services management in Seattle.

The two open-ended questions on the other hand, were intended to identify challenges in advancing resilient water services in the future and to elicit suggestions for improvement. For all five questions the interviewees were allowed to choose whether to answer questions related to water supply (eight respondents), wastewater (six respondents), and/or stormwater (eight respondents).

The results from the first three interview questions, i.e. the ranking exercises, were analyzed individually by giving each placement a set of points ranging from five or ten points for the highest-ranking policy, to one point for the lowest-ranking policy. Based on the ranking, the order of importance for the policies and development steps was revealed. Even though four interviewees ranked less than five or ten choices, and one interviewee listed more than one option as first, second and third choices, all answers were still considered in the results.

For the analysis of the last two questions, which were open-ended, we categorized all responses of both challenges and suggestions according to their content into nine broader themes: collaboration, cost, infrastructure,

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26. Tapio S. Katko, Petri S. Juuti, and Pekka E. Pietilä," Key long-term decisions and principles in water services management in Finland, 1860-2003," *Boreal Environment Research*, Vol. 11, no. 5 (2006): 389-400.

27. Petri Juuti et al.," Shared history of water supply and sanitation in Finland and Sweden, 1860-2000," *Vatten. Föreningen Vatten*. Vol. 65, no. 3 (2009): 165-175.

28. Ossi A. Heino, Annina J. Takala, and Tapio S. Katko, "Challenges to Finnish water and wastewater services in the next 20-30 years," *E-Water*, EWA (2011).

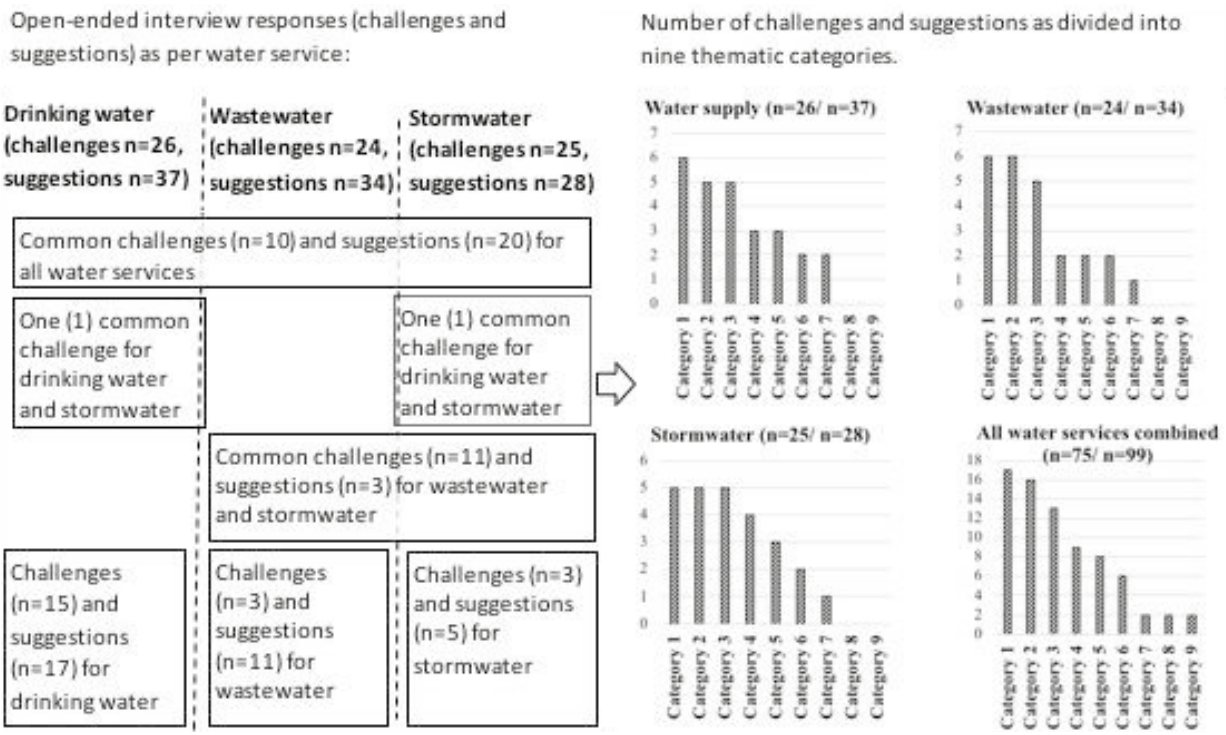

FIG.5 Schematic overview of the analysis process for open-ended questions

mindset and habits, regulation, strategy, workforce, other, and environment (only for challenges) or organizations (only for suggestions). In cases where a common challenge or suggestion was mentioned for two or for all water services, the responses were considered for both or for all water services respectively. A schematic overview of the whole analysis process for open-ended questions is illustrated in Figure 5 [Fig. 5]. All results are presented in detail in section four and discussed further in section five.

3.1 Limitations of the research

Water services management is cross-disciplinary, that is, it connects and relates to many other sectors than just water services, hence there is a vast number of related policies, many of which overlap with the other sectors. For the purpose of this study, the policy compilations used in the interviews were not intended to be comprehensive but rather as selections of the most important policies pertaining to the resilience of water services in Seattle. The selected policies included laws, rules, regulations, programs, and plans that directly related to providing water services and water quality, as well as specific policy choices such as collaborations and a decision to purchase watershed land to secure the water source. To ensure an appropriate selection, interviewees were allowed to add policies to the list.

We acknowledge that ranking the importance of policies can be subjective. Policies often create chains of dependencies where one policy requires

action, and another responds to it. Therefore, at times it can be challenging to choose whether the key policy is an important program or the law enforcing it. To address this limitation, we selected a knowledgeable and diverse group of interviewees. Based on the similarity of responses in our individually conducted interviews, we assume that the group of twelve interviewees was representative enough. In another similar research setting, the Finnish civil engineers Tapio Katko and Pekka Pietilä, and environmental historian Petri Juuti used thirteen respondents.[29] Expanding the group may result in slight changes to the ranking of the results.

4 Results

This section presents the results from the interviews. We begin with the results of ranking the importance of past development steps (section 4.1), advancing then to the importance of present policies (section 4.2). Finally, we present the future-oriented results from the open-ended questions about challenges in advancing the resilience of water services in Seattle and suggestions for improvement (section 4.3).

4.1 Past key development steps enabling resilience

This section answers the first research question about the development steps and policies that have led to the current situation. Based on respondents' choices of relevant issues found in literature and policy analysis, Figures 6-8 **[Figs. 6-8]** illustrate the importance of specific policies and practices for the development of resilient water services in Seattle. The results for each water service are discussed at the end of section 4.1 and further in section 5.

For water supply, over half of the 22 development steps that interviewees found fundamental for resilience deal with securing the water source in terms of water quality and quantity **[Fig. 6]**. Steps to securing the quantity of water include the purchase of watershed land and water conservation programs. The establishment of water testing laboratories and water treatment facilities on the other hand are important steps to ensure good water quality. Other important development steps involve development of the water infrastructure and its management. The results highlight the fundamental basics of resilient water supply: safe and available water, accessible to its users.

For wastewater, on the other hand, the two most important policies relate to the development of legislation and regulation: the National Pollutant Discharge Elimination System, NPDES, and Clean Water Act in 1972 **[Fig. 7]**. Similar to water supply, the development of the infrastructure

29. Katko, Juuti, and Pietilä, "Key long-term decisions and principles in water services management in Finland, 1860-2003."

FIG. 6 Importance of past water supply-related policies to the development of resilience in Seattle, based on respondents' choices of relevant issues found in literature and policy analysis.

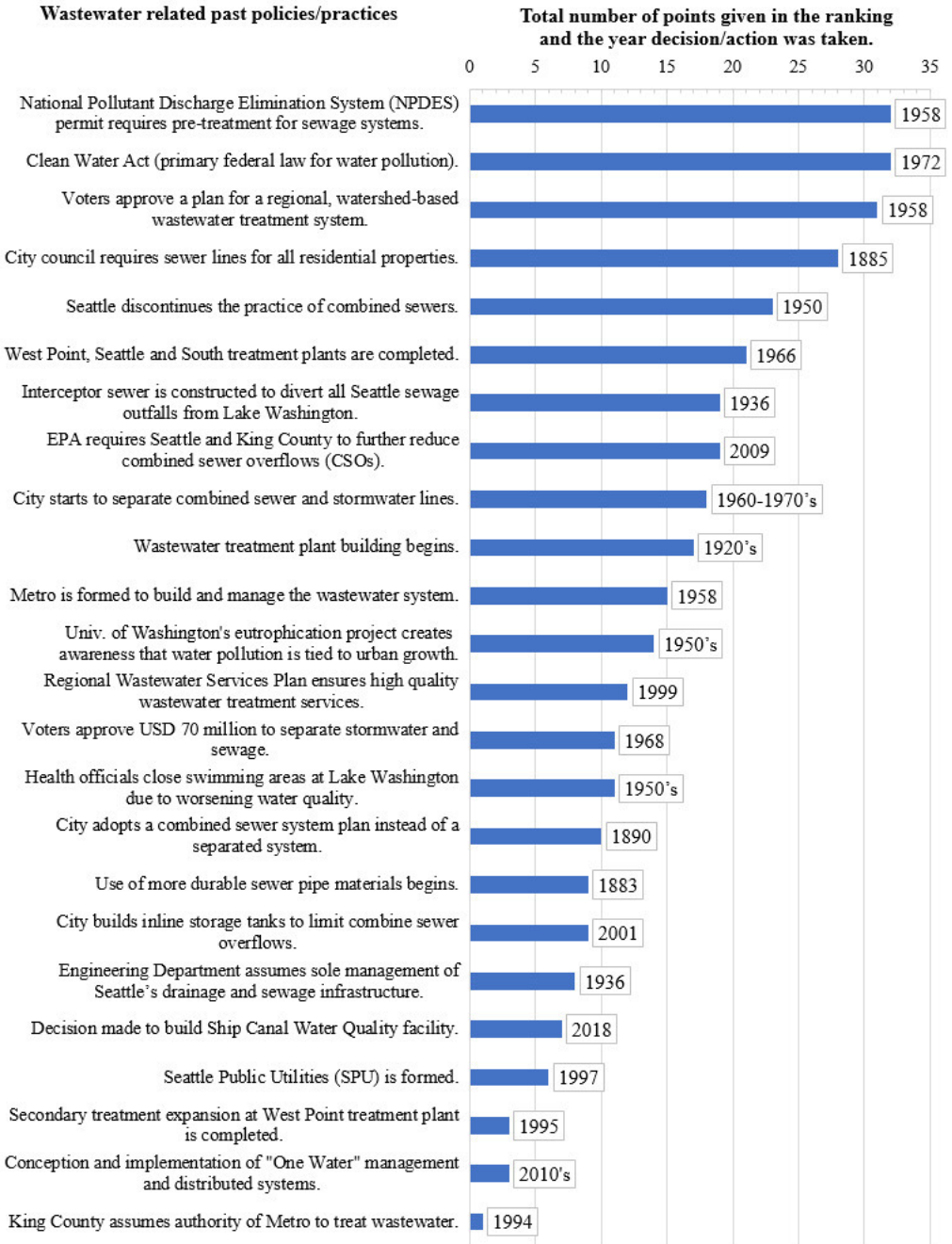

FIG. 7 Importance of past wastewater-related policies to the development of resilience in Seattle, based on respondents' choices of relevant issues found in literature and policy analysis.

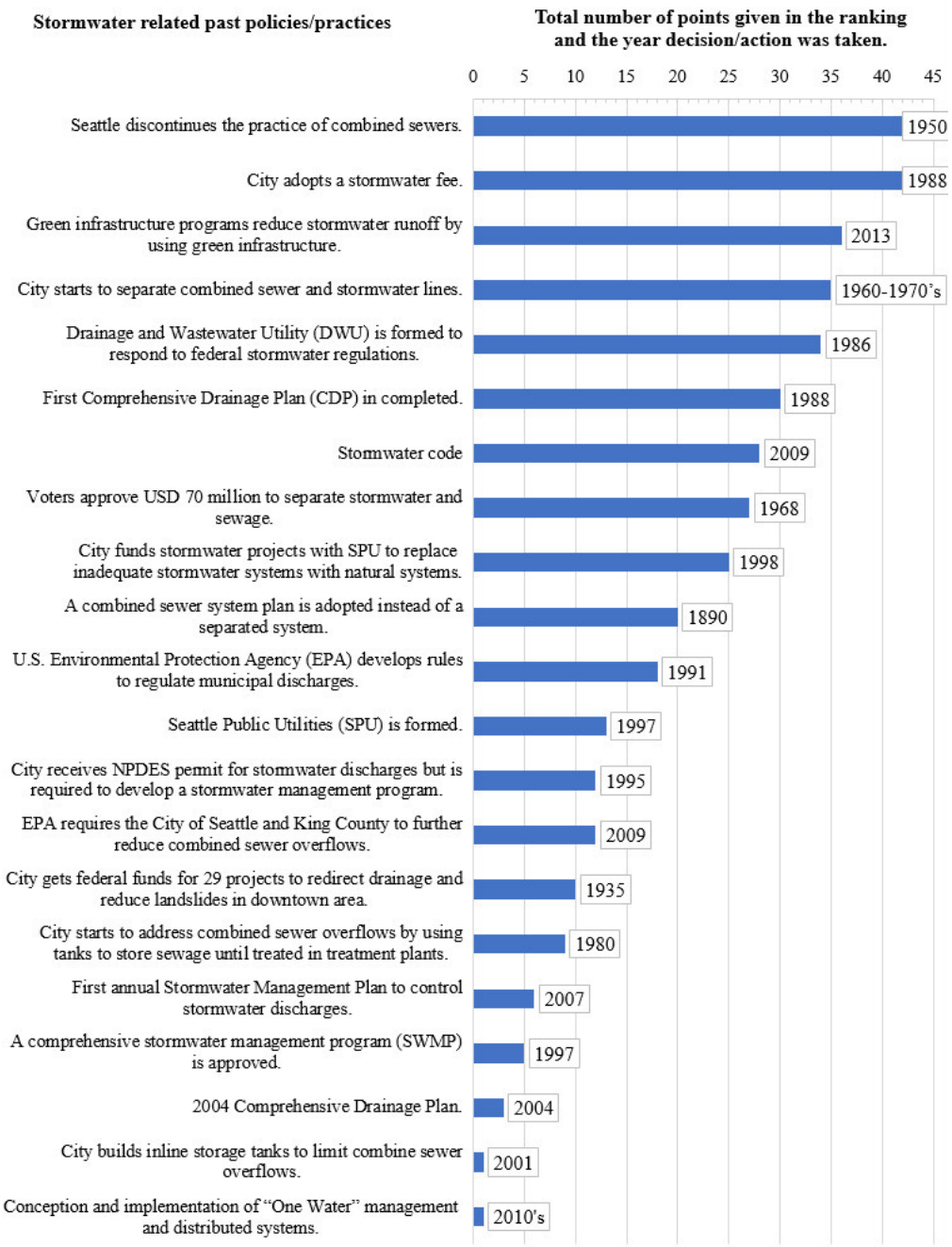

FIG. 8 Importance of past stormwater-related policies to the development of resilience in Seattle, based on respondents' choices of relevant issues found in literature and policy analysis.

and its management are also important for achieving resilience in wastewater services. Most of the 22 policies that interviewees considered fundamental for resilient wastewater services relate to improving water quality, indicating its importance not only to human health but also to the environment.

The steps interviewees found most significant for resilience in stormwater management included the decision to discontinue building combined sewer and stormwater lines, which reduced sewage overflows to the environment during heavy rains. Another was the adoption of a stormwater fee to finance stormwater management; this fee financed many of green stormwater infrastructure projects **[Fig. 8]**. Plans and programs in the ranking, such as green infrastructure and drainage plans, reflect the importance of sustainable stormwater management practices in the existing cityscape.

4.2 Importance of key current policies for resilient water services

This section answers the second research question, concerning which policies are most important for the resilience of Seattle's water services. Based on respondents' choices of relevant issues found in literature and policy analysis, Figures 9-11 **[Figs. 9-11]** illustrate current policies that are the most fundamental in enabling resilience for Seattle's water services. The order of importance provides an indication to policy makers and other officials about, for example, where to target funding, time and effort to maintain and improve resilience. The results for each water service are discussed at the end of section 4.2 and further in section 5.

For water supply, two policies stand out as most important. One is the local, periodically updated, Seattle Public Utilities' water system plans. These are plans for the regional water supply, water system, shortage response, and demand forecast for at least twenty years. The other policy is the city's historic decision to purchase watershed land to secure the quantity and quality of water supply **[Fig. 9]**. Today, that action to protect the water source results also in less need for water treatment, and thereby, in reduced cost. Other central policies highlight the importance of legislation and regulation, such as the National Safe Water Act (1972) to ensure drinking water quality, local Seattle Public Utilities Director's Rules (SPU formed in 1997) to implement legislation, state-level Tribal Rights (1855) and Washington State Law (1st in 1917 on water rights). Additionally, the ranking shows the significance of collaborations and specific programs such as Seattle Public Utilities' Capital Improvement Program (since at least 2001), which is a six-year financial planning tool to identify future capital investments and potential strategies for their funding[30].

30. "2019-2024 Proposed Capital Improvement Program", City Budget Office, last updated 24 September 2018, http://www.seattle.gov/financedepartment/1924proposedcip/default.htm.

FIG. 9 Importance of current water supply-related policies to resilience in Seattle, based on respondents' choices of relevant issues found in literature and policy analysis.

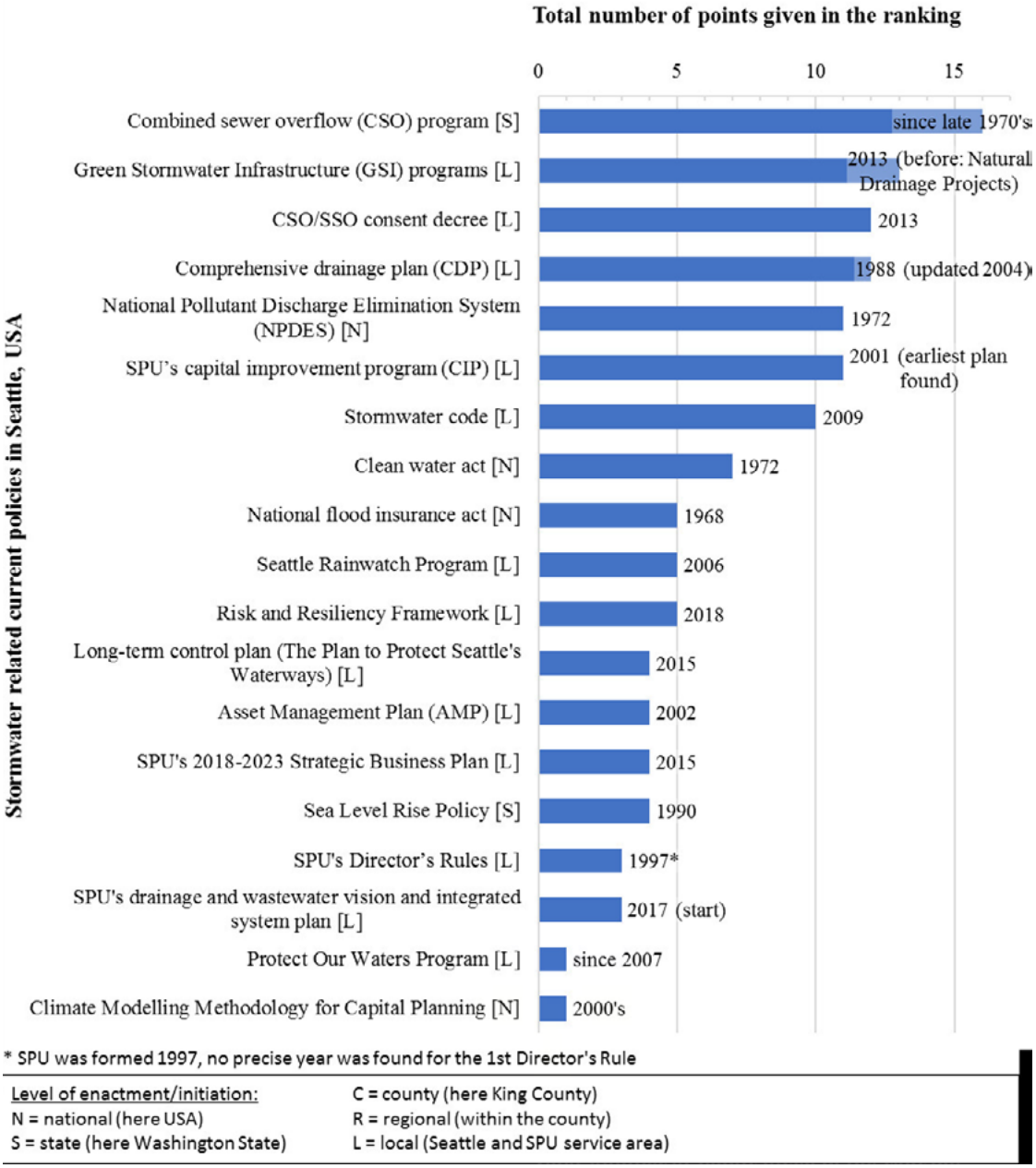

FIG. 10 Importance of current wastewater-related policies to resilience in Seattle, based on respondents' choices of relevant issues found in literature and policy analysis.

FIG. 11 Importance of current stormwater-related policies to resilience in Seattle, based on respondents' choices of relevant issues found in literature and policy analysis.

For wastewater, five of the 17 policies, which interviewees considered important to resilience involved rules and regulations, the most significant being the Clean Water Act (1972), a federal regulation [Fig. 10]. Yet, most of the highlighted policies are programs and plans such as the state-level Combined Sewer Overflow Program (in place since the late 1970's) to prevent sewage overflows, a county-level Regional Wastewater Services Plan (1999) to ensure the high quality wastewater services in the future, as well as Seattle Public Utilities' six-year financial planning tool, the Capital Improvement Program (since at least 2001) and Asset Management Plan (2002) to meet agreed customer and environmental service levels while minimizing costs of maintaining and operating the infrastructure. The number and type of plans and programs in the ranking highlight the importance of practical activities at the local level.

Interviewees considered 19 policies to be significant for the resilience of stormwater management [Fig. 11]. Similar to wastewater, interviewees highlighted several programs and plans and the Combined Sewer Overflow Program (which began in the late 1970's) ranked highest. The three most important pieces of legislation and regulations for stormwater are (i) the local Combined Sewer Overflow (CSO) / Sewage Sewer Overflow (SSO) consent decree (2013), an agreement with Seattle and the national Environmental Protection Agency, Department of Justice, and the Washington State Department of Ecology to formalize Seattle's approach to reducing

sewage overflows; (ii) the National Pollutant Discharge Elimination System (1972), which addresses water pollution by regulating point sources; and (iii) the local stormwater regulation, the Stormwater Code (2009), which aims to protects people, property, and the environment from damage caused by stormwater runoff. Noticeably, most of the plans and programs as well as the regulation deal with stormwater quality. However, urban flooding has been and is expected to be an issue in Seattle.

4.3 Improving the future resilience of Seattle's water services

This section focuses on the challenges involved in improving resilience and recommendations for improvement. Responses regarding both challenges and suggestions were divided into nine broad categories: collaboration, cost, infrastructure, mindset and habits, regulation, strategy, workforce, other, and environment (only for challenges) or organizations (only for suggestions). We begin the section with the envisioned challenges in advancing resilience followed by ideas and suggestions to avoid them.

5 Challenges in advancing resilience in Seattle

In the interviews, the respondents highlighted 75 challenges in achieving resilience for Seattle's water services. [Fig. 12].

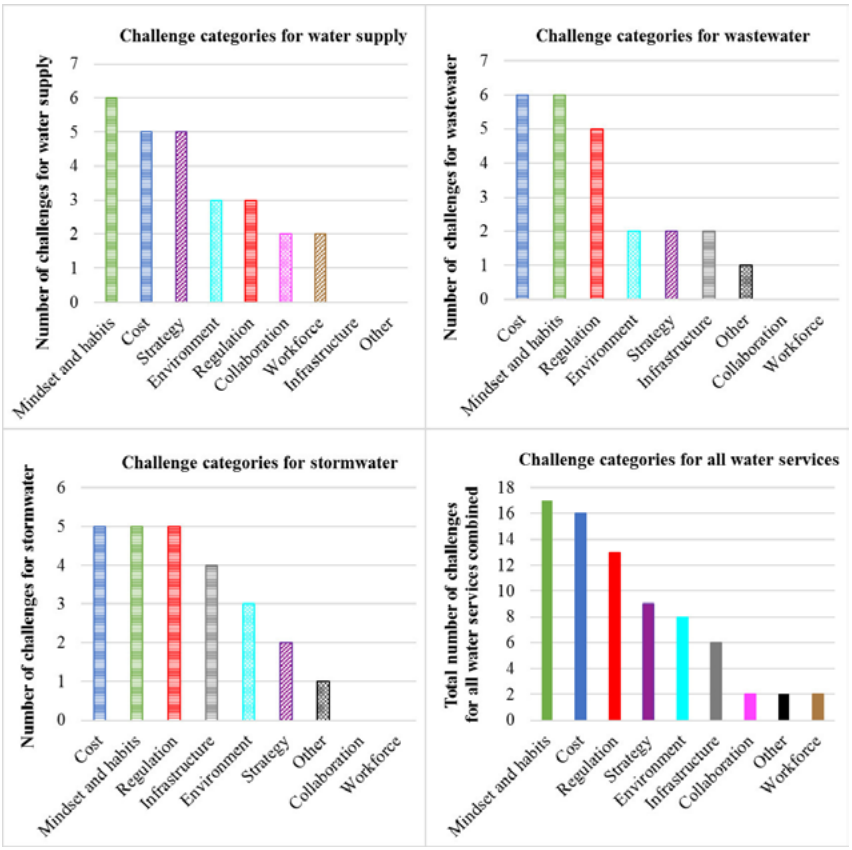

FIG. 12 Number of challenges in advancing resilience of water services in Seattle, USA based on respondents' views.

CHALLENGES	Water supply	Wastewater	Stormwater
Mindset and habits	• Dealing with public opinion about raising water rates to pay for resilience.	• Dealing with competing interests, especially between combined sewer overflows and other programs.	
Costs	• Raising water rates to pay for resilience.	• Prioritizing and directing funding. • Deciding whether capital spending should continue according to 1990's plan or challenging regulators to tackle newer problems and needs for different technologies.	• Raising taxes and getting funding.
Strategy	• Deciding on water allocation between different users. • Finding new water sources. • Balancing and prioritizing needs and requirements.		
Collaboration	• Initiating/strengthening partnerships between research and non-research communities. • Getting people to collaborate in general. • Rapidly aging and retiring workforce. • Right placement of field workforce in emergencies.		
Regulation	• Inflexible water rights.	• While broad in scope and important, the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) and associated permits over-prioritize water quality and combined sewer overflows. • Narrow and constricting regulatory instruments such as permits hamper integrated thinking and make it difficult to address affordability, resilience, and prioritization of the greatest local environmental problems.	
Infrastructure		• Combined sewers and aging infrastructure.	• Climate change adaptation: • 1. handling larger water volumes beyond upsizing systems; • 2. advancing Seattle's green infrastructure program to meet population growth.
Other		• Diversifying demographics and social issues including homelessness and its implications for the provision of water services.	

TAB. 1 Specific challenges in advancing resilience of water supply, wastewater, and stormwater services in Seattle, USA based on respondents' views.

The greatest common challenges for all water services are seen in the current *mindset and habits* of the general public, officials and professionals. These challenges include issues in understanding the impact of societal and environmental changes; a lack of holistic and long-term thinking; delays in decision-making regarding issues that are unlikely to arise in our lifetime; a mindset that concentrates only on resisting change instead of adapting to it; and a reluctance to depart from current practices, processes and ways of thinking. The second greatest challenge, *costs*, is three-fold. Interviewees reported a shortage of funding and difficulties in maintaining affordability—of water for example, and restrictions that prioritize the use and distribution of funds. In terms of *regulation*, several interviewees called for more flexibility and adaptivity. While laws and national regulations were seen as important, associated permits were considered narrow and constricting, further hampering integrated thinking and ability to address affordability, resilience, and prioritization of the greatest local environmental problems. Strategy-wise the challenge lies in choosing the right strategies to navigate uncertainty and the plethora of future scenarios. There is also a risk that, in the future, city priorities might change, resulting in less emphasis on resilience. Water service-specific challenges are described in Table 1 [Tab. 1]. The table provides detailed challenges for each water service that can be useful for future policy development.

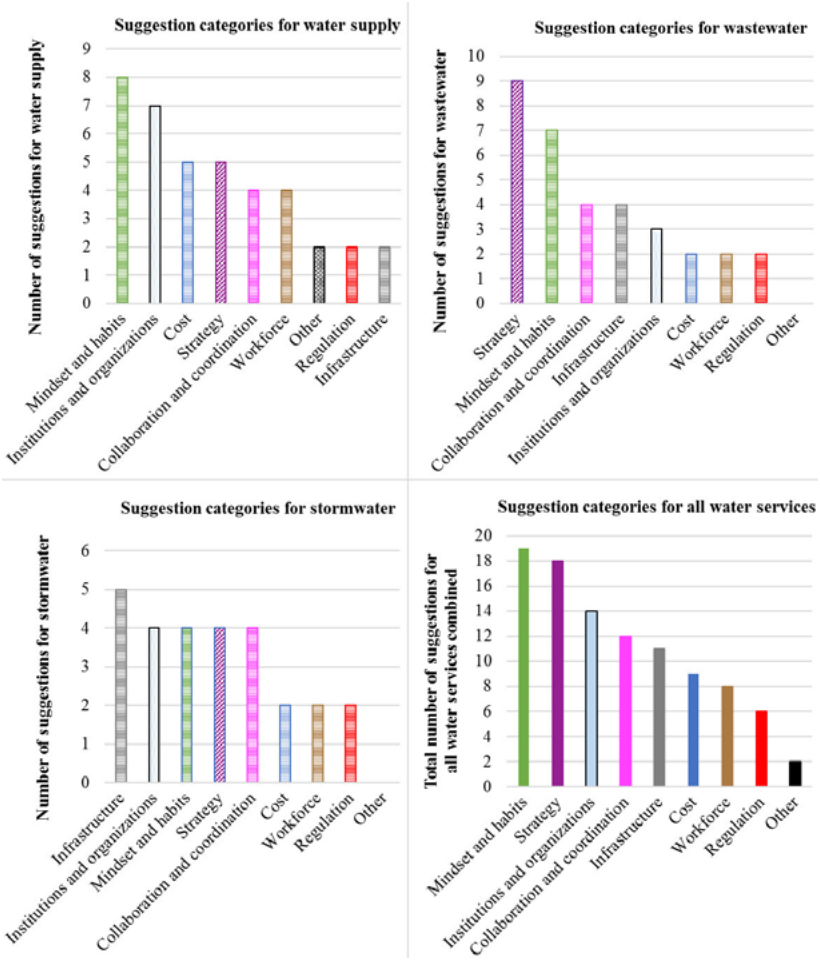

FIG. 13 Number of suggestions for advancing resilience of water services in Seattle, USA based on respondents' views.

SUGGESTIONS	Water supply	Wastewater	Stormwater
Mindset and habits	• Continue water conservation. • Continue working on demand management and people's willingness to spend money on resilience.	• Improve officials' and professionals' understanding and work on regional values, residents' issues and expectations, shifting demographics, equity and social issues, and the interconnectedness of different sectors.	• Perceive resilience as social and human capital. • Encourage acceptance to changes, rather than resisting them. • Learn to live with water.
Costs	• Consider water rate regime for climate change adaptation despite possible opposition. • Execute and plan for financial resilience. • Decide on how, where and when to use funds.		
Strategy	• Avoid overbuilding the water systems. • Plan for uncertainty.	• Improve strategies for emergencies. • Improve response strategy and recovery plans by i) enhancing understanding of interconnectedness of different sectors and actors, and ii) providing services like translation services. • Continue developing design guidelines for convenience pipelines. • Increase concentrated communication and focused outreach to certain neighborhoods. • Approach resilience in a more comprehensive manner by including ways to create resilience, starting points, and resources for action.	
Collaboration	• Improve and create connections within and outside the utility. • Explore interagency and regional collaboration to connect and find new water sources.	• Improve collaboration and coordination to prioritize the biggest combined sewer overflows. • Increase coordination between government entities, private sector and other stakeholders.	• Advance partnerships with other city agencies to better utilize the city landscape in stormwater management.
Workforce	• Respond to the aging workforce dilemma by continuing apprenticeship and internship programs and by emphasizing the benefits of the public service sector such as work-life balance. • Dedicate staff to resilience.		
Institutions and organizations	• Embed resilience as part of daily operations.		• Rethink how the utility could be more flexible and more of a catalyst for change instead of just providing services.

Institutions and organizations	• Embed resilience as part of daily operations. • Enable flexibility in changing the course of projects and programs by monitoring changes, identifying thresholds, and adapting accordingly. • Make organizational changes to better foster champions, vision, and peer networks.		
Infrastructure	• Further explore options to diversify the water source portfolio by i) interconnecting systems and water storage regionally, and ii) finding and using new sources such as groundwater and desalination.	• Continue the work on combined sewers. • Explore new pilot programs and technologies such as a real-time micro-scale wet weather monitoring program pilot from Copenhagen that allowed the drainage system to adapt automatically to changing flows. • Support installing on-site water systems and technologies during the next building boom to capture stormwater and greywater and to treat wastewater to reduce the demand in the central system.	• Use city's open space better as water storage.
Other	• Push decision making by using external pressure from partners, voters, and maintaining the Seattle brand. • Continue work on cyber security and vulnerability.		

TAB. 2 Specific suggestions for advancing resilience of water supply, wastewater, and stormwater services in Seattle, USA based on respondents' views.

6 Suggestions for advancing resilience in Seattle

The interviewees offered as many as 99 suggestions for improving the resilience of water services. Compared to the challenges section, the suggestions were more dispersed among the three water services. [Fig. 13].

In general, the on-going comprehensive work on resilience was recognized for all water services in all nine categories and interviewees thought it should be continued. In the combined ranking of interview responses for all water services, the most important category in advancing the resilience of Seattle's water services was *mindset and habits* of the general public, officials and professionals, including political will. More precisely, interviewees proposed that resilience should be perceived more as adapting instead of just resisting, and practitioners should move away from stationary, fixed practices that do not allow enough adaptation and flexibility in a changing environment. In the *strategy*-category, suggestions related to strategies, plans, research, and design guidelines. For all water services, interviewees also suggested a pre-disaster management plan, continuing the current vision plan, including social and equity factors, and

moving away from older, stationary, and change-resisting plans towards more adaptive plans.

In terms of the working culture and environment of *institutions and organizations*, resilience would be better achieved if the institutional set-up allowed more innovation, individual growth, and collaboration. Additionally, interviewees suggested organizational changes to better support the staff who have worked extensively in the field of resilience. In terms of *collaboration*, all water services were encouraged to increase it. One interview response, relating to *costs*, suggested promoting resilience by introducing a discount rate for sustainability. In terms of *workforce*, interviewees suggested recruiting talent that is aware of the past, understands the system management but is not stuck in the old procedures. In terms of *regulation*, federal and local regulation should be able to change and adapt according to changing environmental conditions. Water service-specific suggestions are summarized in Table 2 [Tab. 2]. The table provides detailed suggestions and ideas regarding how to improve resilience for each water service separately. These suggestions can be useful in future policy development.

7 Discussion

Overall, the results indicate that the important policies enabling resilient water services in Seattle are not a single type and design but a mix of laws and regulations, programs and plans, and specific policy choices that take place at all levels of governance, although mostly at the local level. Since flexibility and adaptability are part of the definition of resilience,[31] we argue that diverse policies are an essential element when responding to changing circumstances. Therefore, we suggest that for water services to be and become resilient, they need a diverse policy environment both in terms of type and design of the policies but also in terms of the governance level at which they are implemented.

While local level policy design and implementation can be restricted by its set environment (including physical location, climate and the past) and national and regional legislation [Fig. 14], we argue that local regulations, plans and programs can still significantly influence resilience due to local knowledge and understanding of the natural and social environment. Combined with sufficient authority, local policies can enable flexible and innovative policy responses. Additionally, we argue that in resilient policy design it is important to understand how current policies have been developed, because many past decisions still influence present practices.

While according to institutional theories, policies are considered formal rules and institutions, informal rules have an impact on the transforma-

31. "Terminology," United Nations Office for Disaster Risk Reduction.

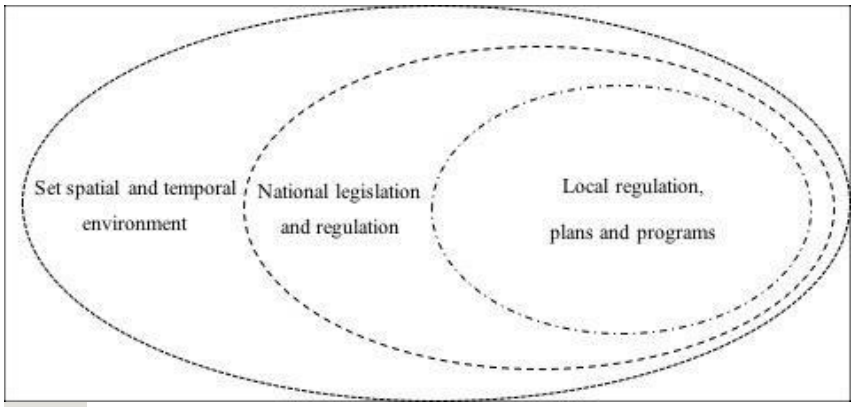

FIG. 14 Restricting spaces of resilience in water services. From United Nations Office for Disaster Risk Reduction, UNISDR. "Terminology." Accessed February 28, 2019 at https://www.unisdr.org/we/inform/terminology..

tion of formal institutions.[32] In other words, habits, norms, and traditions can influence how successful implemented policies will be. The importance of these informal rules was highlighted in the results of the open-ended interview questions. Changing people's mindsets and habits, that is, the informal rules, was seen both as the greatest challenge and best path to achieving greater resilience.

8 Conclusions and recommendations

In this study, we explored how policies have enabled resilience in Seattle's water services as well as challenges in improving resilience and ways of responding to them. Furthermore, we identified three restricting spaces or levels [Fig. 14] in implementing policies that promote resilient water services.

Based on the analysis we conclude that for resilient policy design, it is important to understand the past development steps because they are often connected to present practices. In Seattle, the most important past development steps and policies that have enabled resilience in water services relate to i) securing water quantity and quality; ii) building, operating and managing adequate infrastructure; and iii) relevant legislation and regulation. The most important current policies, on the other hand, relate more to managing and improving the existing resilience, that is, having plans and programs and managing systems which advocate resilience.

In addition to formal rules, informal rules also play a role in policy development. Based on the interviews, the greatest challenges in advancing resilience in the future involve informal rules, that is people's mindsets and habits. Other challenges included lack of funding and inflexible regulation, which can hamper integrated thinking and the ability to address, for example, the prioritization of the greatest local environmental problems. The interviews also resulted in suggestions for improving resilience, of which four main recommendations are: i) creating awareness and chang-

32. Mantzavinos, North, and Shariq, "Learning, Institutions, and Economic Performance," 77-79.

ing the general mindset (regarding the value of water and of water use and management); ii) further improving current strategies to respond to various future scenarios as well as to social and equity issues; iii) implementing concrete measures to embed resiliency into daily operations and future visions; and iv) improving holistic, cross-disciplinary collaboration and coordination.

Our findings indicate that successful policies for resilient water services are diverse in terms of their design, type, and implementation level. While actions at the local level are powerful in enabling resilience, activities and decisions or, on the contrary, inactivity, at national and global levels might impact the extent to which the local level is able to implement local policies that could enable more resilient water services. Therefore, resilience should be considered in policy-making at all levels from local to global.

The results of this study provide insights regarding the importance of certain policies to the resilience of water services. These insights should be useful to policy makers in Seattle as they clarify the most fundamental elements that contribute to resilient policy design and water services management. These elements, combined with challenges and suggestions provided in the interviews of the water sector professionals, can then be further considered in future planning. In terms of future research, repeating similar studies elsewhere would reveal whether, and to what extent, challenges in improving resilience and suggestions for improvement follow similar patterns as in Seattle.

Laura M. Inha is a doctoral student in Tampere University, Finland researching policies for resilient water services in developing and developed countries, and in rural and urban settings. For her degree, she spent a year as a Valle Foundation visiting scholar in the University of Washington in Seattle, USA. Inha has a master's degree in civil engineering majoring in water and environmental engineering. She has gained seven and a half years of work experience in stormwater management consulting in Finland, and in international development in the Global Water Practice, World Bank, concentrating on water security, groundwater management, and sanitation issues mainly in India.

Dr. Jarmo J. Hukka is an adjunct professor at Tampere University in Tampere, Finland. He has 42 years of professional experience. His research interests include water services policy, governance and management, sector reforms, privatization, services pricing, asset management, critical infrastructure protection and resilience. Dr. Hukka has authored 180 publications. He has also worked 12 years for overseas projects in the Cayman Islands, Sri Lanka, Kenya, Kosovo, and for the African Development Bank in Gambia, Ghana, Liberia, Nigeria and Sierra Leone.

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MAIN SECTION

Water as Source of Conflict and as a Vehicle for Peace

Klaas Johannes de Jong — Independent researcher (Netherlands) — KJ_deJong@outlook.com

ABSTRACT

Water accessibility in Israel and the Palestinian Territories is part of the politics in the Israeli-Palestinian conflict and contributes to the feeling of mistrust and misunderstanding between Israelis and Palestinians. This article explores the implications of access to water. It proposes an architectural design for a Temple of Water as a catalyst for dialogue and understanding between Israelis and Palestinians in the water-stressed region of Hebron on the southern West Bank. It aims to create a water space for social and communal practices as a vehicle for social interaction. Opportunities for peaceful coexistence are needed in conflict areas. The Temple of Water makes a statement about water's power, meaning and influence. The research highlights the potential of spatial planning and design to promote either conflict or peaceful coexistence. Key specifications for architectural projects in water-stressed and conflict-ridden spaces have been defined with a theoretical framework concerning the value and implications of water in Israel and Palestine. The research takes a step towards understanding the power, meaning and influence that water can have through its physical embodiment in an architectural artefact.

KEYWORDS

Water Management; Israeli-Palestinian Conflict; Water Conflict; Architecture of Water.

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Introduction

Water has long been at the center of communal activities. The physical embodiment of the relationship humans have with water—including structures for gathering or distributing drinking water and spaces for washing and cleaning—has been at the center of people's lives around the world. Architectures of water—infrastructure, buildings or monuments—are part of society. They serve as physical artifacts with spiritual associations and memories linked to important events.[1] They have become part of culture, politics, and economics. Because life depends on water, water management can be the source of conflict.[2] Faulty infrastructure, (territorial) management, politics, geography and climate change are important factors that can exacerbate water scarcity and its problems of unequal distribution. These factors can lead to mistrust, misunderstanding and antagonism between different groups of consumers in a region.

As a Dutch graduate student at the Faculty of Architecture and the Built Environment at Delft University of Technology in the Netherlands, I became aware of the importance of water as a dividing issue in the Israeli-Palestinian conflict after a visit to Israel and the Palestinian Territories in 2016. I had no ties with Israelis or Palestinians, but as an outsider I forged my view of the conflict and water management through an investigation that included reviewing relevant literature, mapping, visiting the region and engaging in informal conversations with Israelis and Palestinians. The research taught me the importance of territorial water management—the management of water defined by territory—and importance of the physical representation of water planning and design as part of the Israeli-Palestinian conflict.

After this initial investigation, I wanted to explore the issue further through research by design, advancing a possible architectural intervention in order to explore the symbolic, cultural and political implications of a modern Water Temple, a physical structure that embodies the issues I wished to address. From an architectural perspective, I explored the possibilities for bringing Israelis and Palestinians together with water. In opposition to the architecture of conflict—consisting of segregating barriers and bypasses—I defined a positive approach towards desegregation and normalization of Israeli-Palestinian society, while providing an equal distribution and sufficient supply of water to Israelis and Palestinians.

Water is one of the issues that is hotly debated among the population groups in Israel and Palestine, as demonstrated in the award-winning book, *Atlas of the Conflict: Israel-Palestine*, by Israeli author and

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2. David Newman, "Shared Spaces - Separate Spaces: the Israel-Palestine Peace Process," *GeoJournal* 39, no. 4 (1996): 368.

map-maker Malkit Shoshan.[3] Because of biased territorial water management and substandard water infrastructure, Palestinians have limited access to water, with a daily per capita consumption at 73 liters in the West Bank, while the per capita daily consumption in Israel is 242 liters.[4] Two separate authorities in Israel and the Palestinian Territories provide the Israeli and Palestinian peoples with water. The Israeli Water Authority (IWA) and the Palestinian Water Authority (PWA) are responsible for providing water to their respective populations through the Israeli and Palestinian water infrastructure. A Joint Water Committee (JWC) was founded to oversee common water resources and manage the water infrastructure of the West Bank.[5] The infrastructure under the responsibility of the PWA is outdated and is not connected to all Palestinian communities: only 55% of Palestinian localities are connected to piped water supply systems.[6]

This research draws on a theoretical framework dealing with the value and implications of water for water-stressed regions, and scholarship regarding pathways to normalization and peace in conflict areas. The social and political implications of water are recognized by UNESCO associates in the 2015 book *Water and Heritage*[7] and in a 1994 article by American economists Berck and Lipow[8]. The book *Water and Heritage* reveals the importance of water and water systems for many aspects of people's lives throughout history. To further explore the value of water, this paper draws on the ideas of American journalist Cooley[9] and American scientist Gleick.[10] Their works demonstrate why water is so often a source of conflict. Various sociologists, economists, planners, engineers and geographers—including American economist Ostrom,[11] British political

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3. Malkit Shoshan and Joost Grootens, *Atlas of the Conflict: Israel-Palestine* (Rotterdam: 010 Publishers, 2010).

4. B'Tselem, *The Gap in Water Consumption between Palestinians and Israelis*. Accessed February 18, 2019. https://www.btselem.org/gap-water-consumption-between-palestinians-and-israelis.

5. As part of the 1995 Oslo II accord, the Israeli Water Authority (IWA) of Israel controls water resources in Israel and the Palestinian Territories. The Palestinian Water Authority (PWA) is responsible for the water network and infrastructure to Palestinians. The 1995 Oslo II accord agrees on the division of groundwater that the IWA must deliver to the PWA. The PWA depends on the water supply from the IWA. The Joint Water Committee (JWC) was founded in 1995 to oversee resources and manage water infrastructure of the West Bank. The JWC has an equal number of representatives from both Israel as the Palestinian Territories. Agreements and decisions have to be reached by consensus; Swedish Senior Water Resources Management Specialist at the World Bank Anders Jägerskog argued that the asymmetrical power between the parties gives Israel the upper hand with regards to implementation of agreements.

6. Bader A. A. A. Zahra, "Water Crisis in Palestine," *Desalination* 136, no 1–3 (2001): p.97.

7. Willem Willems and Henk Van Schaik, eds., *Water & Heritage: Material, Conceptual and Spiritual Connections* (Leiden: Sidestone Press, 2015).

8. Peter Berck and Jonathan Lipow, "Real and Ideal Water Rights: The Prospects for Water-Rights Reform in Israel, Gaza and the West Bank," *Resource and Energy Economics* 16, no. 4 (1994) 287-301.

9. John K. Cooley, "The War over Water," *Foreign Policy* 54 (1984) 3-26.

10. Peter H. Gleick, "Water and Conflict: Fresh Water Resources and International Security," *International Security* 18, no. 1 (1993): 79-112.

11. Elinor Ostrom, *Governing the Commons. The Evolution of Institutions for Collective Action* (Cambridge: Cambridge University Press, 1990).

geographer Newman,[12] Palestinian sociologist Mi'Ari,[13] American geographer Curti[14] and British academic Larkin[15]—have argued for the importance of interdependent management of water resources and the need for interaction between different stakeholders, and governance level, to achieve normalization in conflict areas. Here, the physical environment of the Israeli-Palestinian conflict will be analyzed through the perspectives of *In Statu Quo,*[16] a 2018 book that discusses the social and political connotations of spaces of conflict in Israel and the Palestinian Territories.

The first section explains the implicit value of water to society, politics and economics. The second section focuses on the implicit and explicit valuation of water and how valuation might differ across cultural contexts. The third section describes how spatial planning and the design of water and water systems may contribute to normalization and peace. The paper concludes with a proposal for an architectural intervention for water-stressed Palestinian Territories. The proposed Temple of Water restores water as a vehicle for social and communal practices for Israelis and Palestinians in the water-stressed region of Hebron on the southern West Bank.

Implications of Water in Israel and Palestine

Laws and regulations of the Ottoman Empire once controlled land ownership and water consumption in Israel and the Palestinian Territories. The Ottoman laws define water use entitlements—and indirectly entitlements to land ownership.[17] Land that is not actively tilled and water that is not consumed can be legally expropriated, meaning that lower water consumption can lead to loss of land ownership and any water rights associated with that land.[18] Not surprisingly, the planning and design of water has deeply influenced relations between Israelis and Palestinians. In 1964 the Israeli water company Mekorot was founded during the so-called Zionist hydraulic mission era. At the time, Zionists and British Mandate authorities built the National Water Carrier (NWC) that transported water from the Sea of Galilee in the north of the country southward to the other parts of Israel, including the arid Negev Desert. As water was extracted from the Sea of Galilee—a freshwater lake and important source of the Jordan River—the water flow in the Jordan River decreased, reducing the availability of water in the West Bank. This led to the 1967 Arab-Israeli

12. Newman, "Shared Spaces," 363-375.

13. Mahmoud Mi'Ari, "Attitudes of Palestinians Toward Normalization with Israel," *Journal of Peace Research.* 36, no. 3 (1999): 339-348.

14. Giorgio H. Curti, "From a Wall of Bodies to a Body of Walls: Politics of Affect | Politics of Memory | Politics of War," *Emotion, Space and Society* 1, no. 2 (2008): 106-118.

15. Craig Larkin, "Remaking Beirut: Contesting Memory, Space, and the Urban Imaginary of Lebanese Youth," *City & Community* 9, no. 4 (2010): 414-442.

16. Ifat Finkelman, et al. eds., *In Statu Quo: Structures of Negotiation* (Berlin: Hatje Cantz Verlag, 2018).

17. Berck and Lipow, "Real and Ideal Water Rights," 293.

18. Ibid.

war—also known as the War over Water,[19] culminating with the "Six-Day War" of 1967. The situation has changed little since. Hydrologists working with Palestinians have called the current water management system in Israel and the Palestinian Territories "Hydro-Apartheid".[20]

Water can be a source of conflict, if it provides a source of economic and political strength, so that ensuring access to water justifies going to war.[21] To avoid losing economic and political strength, Israel seeks resources to ward against water scarcity. The importance of agriculture for land ownership and food security drives the country to innovate in water supply. Desalination plants provide fresh water from the Mediterranean Sea. Desalination plants are economically expensive, however, in relation to standard and traditional water sources like aquifers, lakes and rivers.[22] In addition, desalination plants consume a lot of energy and damage the sea's biodiversity.[23] For Palestinians, desalination plants are unaffordable without support and aid from external parties.

Economically, Palestinians do not have the ability to invest in water innovation and they depend on the agreements on water supply by the Israeli Water Authority as stated in the 1995 Oslo II Accord. Since then, the Palestinian society and its demand for water have grown and the water infrastructure further degraded. It is unclear whether Israel meets the Accord's requirements regarding water supply or not. Palestinians believe that they are continually denied access to water and that this denial prevents them from developing their economy.[24] Besides the economic aspects of denied access to water, water has become a source of mistrust and localized conflict in Israel and the Palestinian Territories. Mistrust and misunderstanding have kept Israelis and Palestinians from being able to coexist peacefully. This situation, if not controlled, may continue in the long term. Cooley writes that "long after oil runs out, water is likely to cause wars, cement peace, and make and break empires and alliances in the region, as it has for thousands of years."[25]

Equality and Cooperation

To achieve stability, democracy and peaceful coexistence, it is important

19. John K. Cooley, "The War over Water," 3.

20. Randy Schrum, *The Hydro-Apartheid of Palestinian Communities in Israel*, Accessed November 15, 2018, https://anydisaster.com/hydro-apartheid-palestinian-communities-israel.

21. Peter H. Gleick, "Water and Conflict," 84.

22. Eran Feitelson and Gad Rosenthal, "Desalination, Space and Power: The Ramifications of Israel's Changing Water Geography," *Geoforum* 43, no. 2 (2012): 274.

23. Fred Kuepper, "The Impacts of Relying on Desalination for Water," *Scientific American*, Accessed March 16, 2019. https://www.scientificamerican.com/article/the-impacts-of-relying-on-desalination/.

24. Jennifer Najjar, "Water: A Potential Vehicle For Peace?", *University of Denver Water Law Review* (2019). Accessed November 15, 2018, http://duwaterlawreview.com/water-a-potential-vehicle-for-peace-2/.

25. Cooley, "The War over Water," 3.

to take into account the planning and design of water in Israel and the Palestinian Territories. After studying the attitudes of Israelis and Palestinians about normalization, Mi'Ari concludes that a large group of both Israelis and Palestinians are supportive of normalization.[26] Israelis generally support normalization with Palestinians, before or even without solving the main issues of the conflict. Initially, Palestinian academics and activists were against normalization. According to their ideas, normalization could only take place between two equal parties. Since the 1993 Oslo Accords however, their ideas have changed and they tend to support normalization with Israelis. Specifically, Palestinian merchants and farmers who work and trade with Israelis tend to support normalization more than people who stay within their own communities. Some Israelis and Palestinians meet in safe environments and gain economically from their contact. Everyday interaction between people and economic cooperation towards peace seems to encourage normalization between Israelis and Palestinians.[27]

Attempts to create spaces that promote neutrality and equality have been part of the post-conflict rehabilitations of many cities and societies. After decades of religious and political conflict in Beirut (Lebanon), the divided city arguably became the world's largest laboratory for post-war reconstruction.[28] Projects were built to connect locals and tourists via the creation of neutral spaces that bring together different groups of people.[29] Yet, the projects failed to provide accessible and dynamic meeting places, because of their intended neutrality. In other words, the projects realized in Beirut lack the power to attract people and to engage them.[30] Planners and designers should avoid neutrality in their designs as they may leave people unable to identify with their projects. Similarly, in Israel and the Palestinian Territories, invisible layers of water-related infrastructure such as underground water structures are difficult for people to identify with.

To reduce mistrust, misunderstanding and antagonism it is important to facilitate everyday interaction and economic cooperation between different social groups, rather than build physical objects that separate them. Territorial management and policies create soft borders that are as effective as walls, as they create inequality among citizens—or the impression thereof. Cooperation and inter-dependencies can reduce conflict between rivals. Inter-dependency encourages different people to keep themselves from being in conflict with their 'partners'. Elinor Ostrom supports the idea of interdependent management of natural resources—in which different entities are considered equal, have equal access to a common-pool resource and are dependent on each other's extractions

26. Mi'Ari, "Attitudes of Palestinians," 339-348.

27. Ibid., 339.

28. Larkin, "Remaking Beirut," 415-418.

29. Ibid., 428.

30. Ibid., 428.

from that resource—to avoid conflict. According to Ostrom, different parties can benefit equally from common-pool resources (CPR) following her design principles for CPR management as conflict resolution.[31]

Coexistence through the Architecture of Water

This section presents a possible intervention in spatial planning and design of water and water systems as physical structures to promote normalization and peace between Israelis and Palestinians. The proposed architectural design aims to influence conflict situations and aims to promote peaceful coexistence, stability and democracy through the architecture of water.

My proposal is for a Temple of Water, which introduces water as social and communal practice for Israelis and Palestinians in the water-stressed region of Hebron (West Bank). The Temple of Water project focuses on

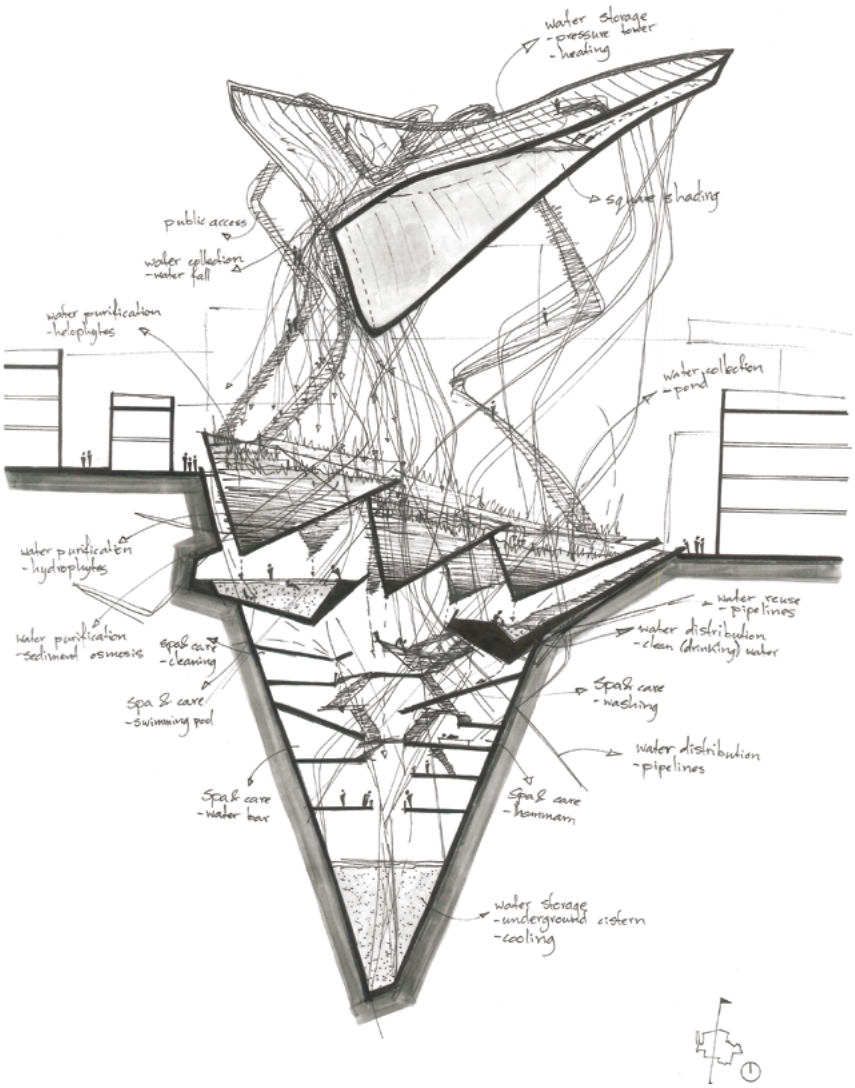

FIG. 1 Temple of Water design sketch by author.

31. Ostrom, *Governing the Commons*.

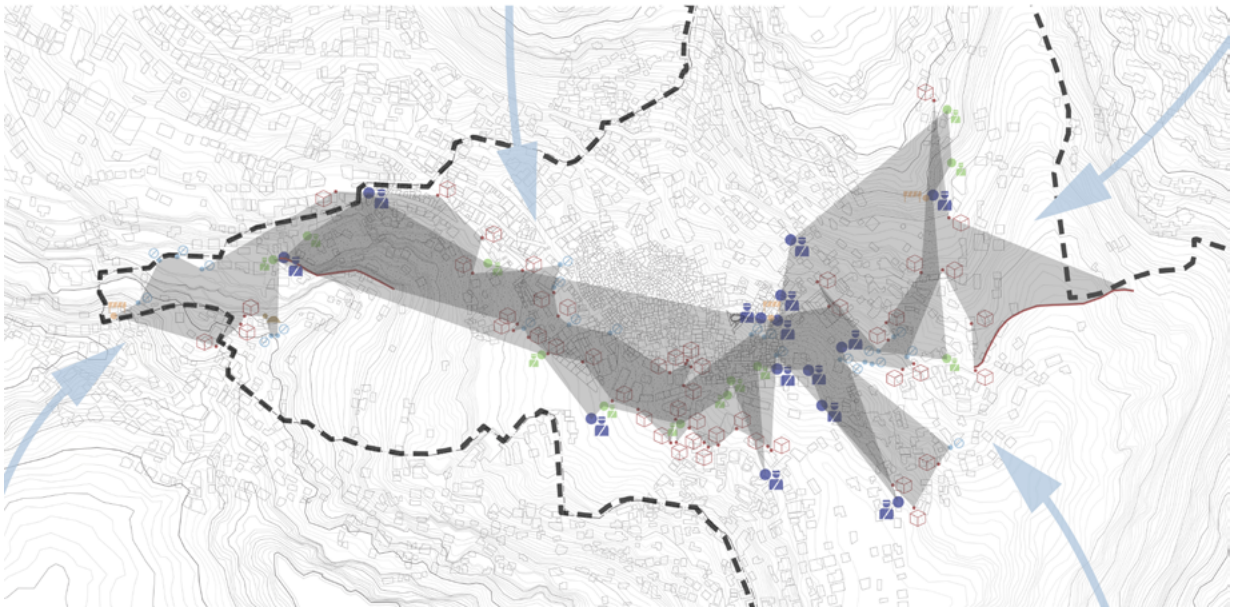

FIG. 2 Map of Hebron checkpoints and barriers. Dashed line: border H1/H2. Dark grey area: theoretical walled area. Map by author

the crucial nature of the relationship between water and architecture in spaces of conflict. The intervention can be generalized to other water-stressed and conflict-strained regions of the world. **[Fig.1]**

The city of Hebron is a key site in the Israeli-Palestinian conflict. It lies in the south of the West Bank and it is one of the oldest continuously inhabited places in the world. It includes Abraham's burial place, which is located in the Old City of Hebron, and known as Cave of Patriarchs (Me'arat ha-Makhpela) by Jews and as Ibrahimi Mosque (al-Haram al-Ibrahimi) by Muslims. It is an important site for followers of Judaism, Christianity and Islam: the three monotheistic religions. Both Jews and Muslims use the building religiously, but in different spaces of the building.[32] **[Fig.2]**

Although Hebron (or Al-Khalil in Arabic) was once a place where Jews and Muslims peacefully coexisted, the city is now divided into two areas, "Area H1"—which is under full control of the Palestinian Authority (PA)—and "Area H2"—which is under full control of the Israeli military (IDF).[33] The division of Hebron into areas H1 and H2 is a consequence of politics following conflict between Muslims and Jews such as attacks and murders.[34]

There is no continuous wall in Hebron, but soldier-controlled checkpoints, sections of walls and other barriers work together as one continuous space, which I call the theoretical wall of Hebron. The area within this

32. Eyal Weizman, "Scenography," in *In Statu Quo: Structures of Negotiation*, edited by Ifat Finkelman et al. (Berlin: Hatje Cantz Verlag, 2018), 185-230.

33. Müller, Patrick, *Occupation in Hebron*. (The Alternative Information Center: Jerusalem, 2004), 39-41.

34. After the massacre of 29 Muslims at prayer in the Cave of Patriarchs by Israeli Baruch Goldstein in 1994, peace talks for Hebron started. The Hebron Agreement followed in 1997, which left the city divided in two sectors: H1 and H2. In accordance with the Hebron Protocol, H1 came under full control of the Palestinian Authority and H2 came under full control of the Israeli military.

FIG. 3 Checkpoint in Hebron—example of the physical embodiment of the H1/H2 border. Photo by author.

theoretical wall includes parts of the Old City and the Cave of Patriarchs in area H2. Neither Israelis nor Palestinians are allowed to cross certain areas and checkpoints. Israeli soldiers patrol a deserted area with armored trucks—indicated in dark grey in figure 2. As shown on the map, the actual location of checkpoints and other barriers do not necessarily correspond with the exact location of the drawn borders.

Hebron has been described as a microcosm of the Israeli occupation.[35] Some people view the situation of Hebron as the most badly impacted area of the Israeli-Palestinian conflict, second only to the Gaza Strip. **[Fig.3]**

Among cities and villages on the West Bank, the need for water is greatest in Bethlehem, Hebron and Yatta.[36] The United Nations have recognized that "The Hebron Area is actually in need of 25,000 cubic meters [of water] every day"[37]. Palestinian families are known to have been left without water for over 40 days, and the scarcity and poor availability of water for Palestinians is physically visible throughout the city, where one can see water tanks on roof tops, in contrast to the pitched roofs of Israelis in the nearby settlement, where rain water is allowed to flow directly into the ground.

It is in this context that the Temple of Water is designed as an architecture of water: the physical embodiment that is defined by the properties of water. Simultaneously, the Temple of Water responds to water scarcity and the unequal distribution of water to different social groups in Israel and the Palestinian Territories. Designed to take into account the different social implications of water, the project aims to revive the divided Old City

35. Walters, Derk, "Nooit Was Het Zo Erg in Hebron, Microkosmos van de Bezetting," in *NRC Handelsblad* (2016). Accessed November 15, 2018, https://www.nrc.nl/nieuws/2016/01/12/zo-erg-was-het-nooit-in-hebron-1579725-a1168766.

36. Najjar "Water: A Potential Vehicle For Peace?"

37. United Nations, *Water Resources of the Occupied Palestinian Territory* (New York, 1992).

FIG. 4 Temple of Water design location & water distribution diagram by author.

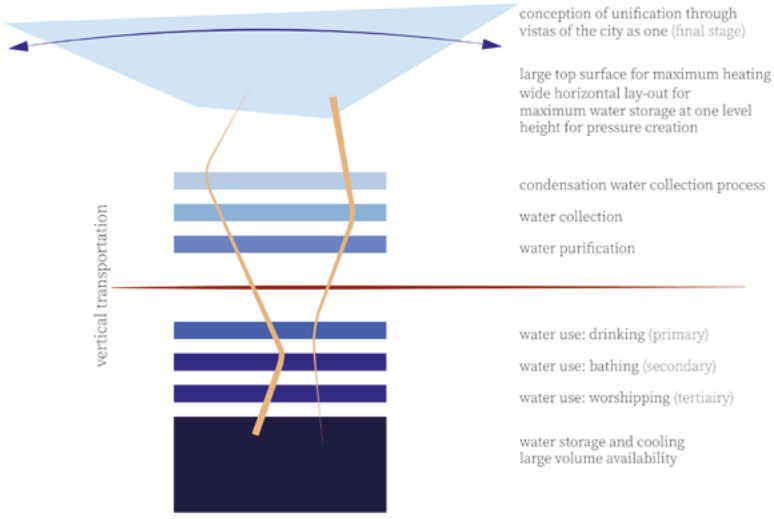

FIG. 5 Concept of section Temple of Water by author.

area and to re-establish everyday interaction and connections between Israelis and Palestinians. The Temple of Water aims to encourage frequent trans-boundary movement in order to counteract the idea that borders are needed. The building is designed as a space for action, interaction and reconciliation, following the assumption that a building is more than a mere structure. It is a place where events are shaped, as underscored by British Israeli architect Eyal Weizman in *In Statu Quo*:

> Buildings are thus not just passive elements, receptive sensors on which events are registered. Nor are they just the scenes of a crime, the locations in which violence takes place. Rather, built environments are composite assemblies of structures, spaces, infrastructure, services, and technologies with the capacity to act and interact with their surroundings and shape events around them.[38]

38. Weizman, "Scenography," 187.

The Temple of Water is located adjacent to a checkpoint and various other static barriers. Both Israelis and Palestinians are allowed to be here, although not at every hour of the day—depending on prevailing conditions. [Figs. 4-5]

The Temple of Water is intended to be an important infrastructure in the city of Hebron. The Temple accommodates water harvesting, water storage, water distribution and use of water in the vertical organization of the building. As rain falls, water is collected and purified at the ground level. Underground visitors can use the water, and the surplus is stored and cooled at the bottom. Different spaces provide different uses by different people. A portion of water is pumped upwards to be heated by the sun, and to create pressure on the underground piping and tubing towards the houses of the inhabitants of Hebron in a way that follows the engineering principles of historical and present-day water towers. At the same time, the design emphasizes the sharing of a common water resource, managed cooperatively, for all people of the city. The Temple's aim is to provide the Hebronites with sufficient water to meet the minimum standard for

FIG. 6 Temple of Water overview of underground platforms. Model and photo by author.

water consumption set by the World Health Organization (WHO). Water is harvested and stored efficiently and is equally distributed to all people of Hebron through an underground infrastructure. The Temple purifies wastewater that is collected from the houses, also via underground infrastructure. Its underground storage serves as a buffer in times of drought.[Fig.6]

The building is open to all and accommodates inspiring, diverse flows of people. The Temple provides space for new habitual practices to develop around water, in which different social groups can find a place to meet. The Temple encourages people to appreciate water and to respect its importance. Collective memories are often associated with spaces of which water is an essential element and help in maintaining social networks.[39] The Temple should become part of the city's heritage where a social network with and between the different social groups of Hebron can emerge. [Fig.7]

The Temple of Water connects to Israeli and Palestinian Hebronites by corresponding with their communal history and traditions. To attract both Israelis and Palestinians, the design refrains from the use of colors or symbols with any political connotation. The region of Israel and the Palestinian Territories have a long tradition of building with limestone. The Temple is designed completely in limestone to connect to the people and to fit within the existing context. The building's floor plan is inspired by the character *ma*, which stands for *water* in the Phoenician language—the language that existed before the appearance of the great monotheistic religions of Judaism, Christianity and Islam. The ancient character for water is brought back in the Temple of Water to connect to all the people in the region, while expressing the importance of water as the source of life.

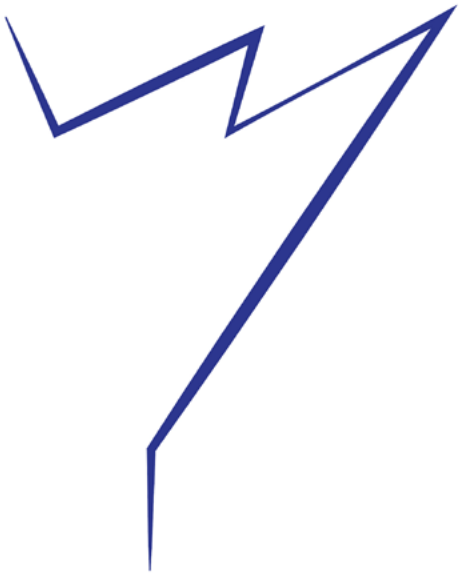

FIG. 7 'Ma character.' Diagram by author

39. Jigyasu, "Reinforcing the Link," 261.

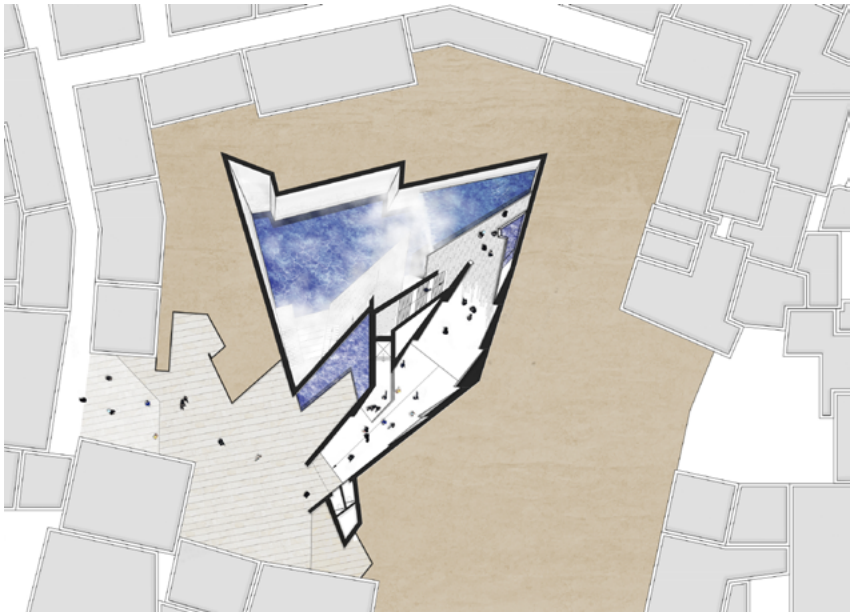

FIG. 8 Floor plan underground: level -1. Plan by author.

The shape provides a continuous source of unpredictability and mysteriousness. People enter the Temple at the start of a long hallway, which leads them underground to the unexpected. The fragmentation in the shape defines three levels of water use—to drink, to bathe, and to relax or use spiritually. The activities take place in shared spaces that allow people to gather together closely or stand at a distance to observe each other. A continuous sound of water drops dripping from the water-filtering ceiling and the sound of a continuous flow of water from the underground waterfall immerses the visitors in the architecture of water. [Figs. 8-9]

The upper underground level (*level -1*, figure 8) at the end of a hallway gives an overview of the underground part of the temple and it is the level where water is available to drink. People can descend to the second underground level (*level -2*) to bathe. The lowest level (*level -3*) can be used as a hammam, a theater, and as a place to sit and worship. The space opens up towards the water and the upper floor levels. In the temple, people are able to experience different facets of water such as sound, humidity, effects on light, and temperature. An elevator connects the underground part of the Temple with the water reservation tower that rises high up in the air. From this location, people can see Hebron as a whole. The elevation allows people to see every part of the city without any obstructions of their sight by political movement barriers. The sight of the city brings people closer to the idea of a city without barriers, where experiences and memories can be made at any place in the city.

The routing through the building is designed with one wide connecting route from the top to the lowest level of the building. People will have to pass each other, but they will have enough space to pass at a comfortable distance. [Fig.10]

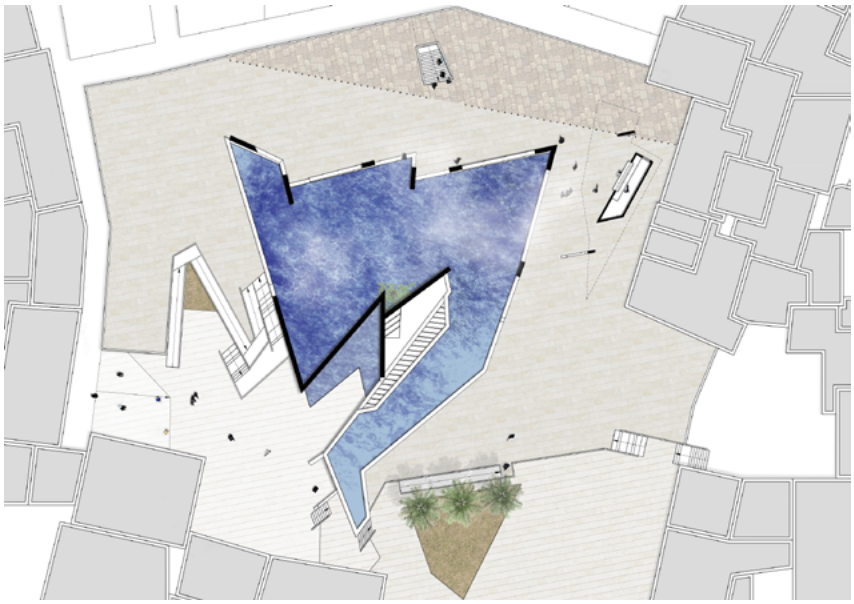

FIG. 9 Floor plan ground floor. Plan by author

The design underscores water's importance by demonstrating the qualities of water through architecture and the provision of a space where people can worship water. The design addresses the problems of territorial water management by being the place where all people from any location can come to use water, while providing a platform for social cohesion and de-segregation through everyday interaction. The Temple counteracts the segregating architecture of walls and checkpoints and demonstrates the possibilities of a space without embodiments and restrictions of (inter) national boundaries. Referring to different architectural and engineering structures that exist or have existed in different cultures around the world, the Temple of Water reintroduces the necessity and importance of water systems as part of the socio-cultural context in the current era, connecting to the surrounding and its community through its materials and in language. The design represents a positive response to the fragile, complex and complicated Israeli-Palestinian situation. The Temple of Water promotes peace and stability through a modern view of water as the center of society, where connections can be created and re-established, and where new habits and practices around water can develop. [Fig.11]

Conclusion

Research on the implications and value of water and water systems shows the importance of cautious design. Water is the source of life, and its systems facilitate social connections. The political and economic strength of a country depends on water, it can be a source of conflict and even war, as it has been already in Israel and the Palestinian Territories. Agreements can lead to clarity, but might also lead to mistrust and misun-

FIG. 10 Temple of Water underground interior visualization by author.

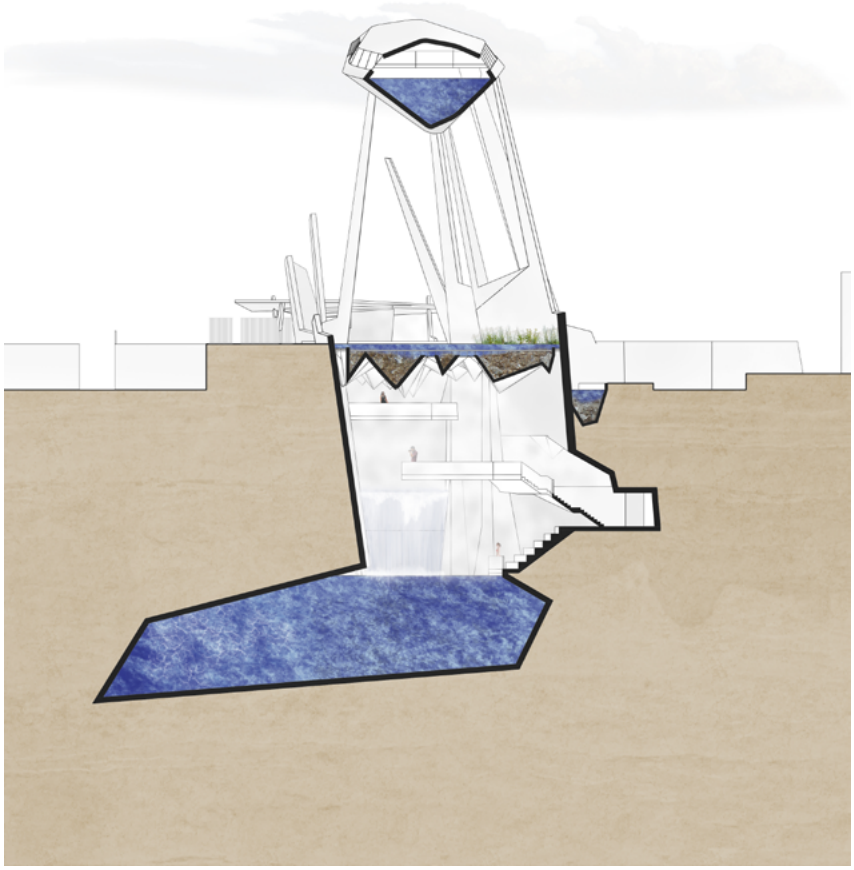

FIG. 11 Temple of Water section by author.

derstanding as systems and societies change over time. It is important to design water and water systems in conjunction with a vision of the future of a city or community.

Normalization and peace in the case of Israel and the Palestinian Territories depend on many factors, including politics, social interaction, water management, and the planning and design of physical space, where people can meet and interact and feel connected to the space and to one another. Physical barriers in space block movement and interaction, and sustain and perpetuate conflicts. Planners and designers must be aware of the possible consequences of their designs for the city and its society. Interdependent relations and democratic management positively contribute to an efficient and egalitarian use of resources.

The Temple of Water is proposed to stimulate everyday interaction between different social groups through a communal need—water. In the specific case of Hebron, the Temple is identifiable by Israelis and Palestinian visitors through its materials, but remains mysterious and unpredictable through its unexpected sequence of spaces and spatial characteristics. The Temple of Water offers a modern view of water as the center of society. Building on the heritage of water, the building restores water as a vehicle for social practices. The Temple provides space to facilitate everyday interaction and connections between Israelis and Palestinians, letting communities grow towards stability, democracy and peaceful coexistence.

Klaas de Jong is a Dutch architect. After his studies in architecture at TU Delft and SCI-Arc, he graduated from TU Delft with a master thesis on the role of architecture in water-stressed conflict regions, 2018. Currently he is based in New York City at Studio Libeskind.

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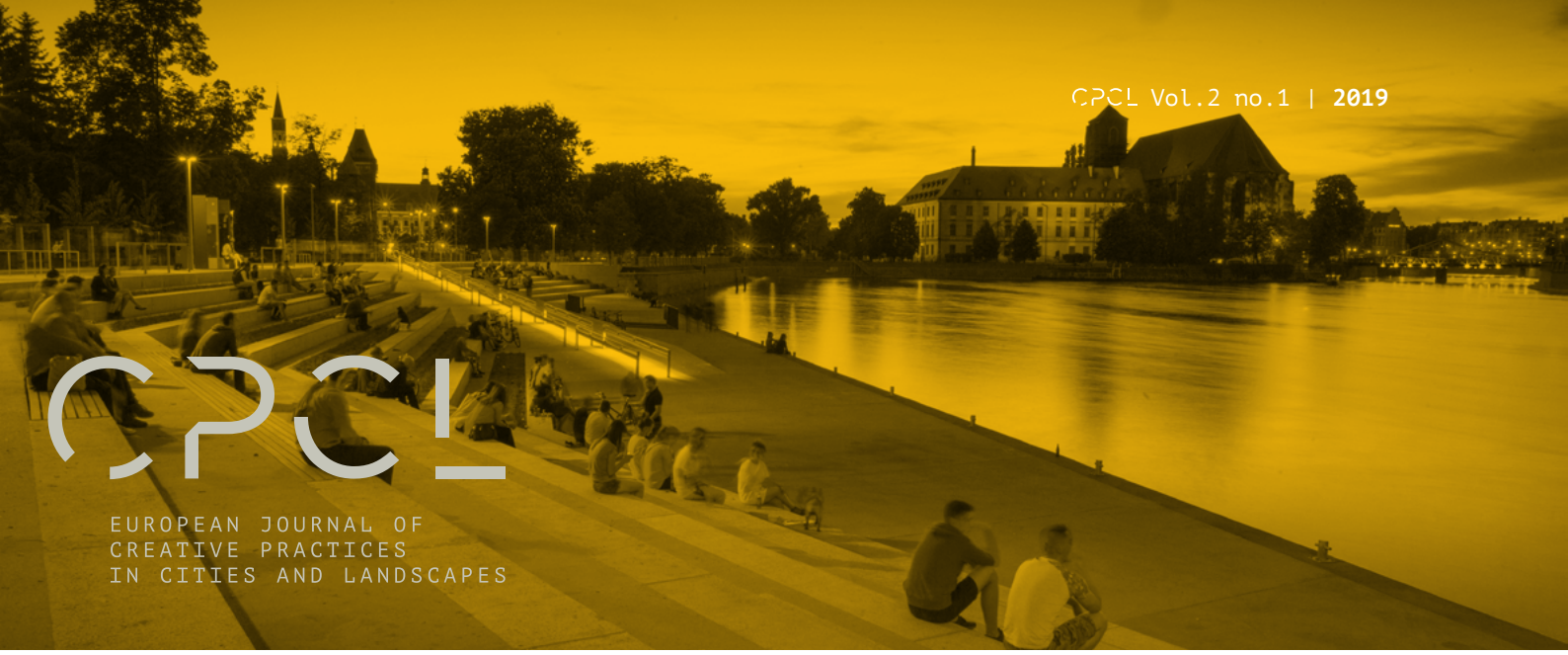

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PRACTICES

Water, Heritage and Sustainability in Practice: the cases of Rochdale and Wrocław

Angela Connelly — The University of Manchester (United Kingdom) — angela.connelly-2@manchester.ac.uk
Serene Hanania — ICLEI (Germany)
Joanna Kiernicka-Allavena — City Hall of Wrocław (Poland)

ABSTRACT

Scholars argue that culture can be considered a fourth pillar in sustainable development, however culture is often overlooked in contemporary sustainability discourses and practice. By considering water management and heritage together, practitioners can begin to address this lacuna. It is important to recognize the aesthetic and social importance of water as well as its technical and economic contribution to historical urban development. Presenting two European case studies, this article examines the way in which water management has shaped the design of urban areas and people's interactions with those areas. In the first case, in Rochdale, Manchester (UK), a project that included the deculverting of the River Roch in order to reduce flood risk provided other environmental and social benefits. In the second case, the city of Wrocław, a major flood has led to rethinking the form and function of the city and how citizens engage with it. Lessons from the two cases make it possible to offer recommendations for practice. In an era when climate change demands greater resilience, more attention must be paid to the intimate relationships between water and heritage.

KEYWORDS

Water; Heritage; Sustainability; Flood Risk; Urban Areas.

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Introduction

As a fundamental part of the landscape, water has influenced the design and use of urban spaces over time. Similarly, heritage—encompassing physical forms and customs and attitudes—is also a key part of the urban landscape.[1] Yet the two, water and heritage, are rarely considered together although doing so can provide creative inspiration. For example, efforts to protect cultural heritage from excess water have enabled innovation in urban flood management, such as the erection of temporary barriers to reduce flood risk in Cologne that do not conflict with the city's heritage landscape.[2] Similarly, there has been work on the use of natural heritage to protect wider urban environments from flooding.[3]

Such examples are underpinned by a fundamental change in attitudes towards water management in Europe[4]. European policy has been increasingly focusing on natural water management, integrated strategies and nature-based solutions to combat current flood risk, address water quality issues, and tackle future climatic change. The Water Framework Directive (WFD) and initiatives such as Natura 2000 have helped to shine a light on the use of integrated water management practices at recognized natural heritage sites. Furthermore, the local level and strengthening good water management practices by driving local-level action are growing in prominence. The Urban Water Agenda 2030, for example, was a joint initiative of the European Commission and local governments to safeguard Europe's water resources and strengthen the implementation of European Union water legislation. It aimed at fostering sustainable urban water management in cities through facilitating improved policies and practices at local level and by promoting inter-city exchanges.[5]

A deeper understanding of the interplay between heritage and water may help to enact such a shift in sustainability and water, and may help to

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1. Although definitions of "heritage" vary, it generally encompasses both tangible (physical) artefacts as well as more intangible (including "spiritual") aspects such as customs and behaviour. UNESCO notes that "cultural heritage is the legacy of physical artefacts and intangible attributes of a group or society that are inherited from past generations, maintained in the present and bestowed for the benefit of future generations." This wide definition opens up several possibilities for the intersection of water and heritage in practice. The two case studies presented in this article highlight both tangible and intangible aspects of cultural heritage and the relationship to water management. See "Tangible Cultural Heritage | United Nations Educational, Scientific and Cultural Organization," accessed January 21, 2019, http://www.unesco.org/new/en/cairo/culture/tangible-cultural-heritage/; see also Willem J. H. Willems and Henk Van Schaik, eds., *Water & Heritage: Material, Conceptual and Spiritual Connections* (Leiden: Sidestone Press, 2017).

2. Abhas K. Jha, Robin Bloch, and Jessica Lamond, *Cities and Flooding: A Guide to Integrated Urban Flood Risk Management for the 21st Century* (Washington DC: World Bank Publications, 2012).

3. See e.g. Council of Europe, *Heritage for Development in South-East Europe* (Council of Europe, 2014).

4. Richard Stinshoff, "Beyond the Industrial Revolution: The Transformation of Britain's Canals and Their Cultural Meaning," in *Thinking Northern: Textures of Identity in the North of England*, ed. Christoph Ehland (Amsterdam, New York: Rodopi, 2007), 257–78.

5. 5. "Urban Water Agenda 2030 | Home," accessed January 21, 2019, http://urbanwateragenda2030.eu/.

cement culture as the fourth pillar of sustainability.[6] Approaching sustainability in this way may also shed light on urban development patterns and citizens' relationships with the water that flows through their cities and sustains their lives. However, there are few useful examples for the practitioner community that show how water and heritage can be considered together. Only by having such an understanding can we begin to make solid plans for a more sustainable and equitable water management system based.

This article presents two European case studies that showcase the way in which flood risk shapes the design of urban areas and the relationship between citizens and water over time. Both cases show the multifaceted ways in which water and heritage can be related but in the two cases, the relationship differs. We begin by considering Rochdale (United Kingdom) and follow the deculverting of the River Roch in the town center. The project revealed historic bridges that had been hitherto concealed and that also reduced flood risk and helped realize wider sustainability benefits to the environment, the economy, and people. Our second case study in Wrocław (Poland) examines the impact that floods have had on the form and function of the city as well as the way in which urban flood risk managers can encourage approaches that change how *Wrocławianie* relate to water.

Revealing the Roch: Context

Rochdale is a town of approximately 159 km^2 and a population of just over 200,000 located in the north-west of England and part of the Greater Manchester Combined Authority. Flooding is one of the most significant risks across Greater Manchester and the town of Rochdale is particularly affected, as it is the only one of Greater Manchester's towns that has a river running through it—the River Roch, from which Rochdale takes its name. The river has several tributaries and the fluvial risk they pose has a negative impact on economic opportunities and housing in an area where the watercourses rise quickly during periods of intense rainfall. In addition, Rochdale has significant surface water flood risk in certain areas owing to an abundance of sealed surfaces and intense rainfall.

Historically, Rochdale was an important place in the north-west of England due to its location in a valley where a river crossing could be created to facilitate trade between Yorkshire and Manchester.[7] In the Medieval era, Rochdale was renowned for its wool industry and the town began to grow because of the location's transportation possibilities. Originally, the town center was mainly on the south bank of the River Roch; however, expan-

6. Jon Hawkes, *The Fourth Pillar of Sustainability: Culture's Essential Role in Public Planning* (Champaign, IL: Common Ground, 2001); Willems and Van Schaik, *Water & Heritage*.

7. Ian Miller and Chris Wild, "Rochdale Bridge, Rochdale. Archaeological Deskbased Research and Field Survey Report" (Oxford Archaeology North, 2011).

sion occurred to the north of the river during the Medieval period and the Rochdale Bridge was constructed to connect the town and ease trade routes. Over several centuries, phases of redevelopment were undertaken to expand or replace parts of the Rochdale Bridge. Such changes were necessary as the town grew in size and importance particularly during the Industrial Revolution; Rochdale's population exploded from 8,452 in 1801 to 43,668 by 1860.[8]

Throughout the nineteenth century, the Roch was an open watercourse running through Rochdale town centre. The Rochdale Bridge accommodated regular traffic and, by 1882, the Wellington Bridge was also added. However, the Roch was polluted and the resultant stench, as well as a need to construct a new tram stop, led to culverting of the area between the two bridges. Consequently around 500 m of the Roch was culverted between 1904 and 1924 using the then-pioneering Hennebique reinforced concrete system.

Between 1995 and 1997, repair work to the culvert exposed the Rochdale Bridge—reputedly once the widest in the United Kingdom—which had been hidden under the culvert. Community interest in the bridge was piqued, although a campaign to have the bridge permanently exposed and conserved proved unsuccessful. The proposal was reconsidered over the following decade. By 2010, Rochdale Borough Council had commissioned an archaeological survey which revealed that the Rochdale Bridge underneath the concrete culvert could be considered to be a series of bridges that were constructed in five distinct architectural styles.[9] Although the Medieval phase could not be exactly dated, evidence of a pointed Gothic arch typical of the period led to the conclusion that the Rochdale Bridge was "a rare example of an early urban bridge."[10] Additionally, the archaeological survey identified early parts of the reinforced concrete culvert of heritage significance as one of the earliest applications of the Hennebique system. This posed a conundrum in terms of what to preserve and what not to preserve when removing the culvert from the River Roch.

As proposals to deculvert the Roch gained momentum following the survey, the main protagonists connected the work to wider sustainability objectives. Not only could the deculverting of the Roch enhance local heritage, particularly through connecting to sites that pre-dated the culvert including the Grade I listed Rochdale Town Hall[11], but the process could also help to enhance the river ecology, reduce flood risk, and encourage a wider regeneration of the area. Christened "Revealing the Roch," the pro-

8. Edward Baines, *The History of the County Palatine and Duchy of Lancaster* (Abingdon-on-Thames: Routledge, 1868), 502.

9. Miller and Wild, "Rochdale Bridge," 34-38.

10. Ibid., 40.

11. Historic England uses a grading system to classify protected heritage assets. Grade I listing denotes a structure that is of exceptional interest.

ject became central to a major regeneration strategy.[12] Therefore, sustainability objectives that address heritage could, in this case, form a creative project with significant economic benefits. The next section describes the work in more detail.

Revealing the Roch: Project Description

At a cost of almost £5 million, Revealing the Roch attracted funds from multiple sources because the project brought together ecological enhancement, heritage and flood risk management. The Heritage Lottery Fund, which has invested more than £6 billion in the UK to protect heritage, provided around one-third of the project's funds because of the emphasis on local heritage. The Environment Agency also provided significant funds because the project promised to helping realize WFD objectives: the Roch, according to the Environment Agency, was failing in a number of respects relating to wildlife attraction and pollution.[13] In addition, funding for the capital works came from locally available flood funding sources such as the local council and the North-West Regional and Coastal Flood Committee particularly because of the argument that the project would remove debris that coalesced underneath the culvert and could block the river. Therefore, combining the multiple interests around flooding, heritage, and ecology enabled a range of diverse funding agencies to be brought together.

Revealing the Roch consisted not only of the physical work of deculverting the river but also encouraging community members to become interested in and knowledgeable about the historic bridge and the natural heritage of the waterway. The physical works provided an intuitive link to the pre-industrial buildings located in the town center, which had long since lost their orientation towards the hidden river: the pre-culvert building lines did not directly follow the roadworks over the culvert. Revealing the Roch eventually led to a realignment of the esplanade and improvements to the adjacent public realm through the removal of two sections of the 1903 reinforced concrete culvert. In addition, the project led to the restoration and conservation of the Medieval bridge **[Fig.1]**. Additionally, the natural bed substrate, which had been lined with concrete, was restored through the addition of natural sediments. The bank height was reduced to bring people closer to the river. The deculverting of the river therefore brought significant townscape benefits by relating pedestrian movement to the river. This, in turn, helped reconnect Rochdale's built environment to topography, landscape, and existing heritage assets. Consequently, Rochdale Borough Council also thought that socio-economic benefits could be

12. James Holloway, "Environmental Objectives and Selected Case Studies for De-Culverting the River Roch in Rochdale," Report for Rochdale Borough Council and the Environment Agency (Cranfield: River Restoration Centre, 2012), 16.

13. Ibid., 5.

FIG. 1 Ongoing work to the Rochdale Bridge during the Revealing the Roch Project: February 2016. Source: ©David Dixon https://www.geograph.org.uk/profile/43729 and licensed for reuse under CC-BY-SA 2.0 via geography.org.uk

derived from increased footfall businesses. Further benefits were found around the educational opportunities with schools and the wider community in showcasing Rochdale's wider heritage: a drop-in center, for example, was established close to the site for interested individuals to find out more about the project. A time-lapse video helped share the ongoing work involved in removing the culvert [Fig.2].

The public opening during June 2016 was marked by a day of celebratory events to which thousands of people turned up.[14] Revealing the Roch received several national awards including recognition at the national Royal Town Planning Institute awards for excellence in planning the natural environment (2016). In light of its various aims around heritage, ecological restoration and flood risk reduction, the project has also delivered tangible benefits. During December 2015, the deculverting project was tested early on when the north-west of England experienced significant floods. In Rochdale, the river level for the River Roch on 26th December was 1.1 m higher than anything previously recorded.[15] Rochdale's town

14. N.n. "Thousands pack town centre for 'Revealing the Roch' party", Rochdale Online, 25 June 2016, https://www.rochdaleonline.co.uk/news-features/2/news-headlines/103735/thousands-pack-town-centre-for-revealing-the-roch-party.

15. Greater Manchester Combined Authority, "Flood Investigation Report: Greater Manchester. 26 December 2015.," 2016, https://www.greatermanchester-ca.gov.uk/media/1261/boxing-day-flood-report.pdf.

FIG. 2 Time-lapse video of the river Roch deculverting https://youtu.be/x2AQkEG3O8Y.

center was flooded; however, it was felt that despite the damage to 54 properties, the deculverting work enabled water to re-enter the river and to flow more freely through the watercourse, limiting the flood's impact.[16]

Revealing the Roch addressed sustainability by uniting economic growth with environmental and social objectives as the so-called "triple bottom line".[17] Revealing the Roch exemplifies how culture can be considered sustainability's fourth pillar. Of particular interest to practitioners, it also demonstrates the advantages of pooled funding resources and of significant urban design interventions. We now turn to a consideration of the Odra River Basin for a different conceptualization of heritage and water in a context where floods can subtly shape how citizens interact with urban redevelopment.

The City of Wrocław

The Odra River runs through the city of Wrocław and is the second-largest river in Poland with a length of 840.9 km. The Odra Basin has a total area of 124,049 km^2. Approximately 86.4% of this area falls within Poland's territory; 5.9% and 7.7% are within the Czech Republic and Germany, respectively. The Odra River forms approximately 162 km of the Polish-German border.[18] Its largest tributaries are located within Poland and have their sources in the Sudetes (Sudety) Mountains or in the foreland. The mountain character of these tributaries (as well as those located in the Czech Republic) often cause floods in the river basin.

Given its size, the Odra River has significant social and economic value for Poland in general and for Wrocław in particular. Historically and in the

16. Ibid., 116.

17. John Glasson, Riki Therivel, and Andrew Chadwick, *Introduction to Environmental Impact Assessment* (Abingdon-on-Thames: Routledge, 2013).

18. Z.W. Kundzewicz, "The Flood of the Floods—Poland, Summer 1997," In *The Extremes of the Extremes: Extraordinary Floods*, proceedings of a symposium held in Reykjavik, Iceland, July 2002. (Reykjavik: 1A11S Publ. no. 271., 2002).

present, it has influenced business development, social integration, urban space and climate. However, it is not used as a source of drinking water for the population.[19]

Because of the prominence of the river and its many bridges and crossings, Wrocław is known as the "Venice of the North". It provides a rare example in Poland of a close relationship between urban fabric and river. The river and its tributaries form very important ecological passageways, with seven national parks located within the river's catchment area; six of the parks lie within Poland and the seventh within Germany.

Multiple floods have affected the Odra River basin over the years. However, the flood of June 1997 proved to be the biggest natural disaster to strike Poland in a period of 1000 years, and was considered a hydrological rarity covering the entire length of the river.[20] It was triggered by a period of constant heavy rain, when absolute water level maximums were exceeded for four to seven days in the upper parts of the river. The existing flood protection system of embankments, weirs, reservoirs, relief channels, and polders, was unable to cope. The flood took place in three phases:[21]

- First, in the upper river basin and its highland tributaries, fast-moving runoff made water levels rise up to 4m within half a day.
- The flood swept downstream into the cities of Racibôrz, Opole, and Wrocław. Wrocław's flood protection system proved inadequate for a peak flow rate greater than its capacity of 2,400 m^3/s.
- The third phase affected the lower end of the river and the boundary area between Poland and Germany. Protective measures were more successful here, where the time delay allowed for embankments and dikes to be fortified.

The flood's catastrophic impact included $2-4 billion in economic losses, 54 mortalities, and 2,592 flooded cities and villages in Poland. Additionally, 162,000 people were affected, and 665,000 ha of land including 450,000 ha of agricultural land were flooded.[22] In Wrocław, 40% of the city's surface area was ravaged, with major damage to infrastructure.

The intensity, longevity, and areal coverage of the flood was not particularly high in comparison to world standards,[23] however the local impact was devastating and made worse by inadequate preparation.

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19. The source of the city's drinking water comes from the Oława River Valley, which is supplied with water from the river Nysa Kłodzka. The city's water resources include 1,026 hectares of meadows and ponds in the south-east of Wrocław.

20. Kundzewicz, "The Flood of the Floods—Poland, Summer 1997," 149.

21. Ibid., 148.

22. Ibid., 148.

23. Ibid., 150.

The Impact of Floods on Urban Development

The 1997 flood and others preceding it are examples of the difficulties Wrocław has experienced with the Odra River. The great flood of 1903 destroyed over 50% of the city, forcing the construction of a flood system, which still structures the city. In the wider Odra basin, 32 weirs and 32 sluices were constructed whilst an additional flood canal was created in the city of Wrocław with a navigable canal running parallel.[24]

Wrocław has been taking actions and measures to shape and strengthen its identity as a "riverside city" and "Venice of the North,"" and seeks to use the river's potential to benefit the economic, touristic and recreational development of the city **[Fig. 3]**. However, the risk of flooding heightens the challenges faced by the city of Wrocław and other riverside cities in Poland, especially because recent decades have seen considerable flux in relevant laws. Legislative issues, along with a shortage of financing, present major obstacles to effective long-term planning.

For many years, the city was committed to a clear flood protection policy, which protected developed areas primarily through engineered flood defenses and prevented the use of areas exposed to floods. The 1997 flood brought together city authorities and governmental entities and they began cooperating on a more comprehensive effort to protect Wrocław

FIG. 3 A renovated boulevard on the River Oder. Source: Wrocław_Official. Licensed for reuse under Creative Commons via Flickr https://creativecommons.org/publicdomain/mark/1.0/.

24. Alfred Dubicki, Józefa Malinowska-Małek, and Kinga Strońska, "Flood Hazards in the Upper and Middle Odra River Basin – A Short Review over the Last Century," *Limnologica, 11th Magdeburg Seminar, October 2004 on Waters in Central and Eastern Europe: Assessment, Protection, Management*, 35.3 (2005), 123–31.

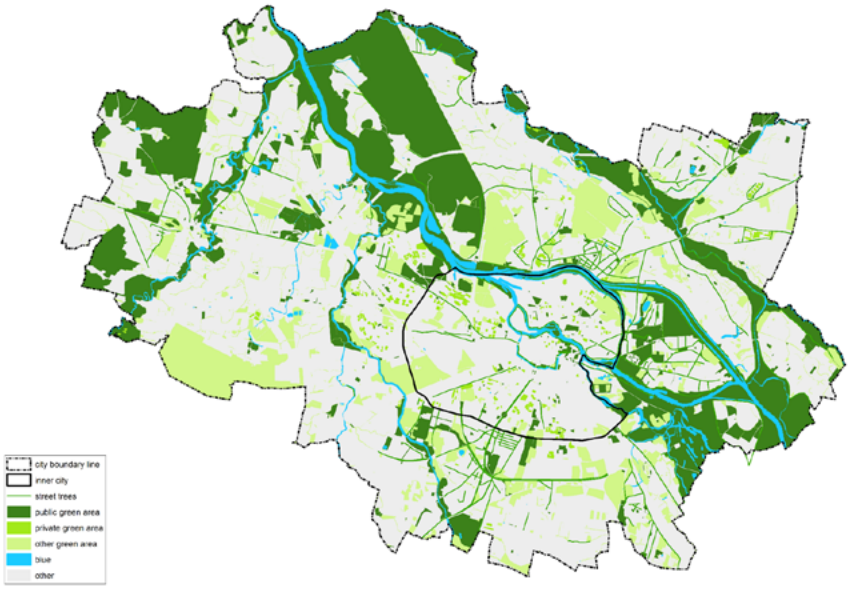

FIG. 4 Map of blue-green infrastructure across the Wrocław area. Source: by permission of Municipality of Wrocław.

from floods. They modernized the Wrocław Water Floodway System by improving river embankments, boulevards, and polders. They also reconstructed hydro-technical structures such as synchronized dams, increased the capacity of the Odra riverbed, and defined land use and management practices for exposed areas. These efforts had a positive impact on the city especially in terms of economic impact, creating social ties, and environmental awareness.[25]

In terms of infrastructural resilience, Wrocław currently features a high degree of river flood protection with forty kilometers of embankments and riverbeds adjusted to a flood wave with a flow of 3,100m^3/s, in line with the Floods Directive 2007/60 /US and the "Flood Risk Management Plan for the Middle Oder River Basin." Moreover, the city is becoming more and more reconciled to co-existence with the river, rather than viewing it as an adversary to be kept out. This new approach can be seen in green infrastructure, such as trees and public parks, across the urban area **[Fig. 4]**.

Additional measures include building agricultural resilience. The flood of 1997 resulted in tremendous loss of agricultural land, therefore Wrocław is working to maintain and boost agricultural traditions and to increase their retention capacity and resilience to floods. There are more than 1000 farms within the city limits, and urban agricultural land constitutes more than 18% of the city's surface area making a considerable contribution to the food offer. Allotment gardens are becoming increasingly popular, covering 5% of the city's surface area and corresponding to 23.1m^2 per citizen (well above the national average of 7.5m^2).

To ensure the sustainability and longevity of its measures, Wrocław utilizes public consultation and stakeholder engagement as valuable resources

25. The World Bank. "Improving Poland's Odra River for Safety", 2015, https://www.worldbank.org/en/results/2015/02/05/improving-odra-river-for-safety-poland.

for the creation of new possibilities for building ownership and the further development of "riverside identity". City authorities are also considering analyzing the feasibility of having waterbuses along short sections of the river.

Such efforts underscore the importance of water—in this case, of flooding—to the cultural identity of urban areas and how water significantly shapes urban development over time. Whilst the Rochdale case showed that water management features can themselves form an important heritage asset, the Wrocław case demonstrates the way in which water management practices over time shape urban form and how people relate to the city in which they live. This is in stark contrast to approaches in the nineteenth and twentieth centuries that denied the existence of water, changed river flows, or tried to hold river water back from urban areas.[26]

Conclusion

The case studies emphasize two different ways that water heritage can become a key part of people's engagement with cultural heritage and part of wider sustainability and resilience agendas. Rochdale shows how water heritage (the bridge and the revealing of the hidden river) can be used to promote regeneration and a closer relationship between people and nature. Wrocław shows how water can be used to create a riverside identity—the river is continually productive for the city and a range of practical initiatives have helped to increase flood resilience and bring people closer to the river.

In Rochdale, citizens have been encouraged to become involved in understanding the physical changes in their area through extensive public consultation. A closer connection to water has assisted in developing the physical urban area as well as ensuring that citizens have a stake in the way that water is managed. The Rochdale case also demonstrates that the integration of various concerns around water and heritage can help leverage multiple funding sources to bring a project to fruition.

Recognising water and heritage together covers different aspects. These include physical assets, as shown in the Rochdale case with its Medieval bridge, to the more intangible aspects of people's relationship to water in urban areas like Wrocław. Therefore, there are several sub-themes that can be realized in practice when considering water and heritage as an overarching narrative theme including: urban design improvement, environmental sustainability and resilience.

26. See, for example, Harold L. Platt, *Sinking Chicago: Climate Change and the Remaking of a Flood-Prone Environment* (Temple University Press, 2018).

Angela Connelly is a Research Associate in Planning and Environmental Management at the University of Manchester.

Serene Hanania is a project officer for Sustainable Resources, Climate and Resilience at ICLEI Europe.

Joanna Kiernicka-Allavena works as Cities Advisor with the Climate-KIC.

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PRACTICES

Rediscovering Community Participation in Persian Qanats: An Actor-Network Framework

Arash Salek — Gemeente Rotterdam (Netherlands) — a.salek@rotterdam.nl

ABSTRACT

Most of Iran's inland areas have permanently lain within arid regions. Today, Iran's groundwater depletion-rate today among the fastest in the world. From the beginning of the agricultural revolution and land-reform in the 1960s, Iran has adopted a governmental highly bureaucratic approach to water management fuelled by technological improvements in high water-dam constructions and modernization of irrigation infrastructure. However, these systems relied on the centralized water management which couldn't solve the issue of the country's increasing water-stresses and therefore it has been challenged by many critiques from civil society and academia.

For centuries, Iran has relied on socio-economic networks to manage groundwater and the traditional method of water-exploitation named qanats which represents an effective system of social corporation and civic participation in water management and in solving the issue of water scarcity in dry regions. This paper introduces a theoretical framework for the necessary transition from the centralized water management towards a multi-actor water-governance regime by adapting the Actor-Network Theory for understanding the traditional patterns of collective water management inside qanat-dependent communities.

KEYWORDS

Qanats; Participatory Water Management; Social Ecosystem; Actor-Network Theory.

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Qanats culture and history

During the last two decades, Iran has been facing extreme drought. Increasingly mounting demands and inappropriate water management are imposing unmaintainable pressures on Iran's water resources. The Iranian environmental activist Kaveh Madani states: "Frequent droughts coupled with over-extraction of surface and groundwater through a large network of hydraulic infrastructure and deep wells have escalated the nation's water situation to a critical level. This is evidenced by drying lakes, qanats, rivers and wetlands, declining groundwater levels, land subsidence, water quality degradation, soil erosion, desertification and more frequent dust storms."[1]

For thousands of years, the Iranians have lived in an arid climate inside the dry Persian plateau, which is not suitable for human life. More than two-thirds of their country is a desert and receives less than 50mm of rainfall a year. Other regions of the world with so little rainfall are barren of attempts at agriculture. So far, Iran has been traditionally a farming country that not only has grown its own food but also managed to produce crops for export, such as cotton, dried fruits, oilseeds and so on.[2] The Iranians have achieved this remarkable accomplishment by developing an ingenious system of qanats for tapping underground water in a way that we would nowadays call sustainable. They traditionally used to live in harmony with their environment, so their techniques to supply water did not end up in the annihilation of groundwater resources.[3]

A qanat or *kariz* is a sloping tunnel which drains the groundwater from an aquifer and leads it to the surface by using gravity flow conditions. It contains a series of vertical shafts in sloping ground, connected underground by various tunnels. These shafts are sunk at intervals of tens up to hundreds of meters in a line amid the groundwater recharge zone and the irrigated land. From the air, a qanat appears as a line of anthills leading from the foothills across the desert to the greenery of an irrigated settlement. **[Fig. 1]**

In his 1979 publication *Les qanats: technique d'acquisition de l'eau*, Henry Goblot describes qanats as the primary factor for the development of civilization inside the Iranian plateau.[4] The development of qanats is not an epiphany of a genius inventor, but a culmination of an evolutionary process resulting from a network of people and institutions. It can be argued that qanats presented a proper way of civic participation inside their societies to solve the problems of water scarcity and empowered the social

1. Kaveh Madani, Amir Aghakouchak and Ali Mirchi, "Iran's Socio-economic Drought: Challenges of a Water-Bankrupt Nation," *Iranian studies* 49, no. 6 (2016): 997–1016.

2. H. E. Wulff, "Qanats of Iran," *Scientific American* 218, no. 4 (1968): 94–105.

3. Ali Asghar Semsar Yazdi and Majid Labbaf Khaneiki, *Qanat Knowledge: Construction and Maintenance* (Dordrecht: Springer, 2017), 9.

4. Henri Goblot, *Les qanats: une technique d'acquisition de l'eau* (Paris: Mouton, 1979).

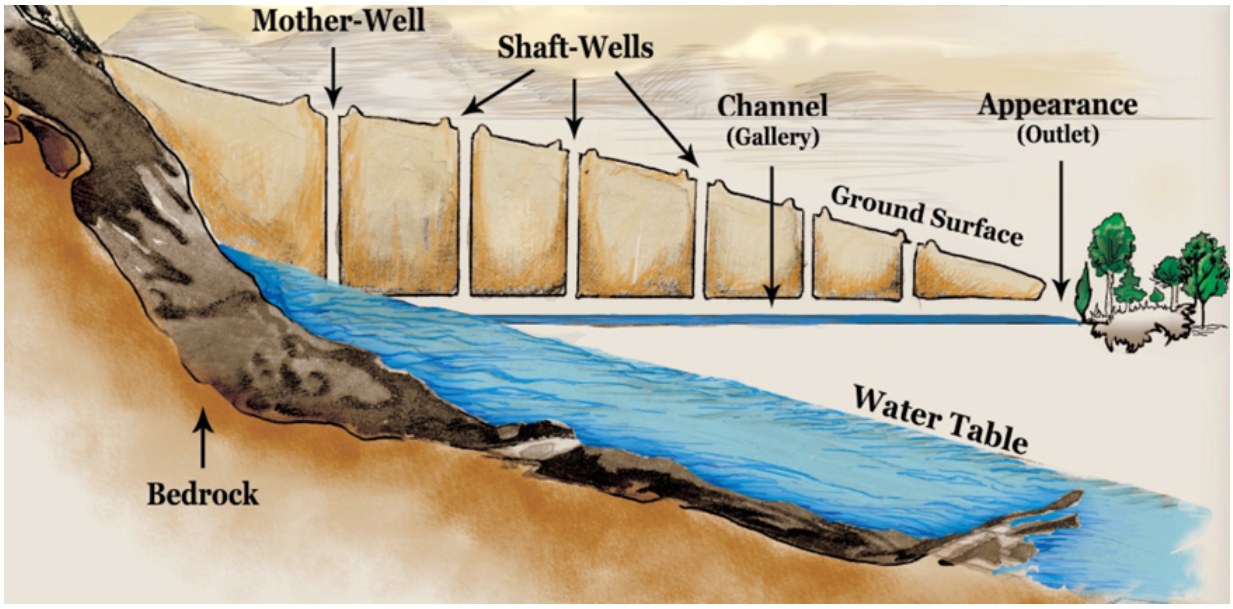

FIG. 1 A qanat profile. Courtesy ICQHS.

coherence rested on peaceful water consumption agreements.

Around the third millennium BC qanat technology was introduced in the central Iranian plateau which revolutionized people's ability to survive and subsist within this arid region.[5] By the first millennium BC, qanats were spread throughout the entire Iranian plateau, from the highlands of Armenia to the lowlands around Kavir, the central desert of Iran. In the Achaemenids era (550–330 BC), the development of qanat technology stimulated the development of thousands of settlements in the entire empire. Fundamentally, qanats reduced the impact of Iran's plain seasonality, allowing for sustainable dwelling in the Iranian plateau, and to utilize the rich alluvial soils.[6] The Greek historian Polybius (200–118 BC) mentions the crucial role of qanats in the existence and development of urbanity in the Iranian plateau and notes the importance of social engagement in their maintenance and functionality: "A true account of these channels has been preserved among the natives to the effect that, during the Persian ascendency, they granted the enjoyment the profits of the land to the inhabitants of some of the waterless districts for five generations, on condition of their bringing, fresh water in; and that, there being many large streams flowing down Mount Taurus, these people at infinite toil and expense construct these underground channels through a long tract, of country, in such a way that the entire society worked together in their construction and use their water and praising the sources from which the channels are originally supplied."[7]

5. Mark Manuel, Dale Lightfoot, Morteza Fattahi. "The sustainability of ancient water control techniques in Iran: an overview." *Water History* 10, no. 1 (2018): 14; Goblot, *Les qanats*, 21; Semsar Yazdi and Labbaf Khaneiki, *Qanat Knowledge*, 4.

6. Manuel et al., *The sustainability of ancient water control*, 15.

7. Polybius, *The Histories of Polybius*, translated by Evelyn S. Shuckburgh (London: Macmillan & Co, 1889), 27.

During the first millennium AD, some powerful administrative institutions were established to protect the water codes and to register and guarantee the access of groups or individuals to qanat water.[^8] A law book from the Sassanid era (224 to 651 AD) mentions the right of every citizen to access water in general, and specifically qanat waters. Their protection from pollution and the need for the public participation in their maintenance are prescribed as public duty.[8]

During the early Islamic era, hundreds of new urban areas were developed as power hubs of Islam around the greater Muslim caliphdom and most of them were supplied by qanat water even if they were established close to rivers. This was due to strategic reasons, namely, because the qanat water was safer and less polluted than river and spring water.[9] In the 13th century, Hamdollah Mostofi, a Persian historian and geographer, describes the city of Tabriz as the capital of farming and agriculture with around 900 ever-flowing qanats. He notes that many of these qanats were built, financed and owned by the local communities or were donated by government or guilds to religious institutions.[10]

During the Safavid era (1501–1736), in order re-establish communications and commerce alongside the ancient Silk Road, hundreds of qanats were constructed for the water supply of the thousands of new caravanserais built along internal and transit roads. Everybody could use their waters but mostly they were maintained and preserved by caravan leaders (*karewan_salar*) and communities and by the few permanent inhabitants of the caravanserais.[11]

During the Qājār period (1789–1925), thousands of new qanats and water reservoirs were constructed. However, many of the peasants were not entitled to own the lands and water they worked on. Therefore, lots of qanats were founded by feudal landlords and rented to individual peasants and their communities through the institute of *boneh*.[12]

In the 1960s, a national agricultural development plan and a land reform program, were presented by the government of the Shah to end feudalism in Iran and allow peasants to obtain the ownership of farms. In this period of technological and governmental modernisation, the traditional patterns of water management changed dramatically. On the one hand, the traditional participatory and community-based water management system

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8. Anahit Perikhanian and Nina G. Garsoian (eds.), *The Book of a Thousand Judgments: a Sasanian Law-Book* (Zurich: Mazda Publishers, 1997).

9. Salma Kadra Jayyusi, Renata Holod, Antillio Petruccioli and André Raymond, *The City in the Islamic World* (Boston: Brill, 2008), 716.

10. Hamdollah Mostofi, *Nezhat ol-Gholoob*, edited by Mohammad Dabir Siaghi (Tehran: Tohoori, 1957), 47.

11. Mohamad Ebrahim Zarei and Zohreh Soltanmoradi, "Barresi-e ertebat-e sobat-e siasi ba modiriat-e ab dar Esfahan-e Safavi [A Survey on the Relevance Between Political Stability and Water Management in the Safavid Isfahan]," Journal of History of Islam and Iran 26, no. 31 (2016), 133.

12. Manuel et al., *The sustainability of ancient water control*, 14.

was replaced by a centralised bureaucratic system of water companies and technocrats working under the patronage of the government.[13] On the other hand, qanats were substituted by the construction of large water dams, irrigation channels and deep wells with electric and fuel-powered pumps.[14]

After the Islamic revolution of 1979, the new administration pushed the so-called *Jihad Sazandeghi* (the Jihad of Construction), to improve the self-reliance of the country. Subsidizing water and energy for the agricultural sector and allowing famers to dig water wells were among the government's plans to encourage agricultural expansion without considering the traditional water resources of the country.[15] Later, the Iranian government tried to change this pattern through some reform with the ratification of the regional Water and Wastewater Companies Law of September 1990.[16] But the efforts in the activation of civil society participation in water resource management and the stimulation of local community engagement in this field have been inadequate.[17] In the 1980–2000 period, more than 14,000 qanats dried out due to falling water tables related to extractions of 500,000 pumped wells around the country.[18]

Traditional Collective Ownership of Water Resources in Qanat Societies and the Actor-Network Theory

> "The Persian qanat system is an exceptional testimony to the tradition of providing water to arid regions to support settlements. The technological and communal achievements of the qanats play a vital role in the formation of this civilizations." (Unesco nomination of the Persian Qanats 2016)

The qanats' social ecosystem can be analyzed from the position and engagement level of various actors and organizations. On the one hand, their existence and functionality are completely related to humans and their creative power in solving environmental problems. On the other hand,

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13. Willem Floor, Agriculture in Qajar Iran (Washington, DC: Mage Publishers, 2003); Kaveh Madani, "Water management in Iran: What is causing the looming crisis." *Journal of Environmental Studies and Sciences* 4, no. 4 (2014): 315–328.

14. John Anthony Allan, "Water in the Environment/Socio-Economic Development Discourse: Sustainability, Changing Management Paradigms and Policy Responses in a Global System," *Water and opposition* 40, no. 2 (2005).

15. S. Mehryar, R. Sliuzas, A. Sharifi and M.F.A.M. van Maarseveen, "The socio-ecological analytical framework of water scarcity in Rafsanjan Township, Iran," *International Journal of Safety and Security Enginnering* 6, no. 4 (2016): 764–776.

16. Reza Ardakanian, et al., "Institutional Capacity Development of Water Resources Management in Iran." In *Capacity Development for Improved Water Management*, edited by Maarten Blokland, et al. (Boca Raton, FL: CRC Press, 2010), 179-199.

17. Ali Mirchi, et al., "Modeling for watershed planning, management, and decision making," in *Watersheds: Management, Restoration, and Environmental Impact*, edited by Jeremy C. Vaughn (Hauppauge, NY: Nova Science Publishers, 2010).

18. Farideh Delavari-Edalat and M. Reza Abdi (eds.), *Adaptive Water Management: Concepts, Principles and Applications for Sustainable Development* (Berlin: Springer, 2017).

qanats have affected the foundation of life for human beings and they affected the structure of the local communities in a positive, sustainable and resilient way. Qanats are environmentally, socially and economically woven into the social structure and communities of their users. Through centuries many complex paths of human-water interaction in arid regions of Iran have been developed based on the existence and functionality of qanats.[19] Moreover, as not many individual farmers could afford the investment in labor and wealth which was required for construction and maintenance of qanats, the development of qanats has been totally dependent on collective actions of various members of local communities.[20]

The Actor-Network Theories (ANT) of Latour, Callon and Law can help us to understand the institutional background and networks and the interaction between leading actors and factors in the past and present which have been established related to the existence and functionality of qanats.[21] Through ANT, social ecosystems may be described as social-ontological phenomena.[22] Moreover, according to ANT, actors can be not only humans, but also non-humans, like flora, fauna, geography or existing infrastructures, etc. In that case, one speaks about actants. According to Latour, these actants have the ability to change their environment, as they have the capacity for agency.[23] An existing mountain, river, road or groundwater resource allows specific spatial development opportunities, as would the availability of technology, money, etc. However, change comes only when these actants interact; or, in other words, whenever they enter a network or association. In these networks, human and non human actants shape themselves by virtue of their relations with one another. Governments, landlords, farmers, water users or residents, (water) planners or (qanat) engineers could be seen as actants. But rather than the players themselves, the decisive factor as the input for development is heterogeneous networking. Like governments, in networked societies everyone has to confront themselves with network assemblages between various actants in order to realize their own objectives.

The process of formation and transformation of the network is called translation. The translation of qanats, as any other actor network, has four stages which are described in the following paragraphs.

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19. Michaela Ibrion et al., "At the Crossroad of Nature and Culture in Iran: The Landscapes of Risk and Resilience of Seismic Space," in *International Proceedings of Economics Development and Research* 71 (2014): 39..

20. Semsar Yazdi and Labbaf Khaneiki, *Qanat Knowledge*.

21. Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network Theory* (Oxford: Oxford University Press, 2005); Michael Callon, "Some elements of a sociology of translation: Domestication of the Scallops and the Fishermen of St Brieuc Bay." The Sociological Review 32, no. 1 (1984): 196-233; John Law and John Hassard. *Actor Network Theory and After*. Oxford: Blackwell Publishing, 1999.

22. Latour, *Reassembling the Social*.; Jonathan Murdoch, "The Spaces of Actor-network Theory," Geoforum 29, no. 4 (1998): 357–374.

23. Latour, *Reassembling the Social*.

Problematization

Problematization is the first moment of translation. It relates to the process of a principal or focal actor striving to become indispensable to the other actors by defining the problem/opportunity and motivating them to enter the network. Therefore, problematization describes the process of alliances, or associations between actants by identifying what they want.

Qanats were built by Iranian farmers and landlords out of communal or pure self interest. Qanats functioned as a primary and essential infrastructure for local liveliness. In every qanat's "agricultural assemblage,"[24] we can focus either on the will of human actors—the assignment and founding the qanat's field operations, the set-up of the hierarchical links between actors and agencies, the management of conflicts, planning, governance, policy making, knowledge and institutionalization—or on topography or hydrology. From this point of view, no distinct actor can be seen as the only responsible for the construction and functionality of qanats. The existence of qanats requires many collective and communal acts. All the elements of the network need to play their part at the appropriate time for the network to remain stable. They also need to cooperate, since the elements depend on each other, regardless of whether they are human or non-human.[25]

Let's start from the digging process and development of qanats. Historically, *moqannis* (qanat diggers), as the masterminds of qanat technology, got commissions for the construction and the extension of qanats from local communities, governors and major landlords. They implemented and guided the digging process and monitored the functionality of the water flow after the construction of the qanats. The engineering skills and hydraulic knowledge and experience of the moqannis have been a crucial part in the development of qanats. After the implementation of qanats project, the moqannis delivered the qanats to their owners and in most of the cases the organization/community of stakeholders and water users.

At the stage of the establishment of the network, other connections between actors occur. A heterogeneous organization is established in the core of qanat's socio economic milieu related to the sustainable transport and consumption of the underground water. For instance, qanats were very expensive projects and their exploitation took long time. Village inhabitants and communities could rarely afford the construction costs of qanat projects. For this reason, a series of investors (landlord or local businessmen, religious institutions) funded the construcion of the qanat. In this way, qanats were based on a kind of collective property, funded

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24. Cyrus Salmanzedeh and Gwyn E. Jones, "Transformations in the agrarian structure in Southwestern Iran," *Journal Of Developing Areas* 15, no. 2 (1981): 200.

25. Law and Hassard, *Actor-network theory*, 1999. Bruno Latour, *Science In Action: How to Follow Scientists and Engineers Through Society* (Cambridge, MA: Harvard University Press, 1987). Callon, "Some elements of a sociology of translation," 196-233.

by the investments of landlords, traders, religious organisation, or voluntary labour from local farmers and inhabitants. However, several qanats were also privately owned. Others, were *vaqf*, contributed to religious institutions for public use, or owned by the royal family and central/regional governments.[26]

In this context, the organization of boneh and the qanat councils can be seen as a social unit wherein some agents (i.e. water users and famers) had rights to use qanat water cooperatively, based on the shared interests of the stakeholders. In particular, boneh (land rentals) was the most notable form of rural co-operation in the field of agricultural economy in Iran. However there were also other types of qanat organizations which were established related to private/financial interests or the political or religious reasons.

In some progressive types of qanat organizations, a qanat council in the community of water users and stakeholders was established to manage all qanat affairs. Usually, they were made up of 5-7 members who were selected by farmers and water users. Every year the qanat owners singled out a few people who were believed by all to be trusted, honest and experienced as council members. In turn, the council should have voted to choose, among the most well-known and influential personalities in the community, the representatives to take care of qanat issues. Their task was to network with other organizations and the government to solve qanat issues.[27]

The power and existence of qanat organizations in various regions was dependent on climate conditions and environmental factors. In areas with favorable natural conditions like the northern provinces of Iran, farmers could enjoy individual types of agri-businesses, and they did not need to engage in qanat organizations. But in areas with harsh climate and in permanent water stress, harvesting dependeded on limited water resources. In these regions, famers had vital interactions with qanat communities, and bonehs were the most common forms adopted to efficiently use water for farming. In each organization many practices and laws concerning the qanat's shareholder's interests and the ways of water distribution, farming and herding have been designed and implemented in accordance with the needs of the rural community and their socio-economic traditions.[28]

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26. Morteza Honari, *Qanats and human ecosystem in Iran, with case studies Ardakan and Khur*, PhD thesis University of Edinburgh, Faculty of science (November 1979).

27. Semsar Yazdi and Labbaf Khaneiki, *Qanat Knowledge*, 13.

28. In order to understand the magnitude and effect of bonehs in the rural economy of Iran, it should be said that, in the 1940's census, at least one million Iranian famers (from the country's total population of 14 million) were participated in this kind of cooperatives. See Morteza Farhadi, "Vareh, ya noei tavanoe kohan va zanane dar Iran va dalael emtedad aan, ['Clause' or a traditional cooperative and of the persistence of old women in Iran]," *Elm-e ejtema'i* 1, no. 2 (1990): 129-162).

FIG. 2 Major stakeholders of the Zarch qanat from 1960, source Semsar Yazdi, The qanats of Zarch, with permission.

Before the agricultural revolution and land reform of the 1960s, these organizations protected the water rights and supervised the distribution of water, and set the rules for the maintenance of qanats inside each qanat community. In most of the rural areas, every farmer could irrigate his land as much as his water share permitted him to do. The water share could range from few hours up to some months, according to the contribution and the share sizes of water users in qanats. Qanat shares were regularly allocated on the basis on the financial capability of their owners. Everyone could buy qanat's water shares even if he or she did not live inside the qanat region and had any land property in the village. However, the shareholding of many qanats were based on more complicated systems, based on a schedule rotating within a certain period. This water division system was consistent with all the likely fluctuation in the volume of water during the year, while quenching the farmers' demand for water.[29]

Most of the shareholders of qanats should have participated in crucial decision-making processes and all the important economic and social matters of their qanāt community.

In a recent study concerning the initial stages of qanat-related social participation, Semsar Yazdi have described the organization of stakeholders and board of one of the few remaining qanat organization inside the historic city of Zarch (Yazd province). The organization and council of this qanat is still the most important decision-making body running this qanat. Every year some 50–60 of the qanat owners congregate and single out

29. Mohammad Hosein Papoli Yazdi and Majid Labbaf Khaneiki, *Qanatha-ye Taft* [The qanats of Taft] (Mashhad: Astan Ghods, 2004).

few people who are believed all to be trusted, honest and experienced as qanat council leaders. Though a share of qanat water is not prerequisite for taking membership of the qanat council, the council members are usually from among the qanat owners who are believed to have stronger motive to take care of qanat issues.[30] [Fig. 2]

These collective and participatory organizations have been taken as the main and principal actors of this socio-ecological assembly network. However, while the qanat's stakeholders and water users were responsible for the existence and functionality of qanats, they needed to work in close cooperation with governmental, judicial and religious institutions as they needed technical, socio-cultural and foremost religious support to achieve their goals.

Interessement

After the network is formed, what terms of commitment are established among actants to protect their own interests? Every actant struggles with the other actants to reinforce their identity through his/her/its system of references, ideas and concepts. How can actants be drawn into problem-solving networks? To answer these questions we need to focus more on the social and institutional aspects of water management and water distribution as crucial socio-economic elements inside qanat's environment. This concerns the participation of water users and investors to develop and maintain the qanats; the ways of civic engagement and social participation in qanat's development and maintenance; traditional water management organizations inside the qanat areas and their interaction with water consumers. While economic issues have been major reasons for construction and maintenance of qanats, we cannot analyze qanat's social-ecosystem only from a financial perspective. The socio-economic environment of qanats is shaped on many lavels by the interaction of networks and institutions mobilizing communities from political, religious and cultural motivations. Within the social and cultural domain of qanats, we cannot find a single motivation as a driver for the existence and functionality of qanats. This is because qanats are more than just economical, technical or even agricultural assemblages. Inside the qanat's social ecosystem the political, religions, technical and socio-cultural institutions have been faithfully linked together. For example, governments had different economic and military interests in development and expanding of qanats compared to religious organizations. The development of qanats could increase governmental revenues and enable the self-sufficiency of urban-rural communities to resist in the case of sieges and military blockades. Water is also a vital resource in Islam, to which everyone has the right to a fair share. This is emphasized in prophet Mohammad's *hadith* (word)

30. Ali Asghar Semsar Yazdi, *Qanat of Zarch* (Yazd: ICQHS, 2014).

that defines water clearly as communal resource to which all, rich or poor, have a right.[31] Therefore, many Islamic institutions founded qanat's development or bought several shares of qanats duty to make qanat water freely available to the Muslim community. Also, many qanats of Iran were *vaqfs*, which means a usufruct or a collective property for religious purposes and public utility.[32] Therefore, many religious institutions, clerics and, in many cases, the qāḍīs (magistrate or judge of a Shari'a court) have directly or through their representatives participated in the establishment and implementation of qanat's regulations and water codes.

Enrolment

Enrolment refers to how these common interests can be translated and concerted into potential associations or assemblages. What are the specific role that actants can assume within these potential alliances?

Each qanat organization includes some key roles. A *Sar boneh or Sar āb ŷar* (chief water manager) and their assistants (yavr boneh or āb ŷar) were in charge of the qanat management. The *Mirābs* were in charge of the water distribution. As we have already seen, the moqannis were in charge of the construction and maintenance of qanat structures. Farmers were the main water users.[33] The position of the sar *boneh* or the chairman depended on his work experience or his financial privileges but was also sometimes determined by kinship and even by the geographical origin of the person.[34] Because of the complexity of bookkeeping of the interests of different individuals in quant water, abyars and mirabs should work permanently during the whole year, and their salaries were determined by the shareholders of the qanat at the end of the crop year or in Nowruz.[35] In bigger qanats, inhabitants and water users chose also some local dwellers to assist the chief mirab which had kind of autonomy for controlling his administration. In most regions of Iran, bonehs were established more on less because of the same reasons, but with different organisational structures. In the case of the Zarch qanat in the Yazd province, qanat organization is shaped as follows:

1. qanat council or the board of stakeholders;
2. *Mirab* (chief water distributor);
3. *Dashtiban* (Land watcher);
4. *Sartaq* (qanat administrator);

31. "Muslims have common share in three things: grass (pasture), water and fire," Prophet Muhammad, cited in Naser I. Faruqui, Asit K. Biswas and Murad J. Bino (eds.), *Water management in Islam* (Tokyo, New York and Paris: United Nation's University Press, 2001).

32. Faruqui et al. 2001.

33. Mostafa Azkia and Valiollah Rostam Alizadeh, "Janbe haie ejtemaei taghsim ab dar Iran [Social Aspects of Irrigation Systems in Iran]," *Ensaan Shenasi* 12, no. 21 (2015): 11-43.

34. Farhadi, "Vareh".

35. Honari, *Qanats and human ecosystem*.

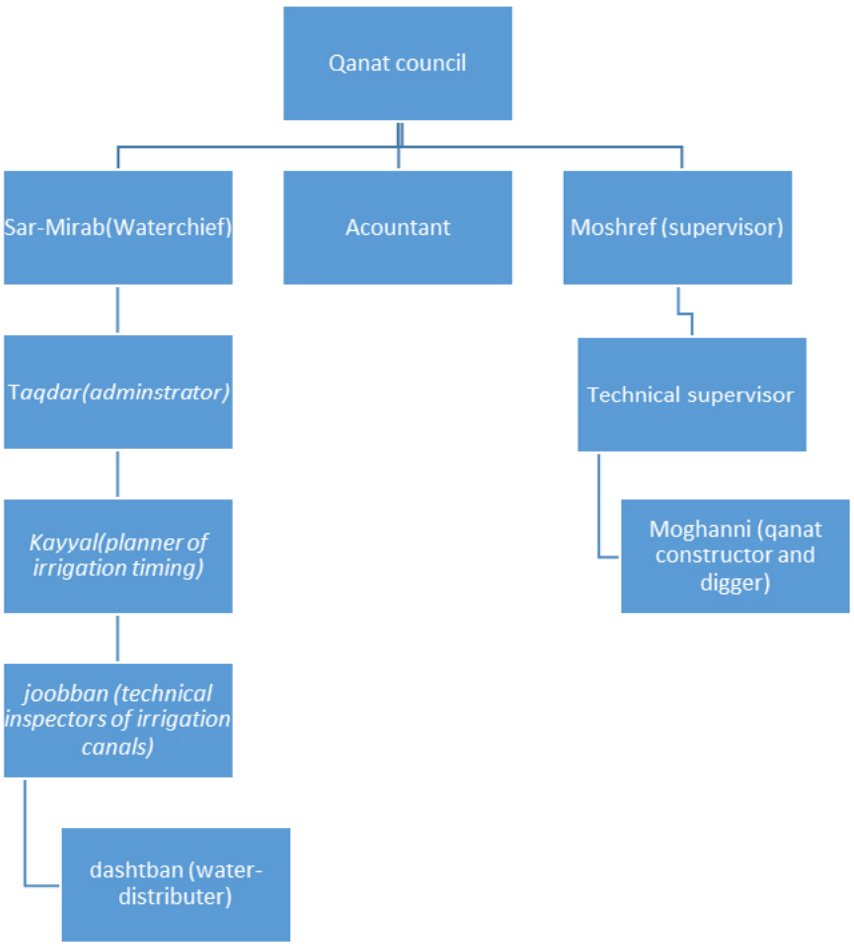

FIG. 3 Management organization of the Zarch Qanat, based on Semsar Yazdi, The qanats of Zarch, with permission

5. *Aab yaar* (watering assistant);
6. *Zaree* (farmers);
7. *Moqanni* (qanat engineer).[36]

For the organization of small qanats, the qanat council has been the most important decision-making body running the qanat. The qanat council had some representatives who were in charge of many issues and in fact they were the executive board for the council. In addition to the council members and representatives, there were also members like *Moshref, Mirab* and *Sabookesh,* who were usually in charge of the irrigation tasks, but they also played important roles in qanat's administration and management. Also, in some qanats an accountant has been added to this organization to take care of financial affairs and to oversee the qanat budget.[37] [Fig. 3] But in the Khorasan region, except for qanat owners (stakeholders) and mirab, in many cases moqanni and a local cleric also participated in qanat council.[38] In case of emergency and for major maintenance tasks, hundreds of men from various villages and cities inside the region voluntar-

36. Azkia and Rostamali Zadeh, Janbe haie ejtemaei".

37. Ali Asghar Semsar Yazdi and Majid Labbaf Khaneiki. *Veins of desert* (Yazd: IWRMO/ICQHS, 2010).

38. Honari, *Qanats and human ecosystem*.

ily assisted the mirabs and qanat constructors. Each qanat organization had complex multilevel links with many networks and institutions inside and outside the settlements including landlords, local governments, clerics and qadis or notarial institutions.[39] This sort of network, with all its complexity and affinity, supported the existence and functionality of qanats. This assemblage, because of its multiplicity in systematizing and supervising the society upon which it is based, presents a remarkable network of actants and institutions. The power of this network lays on its ability for organizing a water management network based on the social participation and rational consumption of water and land resources. The water consumers made sure that the available water resources were consumed carefully and justly. Then, all the actants communally brought their requirements and demands up to the level of the nature's limited boundaries. The evaluation and transformation of the network happened throughout the ages on the basis of various principles, but more or less based on "caring and sharing".[40]

During this enrolment process, qanat councils inside the qanat's socio-economic environment became as such the spokesmen of many social institutions like farmers, neighborhoods, villagers, etc. They were developed in concordance to the overall evolution of the qanat network. In fact, these organizations justified their legitimacy by the agricultural-hydraulic links between the landlords, farmers and inhabitants in one hand and with the judicial-religious institutions on the other hand. Therefore, a complex institutional structure covered the qanat's water distribution based on the water and land ownership, irrigation rights, time sharing etc. This institutional structure was adapted into the socioeconomic status of the local communities, geographical, hydrological and physical things (i.e. expected fluctuations in the volume of water over the seasons) and constituted an accurate way of planning, water management and judgement based on interaction between various institutions. Consequently, within the established institutional structure of local communities a complex network of actors and agencies (same as peasants, landowners and their representatives, for instance *Miraabs, moqannis,* stakeholders and farmers) with various interests and motivations in exploitation and functionality of qanats have raised. The multilevel interaction between qanat and humans has constituted the traditional socio-economic patterns and technical structure of the qanat social ecosystem.

A specific culture based on an ethical duty to water resources has been established in the qanat-based societies which safeguarded water and regarded it as something more than a simple product. The participation of water users in the maintenance and administration of qanats was

39. Ibid.

40. Masoud Yazdanpanah et al, "Iran's traditional water management system as a governance paradigm and learning system," *International Conference on Traditional Knowledge for Water Resources Management*, Yazd, 12 February 2012.

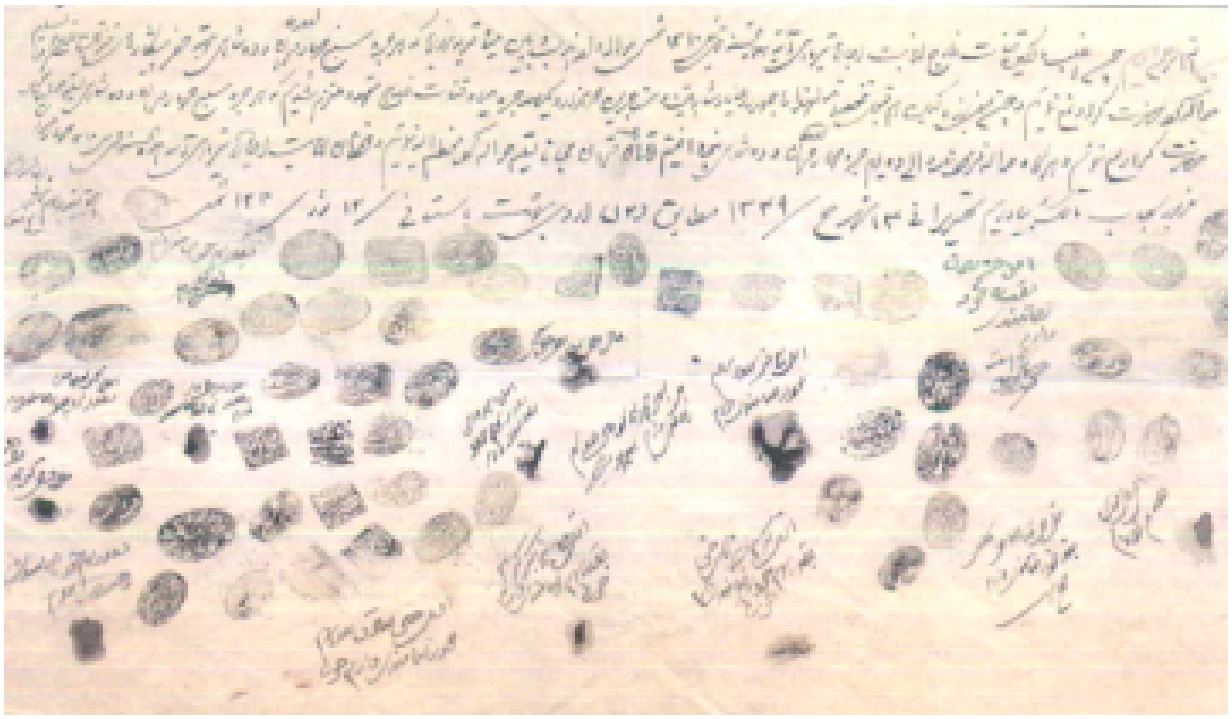

FIG. 4 A document which shows the accordance of the shareholders of Zarch's qanat for general maintenance activities of Zarch's qanat in 1924. Source ICQHS with permission

done often voluntary but in the case of emergency: it was the duty of each healthy male water user to work for their qanats.[41] Every user should have protected the qanat and its domain (*harim*) from pollution and any source of poisoning.[42] Harim is usually constituted by a boundary of about 1.2 km in proximity of shafts in the hard soil areas and about 0.5 km in soft soil. The right/duty of domain protection gave the qanat's water users the possibility to reach the surrounding areas around the shafts in case of any required maintenance and shelter the qanats from any activities alongside the wells that could affect the purity of the waters or the functionality of qanats. [Fig. 4]

Many Islamic law books prescribe that a new qanat cannot be dug if it damages a qanat nearby, although the distance between the qanats is more than the determined harim.[43] Because of this culture, the interaction, collaboration and participation of water users in construction of qanats was based on a kind of communal duty and responsibility toward others.

Mobilization of allies

Mobilization deals with the representatives of the people and things, and the institutional links by which the actants form a resilient relationship.

41. Semsar Yazdi and Labbaf Khaneiki, *Veins of desert*.

42. Seyyed Hossein Hosseini and Zoheir Jahandideh, "Chalesh ha ie hemaiat keifari az ghanavat [Criminal support challenges of Qanats (Case Study Gonabad Ghasabe Qanat)]," *Motalate hoghoghi energy* 2, no. 2. (2016): 289.

43. Abu Hesab Karaji, *Estekhraj e ab haie penhani [Extraction of Hidden water]*, edited by H. Saedloo (Mashhad: 1998), 42-45.

Over centuries, thousands of qanat communities or networks of stakeholders and water users were established in qanat regions based on a collective network structure. Within these communities many frameworks and guidelines for the development and functionality of qanats, together with legislation of water codes and property rights. were defined and agreed upon by the majority of the engaged actors and agencies. For instance, agricultural activities should adapt to a sustainable land use with the careful consumption of the available qanat water. Each network, however, was not self-sufficient, and it was linked into a broader network of the landowners, other qanat communities within the region, the representatives of government and tax organizations, together with qanat experts (qanat engineers and diggers) as well as the clerics or the representatives of religious organizations. Salmanzedeh and Jones described the qanat-based communities as "agrarian structures," which are evaluated over thousands of years by a multilevel set of interrelated human and non-human actors and institutions, that replicated persistently across the dried Iranian plateau.[44] This "agricultural assemblage" effected the productive land use and raised the viability of the social investment.

This participatory water management culture has strongly affected the socio-economic structure of qanat regions throughout their history. Several factors were key to the acceptability of this mobilization:

- The involvement of concerned and influential agricultural/business/religious institutions with a commitment to shared goals and a clear focus on the community's primary demand for water supplies.
- The formation of appropriate multi-functional technical; judicial and social organizations for qanats.
- The development of decision making mechanisms through the setting up of water codes and regulations to facilitate involvement and participation of the stakeholders.
- The support and legitimization from local and intra-regional agencies, and from organizations with sufficient resources devoted to build the alliances.
- The economic power which rested upon agricultural activities and land-watering relations.
- The technological and regulatory rules, which helped qanat organizations to establish direct links between various water users within their domain.
- The water-related spatial planning which in qanat's actor-networks was established based on the collectivity and hydraulic diversity, rather than religious and political power hegemony.

Through the lenses of the Actor-Network Theory, the qanat network has

44. Salmanzedeh and Jones, "Transformations in the agrarian structure".

been described and translated to clarify the phenomenon of the qanat's participatory culture within this network environment. Studying and following the actor-networks, we have looked at how, throughout history, the institutional stages of actor-networks have facilitated the participation of farmers, business and civic organizations in water management in the development of qanats.

Toward a resilient collective water management

The hydraulic bureaucracy of our time lacks the essential public participation in water planning and management. As part of the efforts towards promoting sustainable water management, it is required to empower civic society and representatives/agencies of the local communities to partially overtake their traditional roles in water management. This does not mean returning to the pre-modern agricultural patterns but to tackle the problems concerning civic participation in water management and to show ways to ease the establishment of non-governmental institutions inside water governance structures as a drive for sustainable society.

For sure, more socio-historical analysis is needed to assist non-governmental actors in forcing governmental water companies to recognize the operative position of qanat organizations in water-management and decision-making networks. The successful governance of underground water depends on the interaction of law, policy, actors and institutions. Relying either on a local actor-based or upon a centralist organizational/

FIG. 5 Preservation and maintenance of one of Tehran's qanats during 1915-1918 period by local citizens. National Library and archive of I.R.I

institutional perspective may fail to provide sufficient underground water management. In this regard, Actor-Network Theory can partly demonstrate some paths of negotiation between governmental and non-governmental (community-based) allies and sustain water distribution and management structures in Iran. Similarly, the professional development of regional water companies and planners is needed to effectively support and facilitate local communities' involvement in water management and distribution. [Fig. 5]

Arash Salek is an urban historian and Policy advisor on heritage, regional development and Urban development.

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PRACTICES

Pipe Dreams: Cities Get Creative With Water

Matthew Bach — ICLEI (Germany)
Anthony Colclough — EUROCITIES (Belgium)
Cristina Garzillo — ICLEI (Germany) — Contact: cristina.garzillo@iclei.org
Cécile Houpert — EUROCITIES (Belgium)

ABSTRACT
A photo and sound essay to demonstrate creative ways in which cities are using water to increase resilience, and bring comfort and stability to the lives of residents.

KEYWORDS
Water; Resilience; Urban Planning; Porto; Rochdale; Lille; Wroclaw; Copenhagen.

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"Water is the bloodstream of the biosphere and the determinant of our future,"[1] says Johan Rockström from the Stockholm Resilience Centre. When it comes to cities, water has long been the wellspring of their development, remains today a strategic asset. Considering the yearly recurrence of extreme weather events, increasing in the face of climate change, most cities have come to realise the urgency of improving their urban resilience.[2] And as many resilience specialists have pointed out, urban resilience cannot be achieved and sustained without urban water resilience.

A water resilient city should be well prepared to overcome the challenges associated with both too little and too much water. Cities and residents understand their vulnerability in the face of unpredictable weather. Extreme rainfall, floods generating sewer overflow, draughts and scarcity and rising sea level, are new daily realities for many environment departments in cities.

It is, however, the dose that makes the poison. Water is also a tremendous asset, too long under-utilised by urban planners. In a creative upsurge, cities are bringing long buried water back to the surface for great environmental, cultural and creative ends. New rivers, pools, ponds, lakes and fountains, and their green banks, are reducing the effect of urban heat islands, becoming community gathering spots, and improving local health and wellbeing.

Cities need to think of water as an opportunity and as a resource for economic development while also meeting the critical needs of their residents and the environment[3]. A blue revolution is underway in cities, and this photo and sound essay demonstrates some of the creative ways cities are using water to increase resilience, and bring comfort and stability to the lives of residents.

Daylighting

The second biggest city in Portugal, **Porto**, is suffering from extreme weather events as a result of climate change. To promote resilience, the city is linking blue and green infrastructures, creating natural spaces that improve water quality and function as permeable and shaded areas, engaging people with water.

Porto is bringing a hammer to the concrete, opening the soil and streams beneath. 'Daylighting' cracks open the pipes that have hidden rivers for decades and lets them flourish once again, reconnecting people with the water. **[Fig. 1]**

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1. https://www.thesourcemagazine.org/understanding-resilience-key-water-management/, accessed 9 January 2019.

2. Arcadis Sustainable Cities Water Index, 2016

3. Arcadis Sustainable Cities Water Index, 2016

FIG. 1 Dewatering of the Granja stream / source: Águas do Porto (Porto Water Company)

FIG. 2 Granja stream before and after / source: Águas do Porto (Porto Water Company)

The new green spaces absorb excess rainwater to prevent flooding during rainy seasons. The new blue spaces reduce ambient temperature during hot periods and mitigate the 'urban heat island' effect. [Fig. 2]

Unleashing the water creates a chain reaction. First comes the water, then the greenery, then the people. Porto puts water at the heart of the city's biophysical, economic, and social wellbeing. Water resources of the cities are for its citizens and public participation is a key factor. Water for the people, by the people. [Fig. 3]

Trouble over bridged water

FIG. 3 Águas do Porto (Porto Water Company)
Contact Rita Cunha, Manager, Storm Water, Streams and Beaches Department (rita.cunha@aguasdoporto.pt) for more information.

Rochdale, in **Greater Manchester**, opened up a 500 meter section of its river Roch which had been buried for a century. When it was discovered that a medieval bridge lay under the concrete cover, there was a movement among civil society to bring the bridge back to the city. This was initially quashed, but just over a decade later the decision was made to go ahead with the plan. [Fig. 4]

By reducing the height of the bank and building a drop-in centre where people could learn about the river and its history, Rochdale fully exploited the natural and historical richness of the site. Increased footfall in the area brought economic benefits to local businesses.

FIG. 4 Roch river daylighting timelapse https://youtu.be/x2AQkEG3O8Y

FIG. 5 The brief uncovering of the Rochdale Bridge, 1996. Source: Copyright Dr Neil Clifton and licensed for reuse under CC BY-SA 2.0 via geography.org.uk.

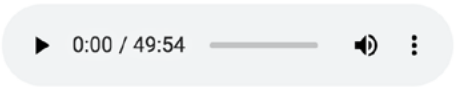
The deculverting of the Roch was also an opportunity to remove debris that built up below the concrete cover, mitigating the risk of future floods. [Fig. 5]

An interesting dilemma arose when it was pointed out that parts of the concrete covering of the river were also of heritage significance. Dating from 1904, these sections were one of the earliest applications of the Hennebique reinforced concrete system.

It is important to remember that heritage involves recent as well as distant history, concrete as well as stone. However, the outcome of the dilemma in this case may be summarised by the image below:

Consciousness of stream

FIG. 6 Rochdale Bridge following restoration, 2017. Source: Copyright David Dixon and licensed for reuse under CC BY-SA 2.0 via geography.org.uk.



BOX 1 Yellow Stream. Discover the ingenious use of pee in China's Forbidden City, and more smart city toilet tricks. Link to site: https://monocle.com/radio/shows/the-urbanist/130/.

In **Lille**, France, Leblan Lafont, an old cotton and linen factory, is today headquarters of the 'site of excellence' dedicated to new technology. The canal crossing this district was relegated to its industrial role, invisible to the surrounding neighbourhoods. The land surrounding the city is flood-prone due to topography and the presence of groundwater close to the surface. Surface water spread 'eutrophication' to water courses, that is green slime from nutrient-rich stagnant pools. [Fig. 7]

Lille decided to redirect the water to the people! New water basins and watersheds that regulate discharge into the canal were integrated into public spaces, to roadside streams and water gardens. In the slow, deep canals, larger impurities sink away from the water, and in the water gardens smaller matter is absorbed by tree roots, natural and inexpensive ways to improve water quality. The new plants, waterways and open green spaces reduce flooding by absorbing and redirecting excess water. [Fig. 8]

Lille's new policy against 'soil-sealing', that is, covering ground with impermeable materials like concrete, mandates that at least 20% of land must be able to absorb rainwater. The location of new buildings is also now

FIG. 7 Lille, Leblan Lafont, cotton and linen factory, © Yves Bercez

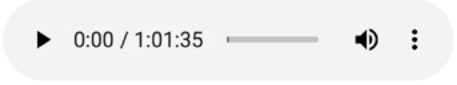
FIG. 8 Lille, roadside stream © Yves Bercez

decided based on soil composition, so that the balance of groundwaters is respected.

The new mix of land and water is teamed up with fluid social diversity. There is a balance between properties for sale and for rent at market prices, affordable housing, and social housing. [Fig. 9]

Sink or swim

FIG. 9 Lille, water park © Yves Bercez



BOX 2 Saying water. Water can be a catalyst for local imagination. "Saying water" is artist Roni Horn's tribute London's River Thames. Link to site: http://www.ubu.com/sound/horn.html.

FIG. 10 Riverboat, copyright Municipality of Wroclaw

1997 was the year that **Wroclaw's** river leapt up and swept across the city. The flood cost around €3 billion, claimed 54 lives and ravaged 40% of Wroclaw's surface. Rebuilding the city's flood protection was not just a matter of repair, or improvement, but of rebirth. The new floodway system developed of river embankments, boulevards, and flood plains. **[Fig. 10]**

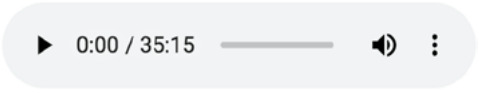
With the flood having destroyed enormous amounts of agricultural land, urban farming is now springing up, with more than 1,000 farms in the city. As well as improving food security, stimulating the local economy, and

FIG. 11 Grassy bank, copyright Municipality of Wroclaw

FIG. 12 Tamka Island, copyright Municipality of Wroclaw

preserving agricultural traditions, this farmland keeps improves the city's water retention capacity, strengthening it against future floods. [Fig. 11]

You can bring the people to water, but you can't make them drink. Wroclaw has sought to make the waterway a democratic issue through stakeholder engagement, public consultation and debate. The city is using a multilateral governance model that brings it together with state institutions, as wells as collaborating with entrepreneurs, to develop its 'riverside identity'. [Fig. 12]



BOX 3 Ready to fire for water. In the USA, some citizens have found a novel way of protecting water: Guns. Link to site: https://www.citymetric.com/skylines/podcast-not-drop-drink-1846.

Fit to burst

In **Copenhagen** the cloudburst system means that the shape of the city and its amenities are subtly adjusted to prepare for floods. When the clouds 'burst' a road serves as a viaduct to siphon water out of the way while skateparks and football fields become temporary reservoirs. [Fig. 13]

FIG. 13 Copenhagen, retention road, illustration from "Cloudburst typologies" developed by HOFOR, EnviDan and Urbanisten for the city of Copenhagen (2014)

A cloudburst road is a road which in normal weather functions as a road in the city and when torrential downpours and large volumes of water occur transport the water to places from which they can either be collected or discharged (typically to the harbour or similar receiving body). The central avenue is brought to a level lower than the pavement and inclined downwards towards the water's intended destination. This can be combined with a retention road. The retention road, pictured above, is convex with porous or green spaces on one or more flank, and stripes

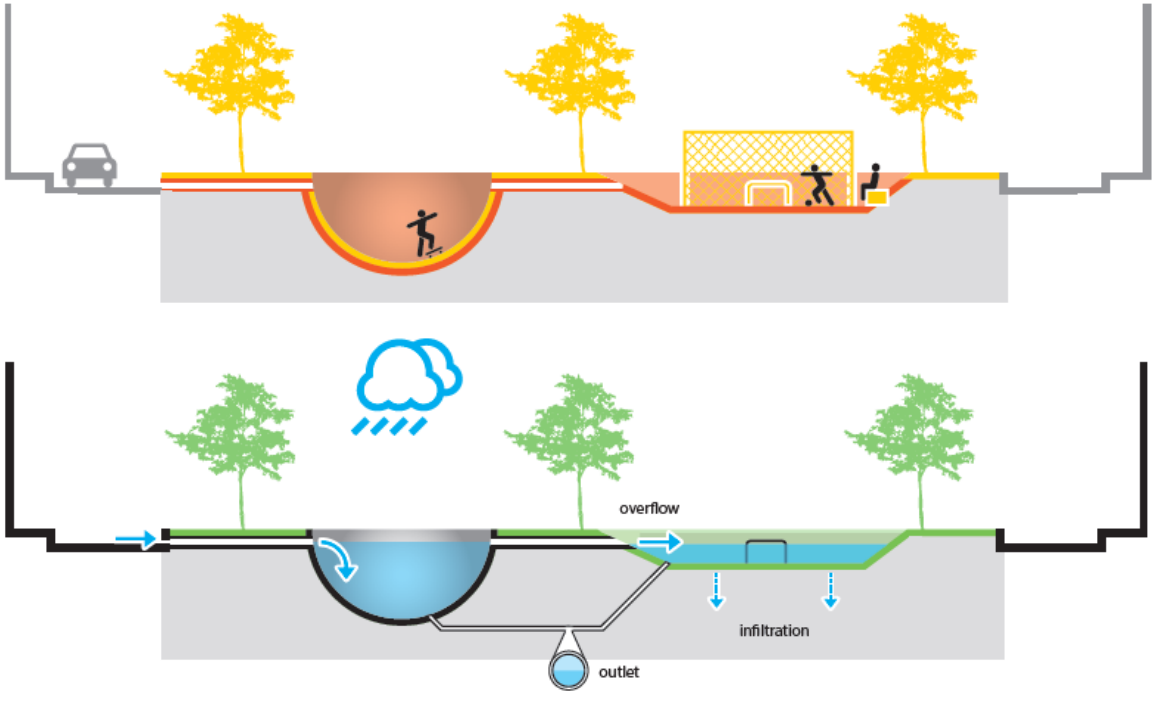


FIG. 14 Copenhagen, retention space, illustration from "Cloudburst typologies" developed by HOFOR, EnviDan and Urbanisten for the city of Copenhagen (2014)

FIG. 15 Copenhagen, retention space in Sankt Annae Plads (photo credit: Søren Svendsen)

of porous stones running across it. The green areas allow excess water to be stored below the street and improve the safety and ambience of the walkways. [Fig. 14]

A retention space is a square or a park arranged to store stormwater. When the downpour is over, the facility is drained either to the sewers or to the cloudburst management system. An example of such a space is Tåsinge Plads. You wouldn't have much fun rollerblading in this weather anyway! [Fig. 15]

Matthew Bach joined ICLEI Europe as an experienced knowledge broker in 2017. He has been working on a broad range of topics from nature-based solutions to cultural heritage, and is currently the scientific coordinator for UrbanA, Urban arenas for sustainable and just cities, a new Horizon2020 project. Prior to ICLEI, Matthew worked globally in academia, the energy sector and international organizations. He holds degrees from Freiburg and Cambridge universities.

Anthony Colclough holds an MA in creative writing from Sarah Lawrence College (NY) which he has been putting to good use unlocking the stories that lie beneath innovative policy and practice for the last 10 years.
He works at EUROCITES on projects in the fields of mobility, smart cities, culture, environment and social affairs. This cross-cutting role allows him to create the hooks and see the links that open cities' stories to the world.

Cristina Garzillo employed with ICLEI since 2005. Having almost 20 years of experience working in and for local governments, Cristina is recognised for her work as expert in local sustainability processes, integrated management and governance as well as author of numerous publications in the field of local sustainability, cultural heritage and knowledge brokerage.
Cristina is an external evaluator for the URBACT III programme and an expert for the European Commission and the Committee of the Regions. She can also draw on a wealth of academic experience gained from previous
role as contract professor at the University of Parma.

Cécile Houpert After a Master degree in European affairs and international relations, Cécile joined EUROCITIES in 2015 as part of the culture team where she works as project officer for culture and cultural heritage. She was involved in the management of the Culture for Cities and Regions initiative, a three-year peer-learning programme for European cities and regions financed by the European Commission. She now coordinates EUROCITIES' activities as part of the H2020 project ROCK, monitoring implementation in the 10 ROCK cities and organising peer-learning and capacity-building activities with partners. She is also involved in EUROCITIES' culture forum and working groups related activities.

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NOTES

International Conference Water as Heritage.

27-31 May 2019, Chiayi, Taiwan

Tino Mager — Delft University of Technology (Netherlands) — B.T.Mager@tudelft.nl

ABSTRACT

The 2019 *International Conference "Water as Heritage"* took place 27-31 May 2019 in Chiayi, Taiwan. Organized by the Taiwan International Institute for Water Education, the International Council on Monuments and Sites (ICOMOS) Netherlands and the Leiden-Delft-Erasmus Centre for Global Heritage and Development, it brought together key water-focused organizations and heritage groups with a concern for water-related heritage in order to develop networks and build working relationships across the diversity of sectors and disciplinary fields. With participants from 25 countries and six continents, the conference explored the mutual benefits arising from such collaborative efforts. A key issue of the conference was the consideration of water-related heritage as an essential element in addressing current and future challenges of water management.

KEYWORDS

Water Heritage; Sustainability; Heritage For The Future; Climate Change; Waterscapes; Waterways; Hydropower.

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Water is not only an integral part of the natural environment and necessary for all life on the planet, it is also an essential prerequisite for all types of cultural development. Without a well-organized supply of water or a decent protection from water, no settlement could persist and no cultural achievements could be made. Thus, in a broad sense, all cultural heritage is more or less related to water. Besides that, all over the world a multitude of tangible or intangible heritage is directly linked to water. This heritage comprises objects, practices and traditions that facilitated human development over millennia by ensuring biological and cultural needs associated with water, which is not only essential for drinking, farming and agriculture, but also enabled transportation and energy generation, and is integral to the worldviews of all human societies. Strangely enough, in today's world these heritage dimensions of water are typically treated separately from functional aspects. During the 20th century, novel engineering approaches brought reliable water supply and created highly efficient ways regarding e.g. land reclamation and protection from water. Older systems were replaced or in a few cases preserved as heritage – in that sense as remainders of historical developments and nowadays outdated technologies. But in large parts of the world, local communities still refer to old traditions and technologies regarding the use of water. In some cases, these cultural practices collide with modern legislation and technology. In other cases, the latter caused harm because they interfered with local circumstances concerning water reserve or access and changed them for the worse while historical approaches proved to be sustainable for centuries. These issues form the starting point for the *Water as Heritage* conference: Overcoming current and future water-related issues by combining modern technology and expertise with the knowledge and experience embedded in water related heritage. The conference had three main objectives:

1. To encourage dialogue between organizations and communities concerned with water from a functional and historical point of view. Currently there is little interaction between cultural heritage groups dealing with the cultural heritage of water, groups promoting the natural heritage of water and other actors active in the water sector.
2. To bring together a wide range of practice communities to explore ways of working together and with communities of interest.
3. To communicate and continue the work on the formation of a scientific group dealing with water and heritage for the future.

How can heritage contribute in a meaningful way to tackle with water issues in a world of mass population, characterized by fast pace and waste of resources? And how can science and traditional knowledge come together to increase resilience to and adapt to a rapidly evolving and changing world? First of all, the answer lies in a renewed understanding of heritage and in a better communication between the heritage world

and the water world. In this respect, the core concern of the conference is the intensive exchange of information between the two sides, which was aimed at through the wide-ranging involvement of relevant organizations and committees. In addition to numerous representatives of various ICOMOS National Committees and ICOMOS International Scientific Committees, various international cultural heritage institutions such as the Centro Internacional de Água e Transdiciplinaridade, The International Committee for the Conservation of the Industrial Heritage, the International Working Party for Documentation and Conservation of Buildings, Sites and Neighbourhoods of the Modern Movement were also represented as the contemporary water world through representatives of e.g. the International Water Association, the International Commission on Irrigation and Drainage or the UNESCO Institute for Hydrological Education. In this unifying character the conference is linked to a series of activities aimed at better connecting heritage organizations and wider water sector industries, regional interests, and communities. It is the third in a series of conferences concerned with the broad topic of "Water and Heritage for the Future." The first conference, *Protecting deltas: heritage helps!*, took place in Amsterdam in 2013 and the second, *Water and Heritage for the Future*, in Delft and Fort Vechten in 2016.[1] Moreover, it further promotes the topic of water related heritage that will also be addressed at forthcoming events, such as the World Water Week in Stockholm (Sweden, 25-30 August 2019, Theme: "Water for society – Including all"), the 20th ICOMOS General Assembly in Sydney (Australia, 1-10 October 2020, Theme: "Shared Cultures – Shared Heritage – Shared Responsibility") and the 9th World Water Form in Dakar (Senegal, 2021, Theme: "Water Security for Peace and Development").

Contents of the conference

The conference was launched with welcoming addresses by Hsiao Tsung-huang, the deputy culture minister of Taiwan, Huang Min-hui, the mayor of Chiayi, Lee Hung-yuan, the rector of TIIWE, and Diederik Six, vice president of ICOMOS Netherlands. A subsequent introduction to the contents by the program chairs was followed by keynote addresses from Shy Gwo-long, Director-General of Taiwan's Bureau of Cultural Heritage, and Henk Ovink, Special Envoy for International Water Affairs for the Kingdom of the Netherlands, emphasizing on the importance of water-related heritage in addressing current challenges to climate change and equitable societies. The subsequent statements by representatives of water and heritage organizations, as well as national ICOMOS committees, gave an overview of the different degrees of importance of water related heritage for spa-

1. Willem Willems, Henk van Schaik (eds.), *Water & Heritage – material, conceptual and spiritual conceptions* (Leiden: Sidestone Press, 2017). Carola Hein (ed.), *Adaptive Strategies for Water Heritage – Past, Present and Future* (Berlin: Springer, 2019).

tial planning, water management and policymaking in various areas and regions. In Australia and the Netherlands, for example, the inclusion of heritage in water management seems to be a matter of course, in other countries it is regarded far less as a potential contributor to tackling the challenges ahead.

The panel sessions were programmatically structured into five parts: *Water for Service, Waterscapes, Water for Power/Power of Water, Waterways,* and *Worldviews on Water*. These themes mark key areas where the link between water and cultural heritage will be crucial in the near future. Case studies and best practice examples were presented in all five sessions, ranging from historical investigations of ancient water systems, renaturation measures, revitalization of inner-city river banks and flood strategies to the role of water-related heritage in the development of ground-breaking technologies and in addressing the increasing climate emergency.

The first session, *Water for Service*, focused on linking water with human needs and settlements, both for the supply of drinking water and irrigation and as a means for waste disposal. Throughout human history, management or mismanagement has been critical to human survival, and the systems that have performed best today serve as models for sustainability. The papers addressed the cultural, technological and administrative aspects of water supply, with the geographical framework stretching from ancient Greece to India, Iran, the Philippines, and Taiwan. Participants discussed different effects of the protection of heritage objects. On the one hand, the entry of numerous Qanats in the World Heritage List has ensured their preservation and promoted this ancient technology a sustainable alternative to widely used diesel-powered water pumps and their catastrophic effects (Semsar Yazdi, Golnoosh Mozafari, Mohammad Esmaeil Esmaeili Jelodar). On the other hand, the World Heritage status of places like the rice terraces of the Philippine Cordilleras has created streams of tourists, which are contributing to the decay of social and family structures, and abandonment of ritual practice (Stephen Acabado). Papers by Taiwanese speakers emphasized the relationship between people and their historical water systems (Yu-Chuan Chang, Da-Wei Kuan, Chung-Hung Chen). The contributions showed the rich wealth of experience in dealing with the origins, cultural associations and adaptations to the community and indigenous practices in the light of the worldwide tendencies towards centralization of water supply and in very different cultural milieus.

Waterscapes include natural or man-made, maritime, coastal, rural or urban areas where water is a dominant feature. In this session, the term water landscape has been used to refer to large-scale landscapes and marine landscapes that are relevant to their historical values. A particular focus was the question which lessons can be learned and how to learn

from traditional or historical water systems, infrastructures and management in the creation of new and technologically modern water sharing projects. The contributions made it clear that Waterscapes designate a large part of our environment, also in urban and arid areas. The papers examined water landscape systems in all parts of the world and reflected specific problems. Best practice examples and guidelines provided an outlook on the possibilities of applying the knowledge associated with historical waterscapes to current problems, such as the deindustrialization of river banks (Yue Lu) and adaptive strategies for floodplains (Ding He). Many papers emphasized the topicality of centuries-old organization of waterscapes and underlined that the historical aspects of these areas are inextricably linked to their present manifestations (Mariano Castellanos Arenas, Ansari Taha, Sahdev Singh/Prachi Sharma, Mikkio Ishikawa, Mozhgan Khakban).

The broad variety of water-based transport routes, from rivers to canals, water towns and even defenses was subject of the session on *Waterways*. It had a strong focus to future developments, highlighting the continuing relevance of waterways while pointing out the potential of historical experience for these important transport routes. Case studies in the Netherlands, India, Japan and China (Masaaki Okada, Hans Suijs, Zahida Quadri, Harry den Hartog, Bart Heinz, Peter Ros) and a report on the educative aspects of the global network of water museums (Eriberto Eulisse) were supplemented by future perspectives on heritage waterways and strategies of adaption for water heritage (Carola Hein, Piotr Lorenz). In addition to maintaining waterways for transport, in the near future the upgrading of urban banks for residential, leisure and business purposes as well as the renaturation of river courses will play an important role. It became apparent that the latter has to be carried out against the background of increasing flood risks and that, in addition to protective measures, strategies for living with this phenomenon are also indispensable.

Water for Power was dedicated to the oldest renewable energy source used by humans. Hydropower has been used for around 5000 years and has taken numerous forms and received various improvements in the course of history. In the context of the transformation of energy systems, the destructive construction of large dams is often referred to and the possibilities for using hydropower on a small scale are insufficiently considered. The session addressed, through European case studies, problems of current legislation that limit the meaningful use of historical waterwheels for energy production due to inadequately adapted environmental legislation - a paradoxical situation (Edmond Staal, Catarina Karlsson). The fact that heritage aspects can also play an enriching role for large energy companies was demonstrated by a revealing insight into the Taiwan Power Company's relation to its own heritage facilities (Chin-Hsing Chien). Andrew Potts underlined the contribution of historical water wheels and their conversion to energy production in relation to the SDGs.

He emphasized that a key impact of climate change is and will be on the water cycle. For example, the numerous historical waterwheels that still exist in the world could make a significant contribution to local energy production. Furthermore, historical techniques can also provide inspiration to develop new types of generators that do not require barrages. It has become clear that this does not have to happen to the suffering of aquatic animals, nor does it have to involve drastic changes in the course of rivers.

Worldviews on Water addressed the spiritual aspects, religious and indigenous perspectives (Hee Sok Lee, Urtnasan Norov, Mona Polacca, Oscar Rivas), which all too often are considered only incidentally, but must by no means be neglected with regard to a meaningful and viable utilization of heritage for shaping the future. Several papers argued with the importance of considering cultural specificities related to water and water bodies when it comes to water quality, access to water, flood protection and energy production. Only by involving as many stakeholders as possible can consensus be reached and sustainable and equitable water management be achieved. This necessarily includes historically grown and still valid relationships with water. Dave Pritchard, Meisha Hunter and Queenie Lin gave examples of how to integrate stakeholders and the opportunities and challenges of embedding water worldviews into policies and management principles. In particular, the session demonstrated that numerous regional peculiarities exist that are repeatedly brought into conflict situations by reckless interventions and regulations. It is time to pursue a more balanced use of water as a resource as well as the basis of all life and culture, in order to ensure equal use for all and to better protect water in all its aspects.

The conference was rounded off by evening sessions, task force meetings, field trips and thematic poster presentations. The evening sessions of Hans Bleumink, Peter Ros and Mao Chia Chen gave an insight into how heritage can be understood as a planning element. In this sense, the concept of heritage goes beyond historical and cultural aspects, because heritage takes on a significance for designing the present. Bleumink discussed an approach by Dutch colleagues that takes account of the changing relationship between heritage management and spatial planning, and transferred this development to water-related cultural sites. He explained that from the monument as a cultural asset to be preserved, the development went via the inclusion of the monument environment into the current approach, which understands cultural assets as the core and inspiration for planning and new developments. In conjunction with the Taiwanese approaches and the discussion that followed, it became evident that cultural heritage has a huge potential to positively support spatial planning for long-term sustainability. However, cultural heritage is often still seen as an obstacle to shaping the future. The reason for this is that sometimes there is still little willingness to learn from cultural heritage and, in addition, a planning culture geared to short-term concerns.

The excursions on 30 and 31 May were devoted to the conference topics related to Taiwan and its different population groups. Several museums (Baileng Tachichai Hydropower Museum, Kaohsiung Museum of History, National Museum of Taiwan History), water facilities (Tachichai Hydro Power Plant, Huludun Waterfront, Xinle Interception Pumping Station, Babao Canal) and cultural sites (Cheng Mei Culture Park, Niumatou Site Cultural Park) were visited. The participants had the opportunity to visit unique water heritage sites, to learn about regional peculiarities and to talk to local authorities.

Outcomes

In a concluding round, the results of the five sessions and internal meetings were presented, together with some points of departure for future actions. The guests had the opportunity to critically examine the program as well as give suggestions. The worldwide case studies and the broad spectrum of interdisciplinary reflections on the topic inspired and motivated many participants. The final discussions focused on how to effectively demonstrate the importance of water-related cultural heritage to water planners and policy makers. Several issues have been identified that need to be addressed. These include strategic communication of the present and future potential of cultural heritage between cultural heritage experts and water experts, better involvement of communities/stakeholders, adaptation of knowledge about water and cultural heritage and the revitalization of (abandoned) water heritage. In addition, in many places adjustments to the legal framework are indispensable in order to create fairer social conditions. A key aspect for these tasks is the involvement of emerging professionals and quality education on water-related heritage.

A significant outcome of the conference was the agreement to continue working on the topic of water and heritage for the future. During two meetings with invited experts, concrete steps for further effective work in this field were discussed. It was decided to strive for the creation of an international platform for networking, education and dialogue on the importance of water heritage in the form of an ICOMOS International Scientific Committee. This proposal was first put forward at a meeting of the ICOMOS Scientific Council in Delhi, India, in December 2017 and has since received widespread support.[2] The aim is to achieve better water futures through the inclusion of water heritage in community engagement, engineering and policy making. On top of the necessary formal steps, a contextual focus has been placed on the following aspects: (1) the development of specific methods that are a basis for developing guidelines and design

2. ICOMOS 19th General Assembly 2017, Delhi, India, Agenda item 5-3, Meeting of the ICOMOS Scientific Council, 10 December 2017.

processes that address the importance of cultural heritage in the water world; (2) the presentation and promotion of best practice examples for water heritage management, and finally, (3) the discussion and development of communication and links between water managers, designers, planners and relevant organizations. With this perspective, the conference has promised a solid basis for continued work on this issue and for its further development.

The publication of selected conference papers is foreseen.

Tino Mager is a Postdoctoral Fellow at the Delft University of Technology. Tino's main interests include heritage conservation and cultural heritage theory. In addition, he has published on post-war modernist architecture and its preservation, on Japanese architecture and the transnational education of artists in the 19th century. As part of the ArchiMediaL project, he is working on the development of methods for the use of artificial intelligence in architectural historical research.

Website

http://www.water-as-heritage2019.org.tw

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NOTES

Water Heritage in Asian Cities Symposium,
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Kaiyi Zhu — Delft University of Technology (Netherlands) — K.Zhu-1@tudelft.nl

ABSTRACT

The *Water Heritage in Asian Cities* Symposium took place between 29 November and 1 December 2018, in Shanghai. In respond to the increasing water risks of a warming planet, four institutes SASS, UKNA, IIAS and NYU Shanghai organized the symposium drawing on their urban studies network in Asia and beyond. The symposium encouraged diversity in perspectives, approaches and research methods concerning water and water heritage. This report explores presentations on three prominent topics discussed during the symposium: the Shanghai Master Plan 2035 (and the waterfront redevelopment it promotes), changing waterscapes, and water-based cultural heritage. Participants discussed how water utilization and management in the history of urban construction and expansion have accompanied the rise and fall of human societies. They emphasized the importance of thinking from a perspective focused on water and of placing water-related practices, studies and cooperation into global narratives.

KEYWORDS

Water Heritage In Asian Cities; Symposium Report; Shanghai Master Plan 2035; Waterscapes; Water-Based Cultural Heritage; Network Asia.

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The Water Heritage in Asian Cities Symposium, held between 29 November and 1 December in 2018, focused on water and water heritage in Asian cities in a historical context. Four institutions collaborated and organized this symposium: Shanghai Academy of Social Sciences (SASS); the Urban Knowledge Network Asia (UKNA) of the International Institute for Asian Studies (IIAS) from Leiden, the Netherlands; the Centre for Global Asia of New York University (NYU) Shanghai and Fudan University's Department of Cultural Heritage and Museology. This symposium was convened by SASS and took place in Shanghai, which has expanded symbiotically with water. Situated in the Yangtze River Delta, Shanghai and its abundant water systems, including the Huangpu River and its tributary Suzhou Creek originating in Lake Tai, provided an ideal context for a diverse group of participants to engage in discussions, debates and learning experiences.

The Shanghai Master Plan (2017-2035) and its goal of "striving for the excellent global city" presented an opportunity to promote this symposium. In this respect, the symposium aimed to encourage scholars from Asia and other parts of the world to rethink the politics of water and its discourse. As with most Asian cities, water has served as the lifeblood of Shanghai for centuries and it has constantly shaped its social, economic, political and ecological character throughout history. However, water has also been considered a threat to humans and their settlements as decision-makers contend with risks posed by, for example, land subsidence, flooding, water-logging, rainwater discharge, natural disasters and extreme climates. Water and its relationship to culture and technology has not been fully recognized; instead, dedicated "prevention" and "control" and "monitoring" approaches narrowly limit water-related discourses. More attention has been given to resistance, the capacity to withstand a water attack, than to the synergistic effects between water and human societies.

The Water Heritage in Asian Cities Symposium provided an opportunity to develop cross-cultural discourse on water-related issues. Two additional topics besides Shanghai 2035 revealed relationships between water, water landscape and human history, among all the panels organized by the four institutions. Presentations on the topic of changing waterscapes explored historical practices and the influential consequences in delta regions and water towns; water-based cultural heritage was defined as distinctive intangible or tangible legacies concerning water issues. Discussion around these three topics highlighted the importance of placing water-related practices, studies and cooperation into global narratives. It also encouraged thinking from a position alongside water and of living adaptively in an era of climate change.

Nature of water and community: Keynote speeches

Facing rapid climate change and water-related problems, professionals' research and practices have focused increasingly on the relationship between human engineering and nature, and the role of water researchers in various dimensions of public life. With her presentation entitled "Water and Community: Controlling Water through Nature", Maria E. Montoya, associate professor of history from NYU Shanghai, discussed water from four perspectives, including its functions for public benefits, infrastructures and commodity and its relationship to governmental structures. Focusing on the example of a flood from a bursting dam, she discussed the diverse public benefits provided by water in the United State, including recreation, irrigation, farm ponds, hydroelectric generation and navigation, and raised questions about whether water is a "public good" or "public bad". Montoya compared dam projects across the world and looked back on water infrastructures in ancient China (500 BCE). She emphasized the necessity to involve and encourage governments to supply large-scale water infrastructure, from decision-making to construction. Considering how to work with nature and how to deal with nature through governmental structures, Montoya used the example of Chinese legalist reformers and governors in the Qin Dynasty and their contribution to Dujiangyan System in the Sichuan Basin. This keynote ended with a discussion of water in contemporary society, its property as commodity, accessibility issues, and water's relationship to human rights.

In the second keynote speech, Professor Han Meyer (Delft University of Technology) explored the possibilities of embracing the uncertainty of nature rather than resisting it, discussing mitigation and adaption approaches in dynamic and evolutionary delta regions. He also reflected on his forty years of experience with water heritage in the Netherlands. Titled "True (Hi)Stories on Water Heritage", his presentation pointed out that water was treated as "a source of wealth and pleasure" over the past 150 years. In hundred years of a fossil fuel economy, transshipment and storage in delta areas have left many urban questions unanswered. Waterfronts have been regenerated on abandoned docklands since the 1970s, with the aim of creating public space for coastal cities. However, the vulnerability of river banks, sea walls and outer dike areas presents important risks to urban waterfront areas. Investigating possibilities to reduce economic and ecological losses and the number of human activities, Meyer elaborated the risks of approaches based on resilience and resistance. On account of his knowledge and experience of forty years of delta research, Meyer called for moving away from human beings' sense of superiority. He called for greater attention to resilience and adaptation, as well as ways of combining those strategies with resistance. Living in and with uncertainty, considering the "young, alluvial and dynamic"

nature of landscapes in delta territories, Meyer ended his speech by emphasizing the importance of "building with nature" and "creating a new relation between urban patterns and the water landscape".

Shanghai Master Plan 2035 and waterfront redevelopment

Reflecting on Shanghai's development history of waterfront regeneration, the panel titled "Waterfront Redevelopment and Urban Transformation" discussed approaches to making Shanghai an innovative, ecological and humanistic city by celebrating water systems, water heritage and the landscape of Shanghai and utilizing its central location in the Yangtze River Delta. This panel explored Shanghai's planning strategies regarding water and water heritage from three scales: regional and municipal planning, water system strategies focusing on the Huangpu River and Suzhou Creek, and one specific case of the post-Expo riverbank.[1] With an introduction to the Shanghai Master Plan 2035, Professor Qiyu Tu (SASS) elaborated the goals of planning strategy from the perspective of improving community services, embedding industrial hubs in the city centre, developing an innovation ecosystem, enhancing regional and global networks and shaping public space. Scholars repeatedly stressed in their presentations that waterfront redevelopment is multi-disciplinary work.

Shanghai started its first round of waterfront redevelopment in 2002 with concerns about sustainability, water capacity and water heritage. Addressing why new strategies are required and how to improve current master plans of waterfronts, senior engineer Dongfan Xi, an urban planner from Shanghai Urban Planning and Design Research Institute, explained that both the Huangpu River and Suzhou Creek play important roles in Shanghai's plans for regenerating the riverside. Describing the Huangpu River area as a "showcase of urban development capacity" and Suzhou Creek as a "typical demonstration of livable features of the ultra-large city", Xi explained the complexity of planning, construction and management of waterfronts. He stated that ecological values, dynamic urban neighborhoods and livable sizes and atmospheres for the public are all taken into account in planning Shanghai's waterfront regeneration. Ning Su analyzed the large scale inner-city renewal along the Huangpu riverbank in the former Expo area and he compared different phases of regeneration before and after Shanghai Expo. He illustrated current problems from this specific case, including the insufficiency of detailed guidance and coordination, industrial homogenization, management fragmentation and unbalanced district development. An overarching political urban plan can never be sufficient for practical, sustainable and long-term waterfront redevelopment, which requires multi-party cooperation and broad perspectives.

1. Shanghai held the Expo in 2010 and the Expo Park laid on both riversides of the Huangpu River.

Overall, the presented strategic plan and practices on the banks of the Huangpu River were positively received by the audience. Han Meyer commented on potential problems. He noted that the riversides of the Huangpu River and Suzhou Creek are linear. Aiming at building a coherent public space, this urban pattern could lead to an uneven usage of Shanghai's waterfronts. For example, although the visiting population in the Bund area along the Huangpu River can reach more than five million on a single day in Shanghai, most planned public waterfront squares and parks are functionless and unattractive with only a few elderly local residents making use of them. He furthermore affirmed the values of historical neighborhoods in Shanghai, praising them as the "golden element" for a vibrant urban environment. In the past, water transportation and port treaties have brought immigrants and concessions to Shanghai, but those extraordinary neighborhoods have been deteriorating. Qiyu Tu and Dongfang Xi indicated that administrative actions and planning strategy could not practically help with community improvement when the inhabitants cannot appreciate the values of their own living environment. The discussion concluded that the urban master plan of Shanghai and water issues included within are indeed public policy, and the duty of professionals is to propose recommendations for long-term development and to provide guidance for flexible adaptation.

Changing waterscapes and histories of water

To investigate possible methods for dealing with water problems, professionals are working on developing advanced technologies and learning from historical experiences. In the first-day panel "Urban Water Infrastructure", two presentations reflected this issue. In his presentation entitled "A consolidated archipelago: outlining the role of water engineering in the urbanisation of the Yangtze River Delta", Christian Nolf, an associate professor from Xi'An Jiaotong Liverpool University, clarified how five successive phases of water management have guided the localization and the structure of urban development from an archipelago of islets to consolidation in the Taihu Basin in the Yangtze River Delta. With this case study, Nolf argued that it is essential to combine the value of water landscape as cultural heritage and enrich technical solutions with a cultural dimension whether addressing the Yangtze River Delta or other delta regions in Asian cities and worldwide. Independent urban designer and critic Harry den Hartog (Tongji University; Delft University of Technology) compared old and new water towns in and near Shanghai. He indicated that although increasingly new water towns have provided a large number of employment opportunities to younger generations under the guidance of national and regional planning strategy, water systems in these towns have become more like decoration with no practical functions; such waterscapes can rarely affect the development of urban patterns

and forms, and it cannot enrich the lives of new citizens, nor promote the improvement of the ecosystem in the Yangtze River Delta. Overall, the papers in this session investigated people's diverse approaches to water throughout history and in the future, arguing that water and water heritage help to perpetuate civilization.

Several presentations in the panel titled "Linked Histories of Landscape and Waterscapes" reflected on the limited capacity of humankind to predict and manage water risks and global warming. Two of the presenters emphasized the dominating role of political resolutions and governing tools in Indian water management. Entitled "Almanac of a Tidal Basin", Debjani Bhattacharyya (Drexel University) introduced her recently published book *Empire and Ecology in the Bengal Delta: The Making of Calcutta*.[2] She introduced the concept of property-thinking, a bureaucratic tool, which the Indian government utilized for colonial land speculation in the Bengal Delta from 1760 to 1920. Bhattacharyya argued that speculative behaviour has had an irreversible impact on ecological systems and the built environment in this largest tidal delta. Another Indian scholar, Rohan D`Souza (Kyoto University), discussed the variability of deltaic human society in the Anthropocene through the analysis of flooding caused by the limited capacity of weather prediction. With examples of floods and their consequences in Pakistan, India, Thailand and America, he further illustrated that policy for water control and management is "art of humiliating politics through 'Good Science' and art of governing without mastery over nature"; in this respect, it seems that authorities are utilizing techniques and management science to evade responsibilities through well-designed but superficial political strategies. A water disaster is always the result of a process. By taking relief, history, engineering technology, expert roles, environment flows, control and management into consideration, he claimed that a flood is a process involving a series of initiatives rather than a simple event.[3] Maurits Ertsen (Delft University of Technology) presented a case study of Surabaya's water heritage and shared a similar position as Rohan D`Souza: that the tangible and intangible water landscape in which we are living today is a consequence of a series of events that happened in the past and will be ever-changing in the future. Ertsen emphasized that recognizing the "essentialism of meaning" of a water-related city is more important than only considering "continuous redefinition of meaning", since our cities are constrained by precedent. Applying the work of Dutch ethnographer and philosopher Annemaire Mol, Ertsen attempted to claim the unicity of political creation and the multiple realities of water in the real world. [4] In this respect, "redefinition", as a political means, could

2. Debjani Bhattacharyya, *Empire and Ecology in the Bengal Delta: The Making of Calcutta* (Cambridge: Cambridge University Press, 2018).

3. Rohan D'Souza, "Framing India's Hydraulic Crises: The Politics of the Modern Large Dam," *Monthly Review* 60, no. 3 (2008): 112.

4. Annemarie Mol, *The Body Multiple* (Durham, NC: Duke University Press, 2002).

only demonstrate the accomplishments of politics in different historical periods, but not provide effective solutions for complicated water-related issues in a city.

Considering changing waterscapes in human society, presenters agreed that ontology, the essence of water and water heritage, is worth more attention and further study. This theme aims to establish a circle between humankind and water, a sustainable future by considering both sides.

Water-based cultural heritage

The perspective of water-based cultural heritage presented in this symposium, focuses on water heritage and its role in transforming populations, settling immigrants and shaping cities' distinctive cultural values. This multidisciplinary perspective aims to build links between different generations of urban society and water-based landscape, figuring out both the universal status and local identity of water heritage by looking to the past and analyzing similar situations around the world.

Cultural heritage is a legacy with distinctive intangible meanings and it is strongly related to narratives of water in a particular region. In the panel "Diversities of Water-based Cultural Heritage", Emma Natalya Stein, a curatorial fellow for Southeast Asian art at the Smithsonian Institution, demonstrated the relationship between art and landscape in urban temples, specifically Prambanan and Bakong in Indonesia, which reflect a sacred and quiet religious atmosphere. Ding Shi (Fudan University) introduced a historical water defence system, Diaoyucheng in southwest China, and interpreted its significance as an outstanding universal value (OUV) by comparing it with many other hill fort defences in the World Heritage Site (WHS) List. Shi emphasized two characters of this cultural landscape: its ingenious integration with the natural landscape and its non-negligible military role in withstanding the Mongols' invasion in the 13th century. Songfeng Chu and Yifei Wang from Fudan University emphasized the necessity to recognize heritage values of the listed Tilanqiao Historical and Cultural Area in the Hongkew District of Shanghai. They explained that Tilanqiao is an archive for academic research, a place to collect vivid historical memories and a shelter that serves as a reminder of the glorious resistance of humanity during wartime. Similar to the case study of Diaoyucheng, Chu and Wang's paper emphasized the global and national significance of the area because of its connection to the Second World War and the Jewish community. Two presentations investigated cases in Shanghai. In "Zaanheh as historical counterfactual", Yifei Li (New York University Shanghai) described the ancient city of Shanghai from the perspectives of hydraulic infrastructure, rivers, demotic livelihoods and a moral economy related to water. Utilizing the traditional and colloquial *Zaanheh* to replace the more recognizable word *Shanghai*, Li focused on describing a shabby and backward Shanghai with its dampness and

stagnant water, its befouled, culverted and vanished flows, its dredging engineering and its pestilence. To investigate connections between local rituals, water gates and the canal system in the old city of Suzhou, in her presentation entitled "Gate, River and Ritual: The Collective Memory of Wu Zixu in Suzhou", Mengyuan Zhou (Soochow University) explored Chancellor Zixu Wu's contribution to the cultural waterscape of ancient Suzhou in the era of Wu State, when he organized the digging of trenches and canals for cereal transport and irrigation. She indicated that it was Zixu Wu who affected the formation and continuity of ritual and collective memory in Suzhou among the local populace, as a response to its long-standing history. In contrast to Ding Shi and Songfeng Chu, Li and Zhou looked more into the unique aspects of the cities themselves. For water-based cultural heritage, the value inherent in one area is usually different from that of any other place. Individual scholars and global heritage institutes can merely provide evaluative criteria of water heritage from their respective positions.

This panel ended with a discussion initiated by Simone Ricca, vice director of the World Heritage Institute of Training and Research for the Asia and the Pacific Region, under the auspices of UNESCO. The discussion in this theme enriched the comprehensive scope and significance of water heritage, by considering water heritage within separate scenarios of localization and globalization. Ricca pointed out that water heritage or any type of heritage is a representation of politics. The way people understand water heritage and their sense of the continuity of heritage traditions might reflect particular attitudes towards social sustainability, shifting values of water and urban landscape and exchanges of culture. Therefore, Ricca and Philippe Peycam (IIAS) also reminded the audience that scholars should be critical of the so-called outstanding universal value of the WHS and its corresponding assessment criteria. Overall, water-based cultural heritage is the production of various human communities, this type of heritage is utilized to express the distinguishing spatial images of a specific time and set of events.

Cross-border cooperation: Book presentation and roundtable discussion

The symposium closed with a roundtable discussion and a book presentation intended to investigate the possibilities for future cross-cultural collaboration. Kaiyi Zhu (Delft University of Technology) started the discussion with the book presentation. Edited by Professor Carola Hein (Delft University of Technology), the book *Adaptive Strategies for Water Heritage: Past, Present, Future* addresses the topics from five aspects: drinking water, agricultural water, land reclamation and defence, river and coastal

planning, port cities and waterfronts.[5] This book follows the agenda on water and heritage issued by ICOMOS Netherlands, which has and will organize a series of academic activities. Zhu introduced a closely related 2019 conference in Chiayi at the end of her presentation. Titled "Water as Heritage", this ICOMOS-organized conference will contain more inclusive topics, such as water-related cosmology and philosophy, water energy, waterscapes and waterways. As Debjani Bhattacharyya and scholars from NYU Shanghai noticed, the cosmology and philosophy of water are topics rarely mentioned in mainstream discourses. Nevertheless, cosmology and philosophy exert a fundamental influence on people's thinking, at all levels in every sector, and dominate perceptions of water heritage. Engineering innovation is also necessary in order to solve the puzzle of natural water systems and to connection their history to the future. This part of the symposium enabled participants to consider more extensive topics related to water heritage and their practical application.

Besides consolidated perspectives, new approaches and methods that could be applied to conduct cooperation projects are needed. In this closing discussion, to enhance common knowledge of water issues among the public, Han Meyer emphasized the importance of pedagogy. Pedagogy could pay more attention to water heritage and water risks in a situation of climate change, Meyer believes in the potential of this approach for developing more solutions in a positive direction. Scholars from different continents proposed possible grants which scholars can apply for and possible sponsors the symposium participants could work with. The scope of these grants and sponsors should be far beyond Asian countries, such as China, Japan, India and Indonesia, and might include European, North American and African cooperating organizations and programmes as well. There are barriers to such worldwide cooperation, but participants are dedicated to establishing networks. The limitations placed on foreign applicants still persist. Looking back at the symposium topic "Water Heritage in Asian Cities" and thinking about the proposal to establish a concrete and regular platform for Asian studies, participants in the discussion agreed that Network Asia needs to take the responsibility to include anything relevant to Asian studies. Scientific research is not the only approach that can enhance the status of water heritage and people's awareness of the critical nature of water problems, but one of many. Issues of water heritage in Asian cities and delta regions have gained attention globally. As an outstanding and comprehensive case, practices and experiences in Asia are worth more research, supervision and dissemination, to strengthen cross-cultural exchanges pertaining to water narratives and technologies.

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5. Carola Hein, *Adaptive Strategies for Water Heritage: Past, Present and Future* (Dordrecht: Springer International Publishing. 2019).

Conclusion

In order to enjoy a sustainable life with water, it is crucial to understand how water has shaped our living landscape. This is only possible by sharing various perspectives and narratives of water. Asking how far humankind can go is to ask what strategy people prefer to pursue in the future, based on their long-lasting but shifting awareness of water. Scholars have discovered the wisdom of past practices, but also the constraints that result from political and legislative strategies. This symposium brought professionals of water together and gave them a platform to discuss and criticize and to share, culturally, socially and ecologically sensitive perspectives; they also presented a clear view of water risks that are currently beyond humans' capacity to manage. Water heritage in Asia represents an emerging issue for scholars not only in Asia or among scholars with Asian backgrounds. Realizing that all problems related to water can trigger a butterfly effect in an era of globalization, water and water heritage issues are catching attention of people on every continent.

During the Water Heritage in Asian Cities Symposium, several under-researched topics and narratives were given attention. Urgent water problems resulting from climate change were such a topic. No clear solution was found for the water risks that are increasingly threatening our cities. The slogan "thinking like a river" was proposed by Rohan D`Souza during the symposium as a guide and mission for this generation. The unpredictable environmental situation, investigated and discussed repeatedly during the symposium, presents the biggest challenge. Within the short term, it is not possible to turn the artificial intervention of the past into nature-based solutions. For example, the banks of the Huangpu River have become artificial landscape belts, filled with public squares and buildings at the expense of the natural ecosystem alongside the Huangpu River. Although regarding water as one key element for urban development, the government of Shanghai still privileges anthropocentrism in its Master Plan 2035. In this respect, there is a still deep misunderstanding of future uncertainties. Generally, this symposium revealed the need to acknowledge the increasingly urgent task for Asian cities: to understand the natural threat represented by water. People from various disciplines, including those focused on policy making, urban design and planning, agriculture, environmental techniques, ecology, water risk defenses, economics and clean water supply must find an approach to sustain humankind in deltas and water towns. The Water Heritage in Asian Cities Symposium in 2018 provided a platform for scholars to think broadly from multiple perspectives. It offered important opportunities for balanced collaboration; this is nevertheless still a superficial and insufficient step, without concrete solutions to enable a livable and sustainable future for humankind.

Zhu Kaiyi is a PhD candidate at the Faculty of Architecture and the Built Environment, Delft University of Technology (Netherlands). Her current research focuses on the urban transformation of historic residential districts in Chinese big cities after 1978, and stakeholders' interpretation and utilization of urban and architectural conservation.

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Erratum Corrige

Esra Akcan, Vando Borghi, Amir Djalali, "The Open Architecture To Come: an Interview with Esra Akcan,"

The European Journal of Creative Practices in Cities and Landscapes 1, no. 1 (2018), https://doi.org/10.6092/issn.2612-0496/8862.

When the above article was first published online on January 31st, 2018, the title contained a spelling error and the word "interview" was spelled "intervew." This has been now corrected in the HTML version of the article.

CPCL's editorial team apologizes for this error.

The correction was announced on March 1, 2019.

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Erratum Corrige

Racha Daher, Viviana d'Auria. "Enacting Citizenship in an Urban Borderland: the Case of Maximilian Park in Brussels,"

The European Journal of Creative Practices in Cities and Landscapes 1, no. 1 (2018), https://doi.org/10.6092/issn.2612-0496/8517.

When the above article was first published online on January 31st, 2018, the title contained an error. The original title "Enacting Citizenship in an Urban Borderland: the Case of the Maximilian Park in Brussels" was corrected to "Enacting Citizenship in an Urban Borderland: the Case of Maximilian Park in Brussels."

In the abstract, "the Maximilien Park" was substituted with "Maximilian Park."

The PDF and HTML versions of the article were updated on December 20, 2019.

CPCL's editorial team apologizes for this error.

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