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AT THE BORDEAUX NATIONAL SCHOOL OF ARCHITECTURE AND LANDSCAPE IN 2022

Conference theme
Internationalizing Education for the Ecological Transition Challenge :
New Stakes for Sharing Knowledge and Acting in a Changing World

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LOCALNESS IN WATER-SENSITIVE URBAN DEVELOPMENT FOR BHUJ AND KOZHIKODE, INDIA

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ABSTRACT:
Outdated, updated, or not, the Brandt Line continues to provide a divide between 'North' and 'South', suggesting a dichotomy between the world's 'developed' and 'developing' regions, respectively. To reduce the contrast between the two, and in response to the challenges posed by urban growth and climate crisis projections globally, the Water-Sensitive Urban Design (WSUD) concept presents valued guiding principles for practice in the field of integrated urban design, planning and water management. Accompanying the WSUD concept, the Urban Water Transitions Framework (UWTF) facilitates the assessment of the progress of an urban environment towards the ultimate 'water-sensitive city' by means of illustrating the developmental steps through which to transition, differentiating more from less developed. By reflecting on the notion of water sensitivity by the hand of water practices and natural and altered hydrological processes in the case study cities Bhuj and Kozhikode in India, the article aims to cast light on contextual and cultural conditions and elements, challenging or contradicting the conventional Northern developmental progress put forward by WSUD and the UWTF. Through examples of barriers for water-sensitive urban development originating from striving for modernity, as opposed to opportunities for water-sensitive urban development which lie in pre-urban development local water practices, the article calls for a consideration of, and emphasis on, localness when assessing the state and potential of urban development.

KEYWORDS:
context specificity, sensitivity, decolonising, north-south relations

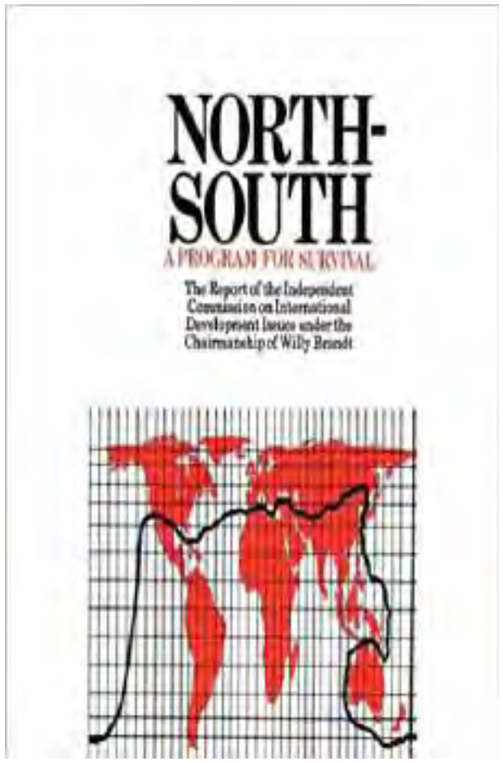

Figure 1. Report of the Independent Commission on the International Development Issues (1980) cover

INTRODUCTION

The 1980 cover of the first report of the Independent Commission on International Development Issues, titled 'North-South: a program for survival', showed a red world map with a black line circulating the globe and cutting through continents to separate two hemispheres (figure 1). Imprecisely and metaphorically referred to as North and South, the two parts of the world represent rich versus poor or developed versus developing, respectively. The black line, now known as the Brandt Line, after commission chairman and former German chancellor, Willy Brandt, originates from the global development process triggered by the Industrial Revolution. The North-South divide was first understood from the perspective of industrialization, whereas the high quality of life attained by the industrial front-running countries turned out to be the actual aim of the development process, and industrialization merely the means (Solarz, 2012). The global economic inequalities it illustrated and called to reform forty-two years later mostly remain present (Lees, 2021).

Strikingly, the Brandt Line world map shows overlap with the map reviewing global inequity in the countries responsible for the current climate crisis, in terms of greenhouse gas emissions, and the countries carrying the burden of its impacts (with the exception of Argentina, Brazil, and China in the South) (Althor et al., 2016). Besides the short-term urgencies of development highlighted by the North-South dichotomy, the current climate crisis additionally introduces long-term uncertainties on how to develop (Burton, 2004) to countries both above and below the Brandt Line. Worldwide, countries are facing more irregular and unpredictable extreme weather and climate events and affected local natural and human systems (IPCC, 2014). Its impacts, however, are arguably equally driven by urban development-driven land use and land cover modifications and the consequential abruptions of the hydrological cycle.

A concept for the integrated approach of (re)development of the urban environment considerate of underlying and embedded hydrological processes and urban water cycles is Water-Sensitive Urban Design (WSUD). Emerged and successfully operationalized in 'the North' (i.e., Australia) (Brown and Clarke, 2007), WSUD is considered fit to address urban and climatic challenges, while delivering additional benefits, in a wide range of contexts (Rijke et al., 2016) and is therefore gaining interest globally. The site-specific relevance of the WSUD concept and approach in the South, however, remains questioned (Bichai and Cabrera Flamini, 2018). Transferability concerns come to light as WSUD gets mainstreamed, originating both from prior conceptualization and novel contextualization, when development principles of WSUD turn out to be dysfunctional, insufficiently inclusive, or even invalid in certain contexts.

This paper aims to highlight what water sensitivity implies in the South, opposing the direct imposition and validity of WSUD as the conventional urban development concept from the North, but alternatively approaches the WSUD concept, focusing on the localness and uniqueness of a context, its culture, and what is and what isn't in place, as elements of an already present kind of water sensitivity to function as entry points for urban development. To do so it 'travels' to Bhuj and Kozhikode, two secondary cities in 'the South' (i.e., India). The hierarchical order of cities suggested by 'secondary', in light of this study, refers to their subnational size and administrative role. Such cities frequently experience poorer initial conditions and lacking infrastructure and service provision, whereas, unlike the common perception, secondary cities collectively are confronted with the most

pressing urban population growth (Roberts, 2014). Especially in India, as the country is facing both the world's highest levels of urbanization and population growth (UN DESA, 2019). At the same time, secondary cities remain underexposed in studies and both academic and non-academic literature on urban development and their urban water management infrastructures (Roberts, 2014) which results in lacking or fragmented data availability and lacking data collection resources (Lindley et al., 2018), when, in fact, WSUD is rather data-intensive (Lerer et al., 2015). In light of general urban water management challenges to address, Bhuj and Kozhikode represent secondary city contexts enduring drought and excessive rainfall, respectively.

State of the art

Beyond (re)developing the urban environment considerate of hydrological processes and urban water cycles, the WSUD concept intends to integrate the water management practices (i.e., those engaged with the urban water cycles and the protection and conservation of the aquatic environment in urban areas) with urban design, planning, and implementation by operationalizing the collaborative and multidisciplinary nature of urban design (Wong, 2006). The WSUD concept has successfully been adopted to a WSUD approach in the contexts of primary cities worldwide (e.g., in Australia, Germany, the Netherlands, Singapore, United Kingdom, United States), proving its suitability to address urban and water challenges in a broad range of climatic conditions (Abbott et al., 2013), yet, only in the North.

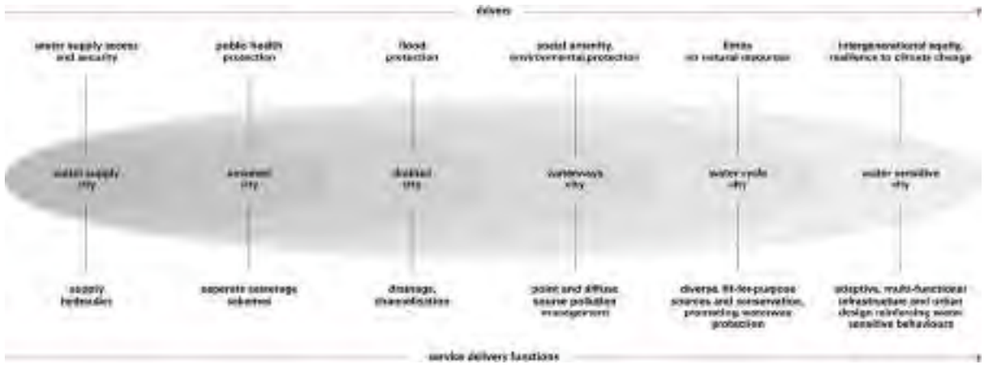

Figure 2. Urban Water Transitions Framework (adapted from Brown et al., 2009)

The ongoing water-sensitive urban development progress in such primary cities is outlined in the Urban Water Transitions Framework (UWTF) (figure 2) (Brown et al., 2009) to accompany WSUD in assessing the state and progress of urban water management and differentiating more from less developed. It sets out typical cumulative developmental steps through which cities transition in their pursuit for water sensitivity. The ultimately developed city state is the 'water-sensitive city' (following the water supply city, sewered city, drained city, waterways city, and water cycle city) which is underpinned by three principles for practice (Wong and Brown, 2009): firstly, to use cities as water supply catchments with a diversity of fit-for-purpose water sources and infrastructures, secondly, to provide ecosystem services, and, thirdly, to generate the socio-political capital to enable water-sensitive behaviour.

Literature, however, highlights transferability concerns regarding the generic experienced qualities from the conceptualization of WSUD as an approach to transition to the water-sensitive city with, as well as regarding the contextualization and limited applicability of WSUD in cities with differently established urban water practices and management. To reflect on North-South relations and the development dichotomy, the article focuses on the concerns arising with the UWTF as a development model. The UWTF fails to recognize the possibility of coexisting city states within an administrative boundary or watershed. When parts of the city lack water supply or stormwater drainage infrastructures whereas other parts are provided, the progress which the UWTF assesses in fact refers to retrofitment in developed parts of the city and to development in others (Fisher-Jeffes et al., 2017). From this perspective, WSUD might be short of promoting equity alongside environmental sustainability and short of identifying opportunities to bypass the Northern development steps and directly implement water-sensitive system alternatives, even in parts of town without basic services.

Methods

Following an extensive literature review on the state of the art of WSUD and its transferability concerns, the key effort around the scarce data availability of the secondary case study cities was the chronological compilation of information on water practices and water infrastructures in the two cities from a multitude of disciplines to assess past urban development and define present problems. This chronological overview provided the basis to distinguish and define local paradigms of water development trends and the paradigm shifts between those, explaining the establishment of the present urban environments, the challenges and entry points for water-sensitive urban development, and the constructive or problematic relations between nature and built form. The key findings from those overviews for Bhuj and Kozhikode were verified through online workshops with local stakeholders and will be provided under 'Case study description'.

The defined paradigms and shifts are not just seen in history but still manifest in the present-day cities as residues from prior periods. By hand of those residual water practices, investigating and reflecting on their discrepancy with conventional WSUD as a Northern urban development approach, this article calls for an alternative approach to WSUD and its intended ideal universal water-sensitive city. One focusing on past and present context and culture, and their already existing water sensitivity, as entry points for water-sensitive urban development. Ultimately, this reflection is used to necessitate a consideration and conservation of localness when assessing and addressing the state, potential, shortcomings, and progress of urban development, especially in the South.

Case study description

Bhuj, India

Bhuj is home to the headquarters of India's westernmost district Kutch, located in the state Gujarat. It had a population size of approximately 150.000 at the latest Indian government census in 2011 (Office of the Registrar General and Census Commissioner India, 2011) of which 33 per cent resides in slums, occupying six per cent of the city's area (Jaimini, 2016). Its location on top of fault lines is at cause of the city's history of earthquake disasters (e.g., in 1918, 1956, and 2001) and are a striking condition of influence to local groundwater processes. Being located in a hot desert climate, the city knows an
average yearly rainfall of

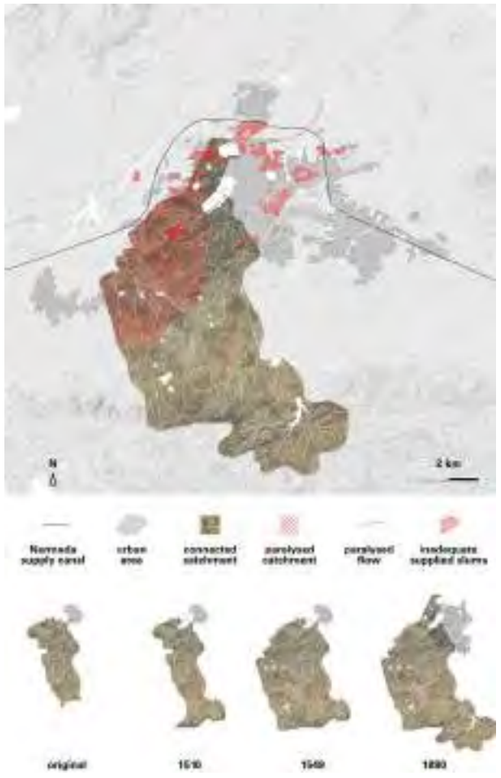

Figure 3. Bhuj and its history of catchment expansion (adapted from Raman, 2014) and current problems (author, 2022)

324 mm and average temperatures ranging between 10,0 (January) and 39,4 degrees Celsius (May) (IMD, 2015; 2016).

To cope with drought seasons and increasing demand, Bhuj has a history of watershed expansion by connecting the original Hamirsar catchment area to neighbouring lakes and watersheds and ingenious interventions to maintain those connections (figure 3) (Raman, 2014). The current watershed within which Bhuj is located has heights ranging from 25 to 275 metres above general mean sea level and conveys water towards the Rann of Kutch, a salt plain desert 70 kilometres north. Despite the expansions, due to earthquakes paralyzing parts of the enhanced watershed, and due to high salinity of the soil (CEPT University, 2016), current local water sources do not succeed in meeting the ongoing increasing demand for household consumption and lakes are commonly dry. Beyond their frequent dry state, lakes are also irreversibly disappearing due to their lacking recognition in statutory documents, permitting dumping of earthquake rubble, encroachment, or development, instead of preservation. Since the 2001 Gujarat earthquake, Bhuj is for water supply heavily dependent on external sources provided by the 225 kilometres long Kutch branch canal from the main Narmada canal with its original source 700 kilometres away from Bhuj (Sheth and Iyer, 2021). Furthermore, local water distribution infrastructure is deficient, resulting in unequal supply, especially disadvantaging slum areas. The online workshops additionally highlighted the lacking awareness regarding the state of local water sources and the perceived ease of access to water provided by external sources, leading to a false sense of water security, overextraction, lacking conservation, and a general loss of traditional water conscious knowledge and practices.

Kozhikode, India

Kozhikode, also known as Calicut, is seat to the namesake district government in the southern state Kerala and had a population of approximately 550.000 at the 2011 Indian government census (Office of the Registrar General and Census Commissioner India, 2011) of which 19 per cent lives in informal slum settlements, covering an area of 386 hectares (Town and Country Planning Department, Government of Kerala, 2017). The coastal city is situated in a strikingly undulating coastal plain at the foot of a large watershed which abruptly rises up into the mountains of the Western Ghats, reaching heights of approximately 2500 meters. In a local climate characterized by monsoons, the orographic precipitation of the Southwest Monsoon encountering these mountains between June and September contributes most to the relatively high total average yearly precipitation of 3054 mm, but is accompanied by the Mango Monsoon in April and the Northeast Monsoon between October and November. Temperatures range between 22,8 (January) and 33,6 degrees Celsius (April) (IMD, 2015; 2016).

Both in remote site research and the online workshops, (unplanned) land use change (figure 4) in combination with lacking water resource management (i.e., both in terms of water quantity and quality) stood out as the key disrupters of water-sensitive urban development and improvement. However pressured stormwater drainage was by the landform of the relatively flat coastal plain adjacent to steep mountains causing heavy orographic monsoon precipitation, in the past the use and maintenance of the valleys of the undulating terrain as nature or water-related and nature-based religious and cultivation practices, such as worshipping virgin forest patches (called sacred groves) or cultivating rice in paddy fields, secured the processing of these extreme water flows (Bhagyanathan et al., 2017). Now, the relatively flat terrain is facilitating unplanned sprawl in all directions land inward up to the mountains. These land use and land cover changes makes the terrain less and less capable to process the excessive monsoon rain (figure 5). It limits processes of rainwater harvesting and groundwater recharge, which the terrain and its use and maintenance by local communities used to protect. On the one hand, this results in increased runoff and flood risk. On the other hand, together with over-extraction of groundwater through open-wells (which remains the major source of water supply) and excessive groundwater outflow through man-made canals (e.g., the Connoly canal, dug for inland transport in colonial times), this results in groundwater depletion and reduced flushing capacity, which consequently results in saline water intrusion. Drainage infrastructure and solid and liquid waste management in Kozhikode are in general lacking. Both ground- and surface water bodies and remaining natural areas (including the Kottuli wetlands with a status of national importance (MoEF, 2019)) additionally suffer from the latter as it causes the habit of waste dumping. Drainage is further obstructed by this waste dumping, siltation, and encroachment of natural drains and wetlands, increasing flood risk.

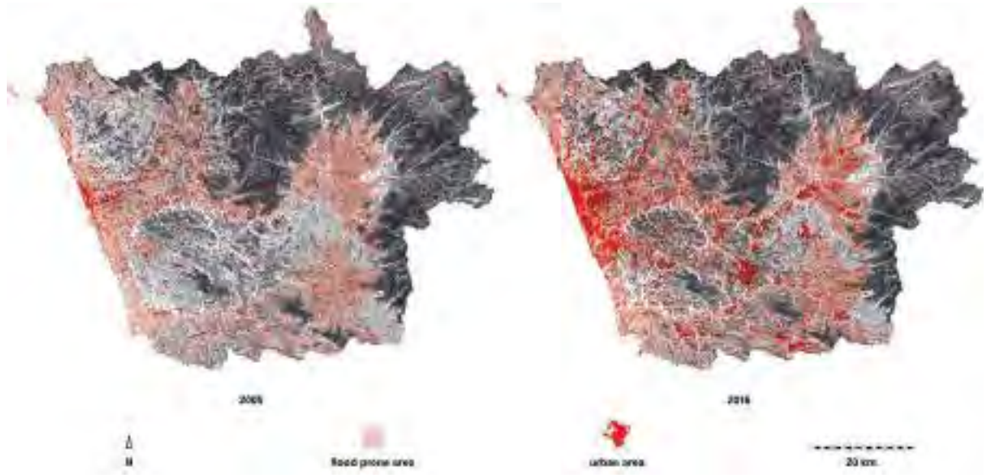

Figure 4. Kozhikode watershed with urban sprawl (adapted from NRSC, 2019)

and flood prone areas (adapted from NCESS, 2010) highlighted (author, 2022)

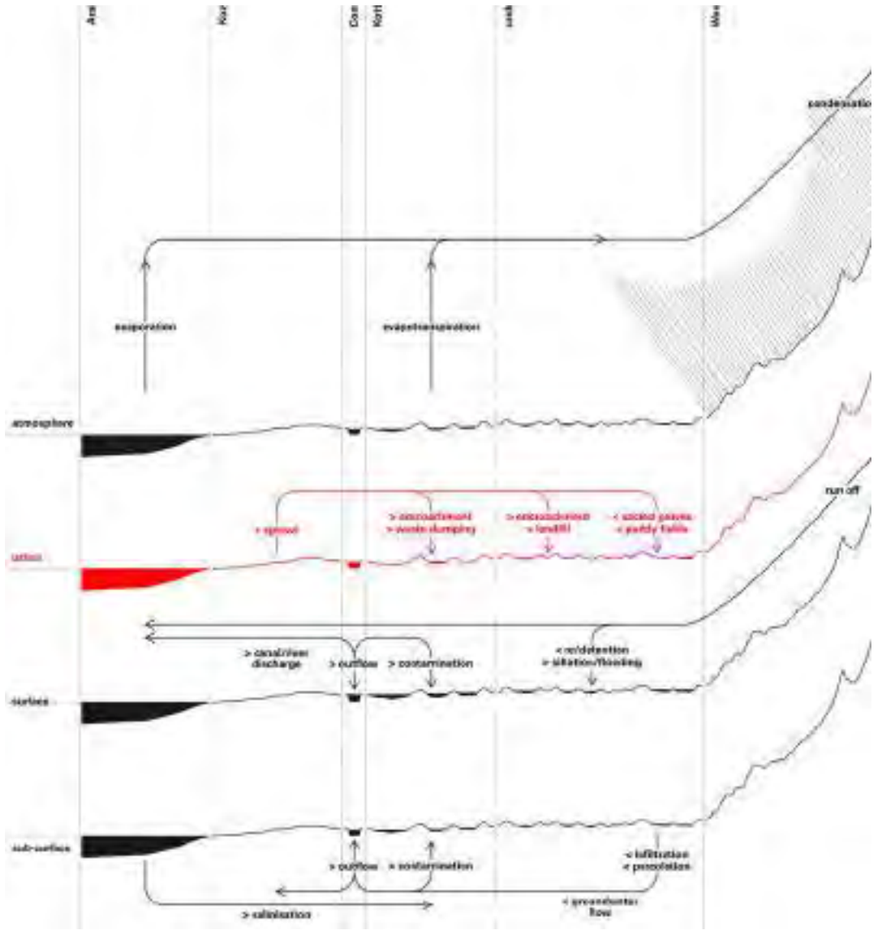

Figure 5. Schematic section of the Kozhikode watershed and its urban and atmospheric, surface, and sub-surface hydrological processes (author, 2022)

Results

Bhuj and Kozhikode both are examples of cities in which the state of service delivery varies over parts of the cities with development urgencies in respect to all urban water cycles. The lacking state and development of service infrastructures, however, results mostly from the unique set of site and culture specific variables, such as local climatic, topographical, geological or seismic conditions and local practices of informal settlement, landfilling, or urban sprawl. Such sets of variables inhibit conventional Northern development proposed by WSUD. Instead of a universal ideal of the water-sensitive city as an urban development goal and a universal definition of what is water sensitivity, formulating and defining these per context, considerate of localness and site variables would facilitate the envisioning of a site-specific plan with local entry points and opportunities to guide urban development in each urban context. The case study descriptions cast light on challenges and entry points for water-sensitive urban development in Bhuj and Kozhikode.

Opposing WSUD retrofitment of primary or Northern cities to cities as water supply catchments with diverse fit-for-purpose water sources providing ecosystem services, secured water supply in Bhuj faces increasing dependency of remote sources as its population grows. Despite the earthquake-prone area calling for a less centralized water supply network, local site conditions hinder independency and decentralization. Unlike following the UWTF to address Bhuj's development urgencies, contextual and cultural entry points can enable immediate water-sensitive urban development, despite potential ongoing developmental deficits. The potential of water sensitivity in Bhuj might rather be about the unfolding of the city's water management history of 'engineering' the natural and expanded catchment to the full set of destitute local hydrological processes, such as rainwater harvesting, in a sensitive manner. Especially when linking those to water-sensitive use and development of the urban environment and sensitive individual use of water through cultural and societal site specificities of Bhuj, enforcing tailored regulations for, for instance, water extraction and (dried-out) lake conservation, and increased awareness regarding consumption and traditional water knowledge and practices.

Kozhikode's undulating topography equally calls for decentralized supply and sewerage networks and its pressuring urban growth and monsoon climate demand an emphasis on developing stormwater drainage and flood protections infrastructures. The latter is complicated by the informal and unplanned nature of settlement, landfilling, and waste dumping practices in, or in proximity to, natural water ways and wetlands. Alternatively, regarding and (re)operationalizing the undulating terrain as such a drainage and flood-reducing infrastructure is an opportunity to secure a similar, yet more locally water-sensitive, performance. Residual local and traditional water knowledge and practices, which were once prevailing, are site specific and culture and society bound means and entry points for water-sensitive urban development. Assigning an 'infrastructural' status to the sacred groves and paddy cultivation, alongside regulations to secure that status, conserving the residual areas where these remain, and expanding and duplicating them in the depressions of the undulating terrain can facilitate the convergence and deceleration of the high stormwater runoff and stimulate infiltration and percolation. Such hydrological processes ultimately safeguard food provision, cultural and spiritual values, biodiversity, groundwater quantity and quality (also for supply), and the landscape's and city's resilience to perturbations (Bhagyanathan et al., 2017).

Conclusion

The Brandt Line, coined over forty years ago with the intention to overcome the economic inequalities between what lies North and what lies South of it, still mostly remain in place to date (Lees, 2021). Reflections of these inequalities in urban environments North and South show ongoing infrastructural deficits and development urgencies in the South and novel development uncertainties in both the North and South, further pushed by economic, societal, and, above all, climatic changes (Burton, 2004). Such urgencies, uncertainties, and inequalities trigger the production of knowledge and approaches to address them. Among those, the WSUD concept emerged from the Northern primary city context (i.e., in Australia) in response to the water infrastructure and urban development challenges posed by urban growth and climate crisis projections, gaining following globally and purported universal validity by means of local successes. The ways to address deficits and global changes, however, depend on each context's state of development and a set of site specificities, enabling or disrupting development.

The secondary Indian case study cities, Bhuj and Kozhikode, highlight how multiple states of development and states of service delivery infrastructures can coexist within their administrative boundaries. Such differences and deficits imply a long way to go for these cities to develop to the aspiring water-sensitive city ideal portrayed by the UWTF. Reviewing the city's water related development trends and the residual local water practices and cultures, however, allude to an alternative and ready existing type of water sensitivity, despite the deficits. One which is not in the first place concerned with the (projection of the) ideal future performance of the urban environment, but rather with the qualities of past and residual water practices and water knowledge and the opportunities to regain and stress those. Approaching water sensitivity and WSUD through past and present site specificities and culture of a context facilitates the assessment of the state and potential of the urban environment and the design and planning for situated development.

This alternative approach of WSUD does not mean the article questions or undermines the value, innovation, and prior success of WSUD. Reviewing water sensitivity in light of North-South relations, however, attenuates the differentiation between more and less developed contexts established after the Brandt Line. The act and tendency of drawing lines recalls Da Cunha's (2019) explanation of the invention of rivers through the drawing of a line separating land from water. A separation which used to be dynamic and have a fluctuating spatial dimension, reduced to a static line to facilitate an efficient operationalization and cultivation of the landscape on one side of the line and the river on the other side of the line. A separation deemed necessary for colonizing India. The construction of the line as embankment or dam had economic implications and did facilitate a form of development, but it also initiated a cultural shift in which natural phenomena like rain and water discharge, which used to be celebrated, became associated with efficiency, uncertainty, and fear (Da Cunha, 2019). Further development of the urban environment and its water management infrastructure therefor calls for 'decolonization', as an effort of unlearning urban design, planning, and water management approaches, to the extent that they are based on Northern urban development, and allow for localness as entry points for situated urban development. Decolonized (Water-Sensitive Urban) design (Schultz et al., 2018) would enable and support local appropriation of the WSUD concept and its application fit for the cultural context by local urban design, planning, and water management practitioners with stronger ties to the culture and history of places, embedded in local water practices and knowledge. It will not dissolve North-South contrasts but offer a shift in perspective, from the distinction between 'developed' forerunners and 'developing' followers, towards a collective situated water-sensitive urban development endeavor.

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