An orienting framework of municipal enablers in urban river governance

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ABSTRACT

Urban river governance is a serious challenge that affects the management and maintenance of human and ecological health under the pressures of urbanisation and climate change. Research has examined river governance in terms of complex processes requiring multi-level coordination at a basin scale. The integrated principle of water management has been promoted through basin-wide governance mechanisms, predominantly led by state institutions. Although local capacity is acknowledged as a critical ingredient of river governance, there is a dearth of knowledge on what constitutes enabling capacities for municipalities addressing urban river challenges. Our case-study-oriented review explores a suite of interrelated enablers at the municipal level, including awareness, political and financial commitments, formal authorities, leaders and front-liners, boundary spanners, and community participation. The urban cases include diverse governance systems around the globe, demonstrating the plurality of enablers for municipal river governance. The orienting framework, whilst non-exhaustive, can serve as a starting point for illustrating variations in local conditions and implementation outcomes, which may complement the basin-level governance approach. The identified municipal enablers must be viewed within their specific place-based contexts, which calls for a closer examination of the interplay between distinct socio-political conditions of given municipalities and basin-wide governance processes.

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HIGHLIGHTS

- Identifies common enablers at the municipal level through a review of global Integrated Water Resource Management (IWRM) case studies

- Advances research on urban river governance and highlights local implementation capabilities

- Offers an orienting framework for illustrating variations in local enablers to complement the basin-level approach

1. INTRODUCTION

Protecting our freshwater sources and restoring their quality is an urgent task for cities to achieve cross-cutting Sustainable Development Goals (SDGs), including SDG 6 on sustainable management of water and SDG 11 on sustainable cities and human settlements. Under the intense pressures of urbanisation and climate change, urban flooding and river pollutants, such as household waste, industrial discharge, agricultural runoffs, plastics, river encroachment, and riverbank erosion, not only choke and degrade waterways but also cost the economy and negatively impact human well-being. To tackle such complex problems, a popular governance reform process, known as the Integrated Water Resource Management (IWRM) approach, has been widely proliferated. This governance process is typically led by institutions at the national level (Biswas, 2008), but in principle, the IWRM approach emphasises that water be managed at the "lowest possible level" (Global Water Partnership [GWP], 2010).

Since then, the literature has evolved from the traditional hierarchical governance model towards a more decentralised decision-making process, which emphasises local dynamics (Van de Meene et al., 2011; Staddon et al., 2017). Yet, local governance has mostly been studied in a 'functional' and 'managerial' sense (Clifford-Holmes et al., 2016). Relatively little is known about what constrains or enables the implementation of transboundary river governance processes at the municipal level (Jetoo, 2017). The dearth of knowledge on the municipal level dynamics in the context of river governance is understandable given the long history of focusing on the bioregional scale (García et al., 2019) and basin institutions (Huitema & Meijerink, 2017).

Our research contributes to an emerging line of inquiry that unpacks the roles of municipalities and their interaction with the bioregional governance processes. Recent studies have investigated aspects of local institutional innovations for water resource management (see e.g. Chien & Hong, 2018; Plant et al., 2014; Vall-Casas et al., 2021). It is also pertinent to note that there has been a great deal of emphasis on localising implementation through the establishment of formal structures and processes, which encompass water policies, regulations and legislation (Global Water Partnership [GWP], 2020). However, new governance processes may be impeded by a lack of stakeholder acceptance (Sandström et al., 2014) and poor legitimacy at the municipal level could impede policy implementation.

When the river governance processes require new associations, relationships, and connections to be added, layered, or fostered in relation to old arrangements, it is pertinent to understand *who* might play *what* roles in enabling implementation at the municipal level, which may include, but not limited to, the establishment of formal institutions. In this light, we propose to define 'enablers' in terms of *how state and non-state actors can play socio-political roles at the municipal level to enhance urban river governance*. We explore this question through a review of existing research on river governance reform processes across the globe, with a specific focus on studies that provide insights into municipal dynamics. We expect to find a wide spectrum of enablers, including through cooperative and confrontative practices
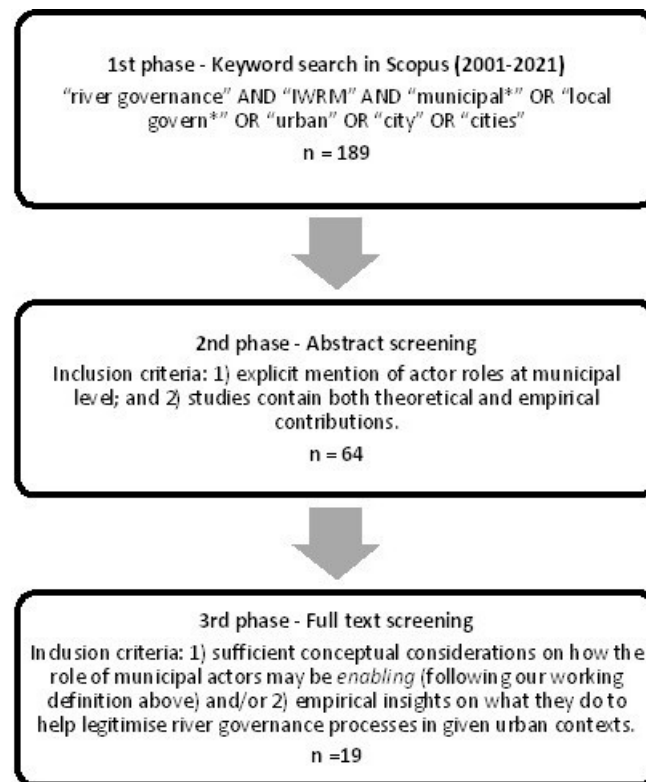
FIGURE 1. Article selection and screening approach.

by grassroots organisations (Mitlin, 2008) and progressive municipal officials (Novalia et al., 2020). Given the emerging nature of this field, our review aims to provide an exploratory perspective and case-based illustrations on the notion of *enablers* at the municipal level for river governance. We consider the role of state and non-state actors, who, by authority or connection to a particular place, can influence urban river governance. Enablers may be bounded by municipal boundaries, but they can also originate from other jurisdictional levels. Such multi-level perspectives are central to our thinking and the broader water governance scholarship.

2. METHODOLOGY

To identify relevant studies that provide insights into municipal enablers for river governance we conducted an exploratory case-study oriented review (Ogawa & Malen, 1991). This particular strategy offers a preliminary step to conduct an open-ended search for emerging themes and patterns, and to develop tentative explanations (Ogawa & Malen, 1991) of the notion of municipal enablers—a topic that has yet to receive extensive empirical attention. We used Scopus as our main database to identify relevant research in the field of water governance with a particular focus on urban rivers. The focus

on scientific publications is because we aim to capture the conceptual and empirical contributions on this topic. Employing an interpretative approach, we analysed reported empirical findings to draw relevant evidence guided by our research question. This approach is considered suitable given the limited conceptualisation of municipal enablers, to date. To our knowledge, there are no existing studies that have focussed on reviewing the *enablers* of urban river governance at the municipal level, with a recent exception (García et al., 2019). Our review aims to identify and describe the socio-political roles played by state and non-state actors, which may be generative in the processes of restoring urban river conditions across the globe. However, given the exploratory nature of the methodology, the review remains primarily descriptive and is not intended to provide a comprehensive account of enablers in urban river governance. Although this limits the depth of our analysis, we believe that this strategy of reviewing available evidence can still offer useful illustrations and new knowledge to ground future research on this topic.

2.1. Article Selection

The articles were selected through three phases (illustrated in Figure 1). Firstly, to narrow down the focus on enablers at the municipal level, we

combined the following search terms "river governance" and "IWRM" and "municipal*" or "local govern*" or "urban" or "city" or "cities". We included articles written in English and extracted publications from 2001 to 2021 because this covers a substantial period since IWRM thinking took off around the 1990s. This first phase of the literature search, conducted in May 2021, yielded a total of 189 articles.

The second phase involved the manual screening of abstracts by the first author using the following inclusion criteria: (1) explicit mention of actor roles at the municipal level; and (2) studies containing both theoretical and empirical contributions. Based on these, a total of 64 articles were selected for further full-text screening. In the third phase, the full texts of the 64 included articles were downloaded and read in full. Our focus on identifying enablers beyond 'formal processes' means that we excluded studies that have focused only on formal reforms (e.g. regulations, legislation). Other excluded articles were studies that reported on (i) IWRM experiences at the national level or basin scale, i.e., have not adequately provided evidence on the role of municipal actors; (ii) have only focused on the biophysical assessment or modelling aspects; (iii) have provided a broad-brush appraisal of governance performance with limited empirical insights on the on-ground practices. In total 45 out of 64 papers were excluded at this final stage.

The large number of excluded papers confirms that there is a critical gap in studying municipalities in urbanising contexts in the existing literature. A total of 19 papers were retained that appeared to have sufficient contributions to advance understanding of our research topic. A wide geographical diversity of cases across the final sample of articles that were reviewed was noted, including municipalities across Asia, Africa, America and Europe. No specific geographical inclusion or exclusion criteria were applied, although developing regions have a dominant representation in this sample. While we have endeavoured to be rigorous, our keywords-driven search of the scientific literature might not have captured all relevant cases and those works were published as grey literature. Nonetheless, our approach serves as an exploratory step to advance knowledge based on available scientific evidence in this embryonic field of urban river governance.

2.2. Article analysis

Our findings were analysed through an interpretive process that included iterative reading and coding of the 19 articles. Codes and interpretations were shared in research meetings for refinement and member checking. We extracted evidence and examples of *enablers* from the articles with reference to the working definition provided before (see Introduction). The examples were tabulated in Excel and we subsequently developed loose thematic categorisations by grouping them. We then compared examples across multiple papers and refined the categorisations by focusing on similarities, differences and complementarities. This step allowed us to verify the internal consistency of the categories. Table 1 presents the identification of the enablers from each reference source, including the reported river governance issues and multilevel interactions.

3. RESULTS

We distinguish the enablers into six categories (Table 2): (E1) awareness, (E2) political and financial commitments, (E3) authorities, (E4) leaders and front-liners, (E5) boundary spanners, and (E6) community participation. Our review does not establish the enablers in order of importance; they represent a set of characteristics that emerged across multiple studies. Because of the popularity of the bioregional perspective, most of the included studies adopt a multi-level perspective that allows them to explore the roles of municipalities as nested under basin-level processes. We note that most studies (14 out of 19) mention the existence of river basin organisations (RBOs), in one form or another, underlining the primacy of the basin view in river governance. Of the 14 papers that mentioned RBOs, only two employ smaller territorial scales in the form of sub-basin learning platforms (Moriarty et al., 2010) as well as non-governmental organisations (NGOs) and city government-initiated river organisations (Lee & Choi, 2012). Ten out of 19 papers provide a municipal-forward analysis, where the municipalities are the main empirical unit. Next, we draw on these case examples to illustrate each enabler and its interrelatedness in practice.

3.1. Awareness

Awareness of problems can shape the willingness and motivation to participate in river governance processes. Most studies reviewed (17 out of 19) mention some aspects of awareness as crucial for river governance processes, including conscious-

TABLE 1. Identification of municipal enablers in the article reviewed.

No	Reference	Municipal area	Country	River governance issues	Multilevel INTERACTIONS	River basin organisation	MUNICIPAL ENABLERS					
							E1	E2	E3	E4	E5	E6
1	Vall-Casas et al. (2021)	Barcelona	Spain	Highlights the failure of top-down Water Framework Directive at the basin level to reach local people and disconnection between basin scale management and municipal level. Examines a pilot of participatory processes across four municipalities was proposed to increase citizen involvement in the restoration of River Besos Basin.	Citizen-based river groups drive horizontal coordination of local volunteers and mobilised supra-local networks, while also enhancing citizen interests from municipal to sub-basin level. The group received support only from municipal governments, while interaction with regional governments has been negligible.	Yes	+	+	+	+	−	+
2	Wicaksono (2020)	Yogyakarta	Indonesia	Examines urban river governance to address flooding issues and environmental degradation along riverbanks. Community movements by the urban poor to rehabilitate the riverbanks, e.g. creating open space, implementing building setback, and waterfront development.	Bottom-up approaches to urban river governance co-exist with top-down approaches. The community movement contributed to better urban planning and environmental protection. The initiative is embedded within multilevel governance structure.	Not reported	+	−	+	−	−	+
3	Ariyanti et al. (2020)	Yogyakarta, Sleman, Bantul	Indonesia	Examines the multi-level interactions and implementation of the IWRM approach in a volcanic river basin, including three municipalities.	The regional level is the priority playing field; degree of multilevel integration differs between levels of government; Municipalities lack the capacity and budget to coordinate with communities. There exists a variety of informal river communities at the municipal level. Some key actors act as bridge between communities and governments.	Yes	+	+	+	+	+	+

Continued on next page

TABLE 1. *Continued.*

No	Reference	Municipal area	Country	River governance issues	Multilevel INTERACTIONS	River basin organisation	MUNICIPAL ENABLERS					
							E1	E2	E3	E4	E5	E6
4	Twinomucunguzi et al. (2020)	Multiple urban and peri-urban areas	Uganda; Ghana; Tanzania	Reviews IWRM approach to address peri-urban groundwater contamination by on-site sanitation. Specifically, the study looks at the implementation of Water Safety Plans as an instrument for managing contamination risks.	Coordination between various institutions and governance entities, including municipalities, has not been well addressed. Basin organisations are in infancy stage, with limited legitimacy. Top-down approach dominates, with limited integration between formal and informal services. There is a lack of institutional support for peri-urban communities in implementing the plans.	Yes	−	+	+	+	−	+
5	Jensen and Nair (2019)	Singapore; Hong Kong	Singapore; Hong Kong	Assesses the impact of Integrated Urban Water Management (IUWM) approach on water security and the level of institutionalisation within water governance at the city level.	IUWM was driven in a top-down manner by a single self-regulating agency backed by strong political commitment. Compared to Hongkong, Singapore has achieved deeper institutionalization where cross-agencies coordination has opened up investments to achieve water security objectives. Public consultation with urban communities does not appear to play major role.	Yes	−	+	+	+	−	−

TABLE 1. *Continued.*

No	Reference	Municipal area	Country	River governance issues	Multilevel INTERACTIONS	River basin organisation	MUNICIPAL ENABLERS					
							E1	E2	E3	E4	E5	E6
6	Ostovar (2019)	Piura	Peru	Examines collaborative water governance approach, including both rural and urban stakeholders, to protect critical upper basin ecosystems to safeguard urban water supplies.	Knowledge and belief systems from urban and rural contexts look different, which present challenges to collaboration. Active bridging to incorporate different worldviews was important, even when the opportunity to participate is inadequate. Leadership helped support such knowledge integration. Because cities are hubs for economic and political power, their views are represented as more dominant, raising questions about co-optation of the collaborative process.	Yes	+	+	+	+	−	+
7	Whiten (2019)	City of Dawson Creek	Canada	Examines IWRM approach to address growing concerns about drinking water quality and risks from land use and climate change. The city has no formal decision making capacity but focused on investments in planning and monitoring.	Obstacles in shared decision making to enable IWRM due to lack of supporting legislation, unclear roles and mandates, and institutional arrangements. The city invested in water source protection initiative, which operates in a research and monitoring capacity, but not recognised as full partner in IWRM. Some progress has been made to create water management boards which can promote dialogue and management oversight at the basin and sub-basin levels.	No, but efforts to create watershed institutions are underway	+	+	−	+	+	+

TABLE 1. *Continued.*

No	Reference	Municipal area	Country	River governance issues	Multilevel INTERACTIONS	River basin organisation	MUNICIPAL ENABLERS					
							E1	E2	E3	E4	E5	E6
8	Chien and Hong (2018)	Kunming City	China	Examines the effectiveness and limitations of hierarchical governance of transboundary river governance to manage pollution and improve water quality. Offers understanding on how authoritarian states initiate their own forms of river governance through prefecture-level cadres, whose career advancement in the political party, depends on achieving specific river-related goals.	A distinct form of top down approach in hierarchical river governance through a single political party mechanism. Lower-ranking political cadres tasked with implementation of river quality management within their administrative jurisdictions, motivated by performance evaluations and career promotion. The territorial approach is effective in the single dimension of pollution improvement over the short term. It is only applied in regional rivers (crossing prefecture-level and county-level administrations within provinces) but not adopted in major rivers that run across multiple provinces.	Yes	+	+	+	+	−	−
9	Wilk et al. (2017)	Cochabamba	Bolivia	Explores perceptions and framings of urban water problems and solutions (e.g. industrial pollution, water and sanitation) in the context of multi-scalar governance. The existing urban water regimes consist of a mix of formalised services delivered by a privatised multinational corporation, water vendors, or local water committees, which are authorised grassroots organisations.	Municipality is blamed for and considered the central actor responsible for addressing urban water problems, yet they have limited capacity to manage wastewater and enforce sanctions against polluters. Multi-level IWRM coordination remains a rhetoric but lack concreteness for delivering technical solutions. The local political context, favoring privatised services, restrict collaboration and sharing of responsibilities across different actors.	Yes	+	+	+	−	−	+

TABLE 1. *Continued.*

No	Reference	Municipal area	Country	River governance issues	Multilevel INTERACTIONS	River basin organisation	MUNICIPAL ENABLERS					
							E1	E2	E3	E4	E5	E6
10	Plant et al. (2014)	Thau Territory (consist- ing of 22 munici- palities)	France	Exploring the role of knowledge brokers to connect top-down technocratic public policies and bottom up development projects to promote IWRM approach for protecting water quality and aquaculture productivity in the Thau lagoon, impacted by urban development, agricultural activities and domestic sewage.	The state government has established a zoning instrument to regulate land use allocation in urban planning by municipalities. The state and Thau's local authority created a multidisciplinary engineering structure as cross-sectoral coordinator and new governance mechanisms to share information and integrate resource planning. While some integration was achieved, there were barriers in gaining full electoral support for inter-municipal engagements to build a shared vision.	Yes	+	+	+	+	+	+
11	Lee and Choi (2012)	City of Incheon	South Korea	Explores the emergence of collaborative urban river governance to restore local streams in terms of ecological indicators, water quality, flood prevention and waterfront amenities.	New institutional arrangements i.e. the Stream Restoration Group, involving government officials, local NGOs, and experts, were established at the city level to facilitate policy making and implementation. A special ordinance was enacted to provide solid foundation for state and non-state partnerships that define roles, finance, and governance structure. The project was regarded as successful in establishing good river governance, facilitating consensus on goal setting, planning, and construction work. No indication of multilevel interaction with higher level governments.	Yes, but SPRG was initiated by local NGOs and the city government	+	+	+	+	+	+

TABLE 1. *Continued.*

No	Reference	Municipal area	Country	River governance issues	Multilevel INTERACTIONS	River basin organisation	MUNICIPAL ENABLERS					
							E1	E2	E3	E4	E5	E6
12	Fatch et al. (2010)	Three second-tier local government units (Makwe, Wabayi, Guyu)	Zimbabwe	Examines the operationalisation of IWRM approach at the local level with a focus on local participation in transboundary water resource management.	Top-down approach to basin governance through Technical Committee established by the state. Limited direct participation, where an avenue for participation is organised at the national level. The study found that local people's water management proposals at the ward and district levels follows the administrative boundaries where people live (not the basin hydrological boundaries). Second-tier municipalities provide an intermediary level for organising participation due to its relevant political administrative boundaries and larger territorial scope (avoiding too much fragmentation in managing water resources).	Yes	+	−	+	−	−	+
13	Geng et al. (2010)	Dalian and Yingkou cities	China	Assesses management challenges and barriers in operationalising an IWRM approach in small river basins at the municipal levels. The Biliu River crosses both Dalian and Yingkou municipalities. The municipalities have shared jurisdictions over the river and have stipulated their own regulations within their own regions. The upstream portion falls under the city of Yingkou, whereas the middle and downstream are under the city of Dalian.	Despite shared responsibilities over the river basin, there is no cross-regional watershed management committees to facilitate coordination. While each city has established water resource and environmental bureaus, these city agencies are not subordinate to one another and cannot play a leading role in watershed management. This leads to tensions and competition between the two regions. There is also a lack of public participation, where public have little access to planning and management processes.	No	+	+	+	−	−	+

TABLE 1. *Continued.*

No	Reference	Municipal area	Country	River governance issues	Multilevel INTERACTIONS	River basin organisation	MUNICIPAL ENABLERS					
							E1	E2	E3	E4	E5	E6
14	Moriarty et al. (2010)	Two towns (Qabatya city and Ehnasia city) and several villages	Egypt; Palestine; Jordan	Develops a 'light' IWRM approach specifically for use at the intermediate and local levels i.e. sub-national and sub-basin to facilitate communication, information-sharing, and negotiation between different water users. All the countries involved face poor water governance issues and lack provision of water services, especially to the poor.	In contrast to top-down IWRM package, the light IWRM aims to be pragmatic, problem-focused and adaptive. The emphasis of the process was on intermediate actors, primarily government technocrats from different water-related agencies. Observed were stronger stakeholder relationships: vertically between villages and towns and government ministries and horizontally between different water-user groups and different line ministries. The limitation is that decentralised authorities remain reliant on national level for funding, thus intermediate actors and local level need to navigate those multilevel relationships to secure resources.	Yes, but the platform is on the sub-national and sub-basin level focusing on water service users and providers	+	−	+	+	+	+
15	Evans and Varma (2009)	Rajshahi; Kurune-gala	Sri Lanka; Bangladesh	Reviews participatory action planning processes for managing urban wastewater for agricultural use amongst peri-urban farmers in two cities. The project utilised IWRM approach to improve interactions between stakeholders and improve decision making.	Participatory planning approach follows the model of 'light' IWRM to establish city-level learning platforms, consisting of multi-level stakeholders, government and non-government actors. It found that stakeholders were willing to cooperate but requires a great deal of external support for capacity building. At the implementation stage, collaboration tends to improve and take place within coalitions around specific activities. No indication of interactions with basin level processes.	Not reported	+	−	−	−	+	+

TABLE 1. *Continued.*

No	Reference	Municipal area	Country	River governance issues	Multilevel INTERACTIONS	River basin organisation	E1	E2	E3	E4	E5	E6
							MUNICIPAL ENABLERS					
16	Mashazi et al. (2019)	City of Johannes- burg and Ekurhu- leni	South Africa	Evaluates public perception, participation and attitudes towards water resource management in the Kaalspruit River to increase community-based management. The river flows through two municipalities.	Reveals that the majority surveyed are aware of the river's current state but far fewer acknowledge their role in river rehabilitation. However, the public appear to be willing to assist should the government make the initiative. No indication of multi-level interactions.	Not reported	+	−	−	−	−	+
17	Warner (2019)	Town of Hawley	USA	Shows how polarising environmental narratives co-evolve from norms and stewardships between different groups and shape an urban river governance process post-disaster. The case focuses on a town experiencing tropical storm and developing flood mitigation solution for the river.	Three different narratives (i.e. 'rivers must be restrained'; 'intervention in rivers should be selective'; and 'rivers must be free') emerged and co-evolved with different norms and perceptions held by different groups in the town. Each narrative offers different problem framings and influenced the preferred solutions. Over time, ideological divides developed and widen, creating polarization regarding how to manage the flooding issues.	Not reported	+	+	+	+	−	+

TABLE 1. *Continued.*

No	Reference	Municipal area	Country	River governance issues	Multilevel INTERACTIONS	River basin organisation	MUNICIPAL ENABLERS					
							E1	E2	E3	E4	E5	E6
18	Mitchell et al. (2014)	Municipalities in Ontario	Canada	Identifies lessons and opportunities of IWRM in Ontario through the performance of the conservation authorities working with provincial and municipal partners to plan and deliver watershed management programs.	The governance model blends top-down and bottom-up approaches to enable joint problem solving and address priorities amongst provincial and municipal governments. Municipal partners worked collaboratively with conservation authorities to address funding cut experienced by the latter. Provincial contributions are often made with non-traditional partners (e.g. Ministry of Culture, Tourism and Recreation). The conservation authorities have clear mandate with measurable objectives, clearly articulated roles and responsibilities for all participations, capacity to obtain financial and human resources and influence initiatives for water security.	Yes	+	+	+	+	−	+
19	Koop et al. (2017)	Amsterdam	Netherlands	Develops an integrated empirical framework to examine conditions determining urban governance capacity. The framework focuses on five challenges: (1) water scarcity, (2) flood risk, (3) wastewater treatment, (4) solid waste treatment, and (5) urban heat islands.	Enabling conditions identified include multilevel network, financial viability, and implementing capacity. These conditions are complemented with other conditions under 'knowing' and 'wanting', e.g. awareness, knowledge, learning, stakeholder engagement, management ambition, and agents of change. Amsterdam excels in flood risk governance, water scarcity and wastewater treatment, but less capacity for urban heat islands. The framework can provide a way for undertaking cross-city assessment.	Yes	+	+	+	+	+	+

TABLE 2. An orienting framework of municipal enablers for urban river governance.

Categories of enablers	General characteristics
(E1) Awareness	Awareness is rooted in subjective experience and underpins willingness and motivations to participate in river governance processes. It can encompass a range of cognitive and emotional drivers, e.g. consciousness of problems, mental models or worldviews, belief systems, concerns and dissatisfaction over existing solutions, meanings attached to rivers, a sense of identity, narratives and perceptions of crisis. Awareness can operate at an individual level but also at a group level. A widespread awareness of a common issue is typically advocated as a key enabler for local implementation.
(E2) Political and financial commitments	Political and financial commitments can drive local implementation by providing a stable and shared sense of direction and resources to undertake actions at the municipal level. Their characteristics vary from one political system to another. They may involve articulation of political discourse/vision, endorsement from political leaders, translation of political ambition into measurable targets, exercise of political control over the performance of lower-level governments, provision of financial incentives, clear allocation of government funding, cost-sharing agreements between government levels, innovative fundraising from other sectors and outside of governments, grassroots movements, and city government-initiated political actions.
(E3) Formal authorities	Authorities, in a formal sense, are associated with enforceable decisions made by governments at all levels. Authorities can stem from administrative, political, and institutional mandates. The exercise of authority varies from one political system to another. In authoritarian political systems, authorisation is allocated in a hierarchical manner to municipal governments, whereas in more democratic systems, tasks or responsibilities are devolved and municipal governments are more autonomous. Municipal governments can have the formal authorities to set water-related regulations, develop infrastructure and services. They may also have the authorities to issue warnings, impose sanctions, or even take criminal actions against polluters. Authorities can be embedded in laws, policies, and regulations that provide legitimacy to decisions and actions implemented to address river governance challenges at the municipal level. These formal instruments also play enabling roles as they provide a clear legal basis to control and enforce action at the municipal level. Some groups of influential actors may hold a more authoritative role than others.
(E4) Leaders and front-liners	Leaders and front-liners can provide strategic mobilisation of resources and various on-ground supports to drive local implementation at the municipal level. Leadership may be characterised by strategic skills to mobilise resources and steer actions. Front-liners may be distinguished by their more on-ground and operational roles (e.g. smaller scale direct interventions and onsite activities), which may go beyond a broad interpretation of leadership by strategic means. However, there may be overlap between the two, in the sense that strategic leaders may also take on operational roles. Leaders and front-liners can come from local governments, political parties, river basin authorities, technical agencies, non-government organisations, and community members. Leadership may take a more hierarchical form in the more authoritarian political system, whereas it may take on a more fluid and collaborative form in more democratic contexts, where the ability to influence actions may lie in trusted personas, informal relationships, and a balance of power between various government and non-government entities.

TABLE 2. *Continued.*

Categories of enablers	General characteristics
(E5) Boundary spanners	Boundary spanners are characterised as actors or organisations who work at the interface of multiple disciplines, groups, and stakeholders and build useful networks. They appear as trusted individuals who convey important messages between levels and groups, bridge the formal and informal efforts, open communication channels, share information, close the knowledge gap, and enhance collaboration. They can also play the role of integrating diverse expertise and mediating the science-policy-society interface. They build alliances and foster dialogues by employing various approaches, including through interdisciplinary team structures, creating a shared physical space to work together, organise public events, host community forums, prepare information for different audiences, facilitate participatory meetings/workshops, etc.
(E6) Community participation	Community participation is broadly characterised as the active involvement of community members, including through public consultation, direct interventions and service improvements, self-organised movements, providing lay expertise and indigenous knowledge, and driving political actions. Members of communities may include the public in a general sense, citizens or residents of a particular local area (e.g. municipalities, towns, riverbanks), local groups/associations, community-based organisations, marginalised groups, and indigenous communities. While community participation is important, who they are and how best they can be represented must be determined on a case-by-case basis, not prescribed from the outset. The level of participation is also likely determined by the prevailing political system. Communities are rarely a homogeneous set of actors. Inclusivity and diversity are key principles of participation—achieving a gender balance, for example, can diversify perspectives and enable more marginalised groups to contribute to river governance processes. Being mindful of power relations is critical, as community members do not necessarily stand on an equal playing field.

ness of pollution risks and contamination among communities (Twinomucunguzi et al., 2020); shared mental models/worldviews about what constitutes a 'problem' (Ostovar, 2019); meanings attached to rivers that increase the sense of place and ecological identity amongst citizens (Vall-Casas et al., 2021); mindsets about the function of the river amongst communities (Wicaksono, 2020); public dissatisfaction over worsening ecological degradation (Chien & Hong, 2018); shared concerns over water security issues (Whiten, 2019); and growing environmental awareness amongst residents (Lee & Choi, 2012).

Awareness-raising activities are frequently proposed to improve public participation (Ariyanti et al., 2020; Fatch et al., 2010; Geng et al., 2010); and change attitudes and behaviours (Koop et al., 2017; Mashazi et al., 2019). In a South Korean case, the following activities were established to promote residents' engagement and attract various social groups, e.g. river academy, river camps, environmental movie festivals, and environmental photo exhibitions (Lee & Choi, 2012). However, others caution that there is a tendency to propose awareness-raising as a *tried and tested* solution without adequately considering other potential solutions (Evans & Varma, 2009). It is noteworthy that the level of awareness may not equally translate to willingness *or* participation in implementing actions. For example, whilst community members are willing to assist in river restoration when requested by the government, they do not see this as their primary responsibility (Mashazi et al., 2019).

As awareness increases, it can have reinforcing and spillover effects. A sense of pride emerges among watershed residents and governments over their success in promoting the new collaborative approach (Mitchell et al., 2014). This positive emotion, in turn, mobilises more financial support from the municipalities. A strong sense of place may be developed through direct experience and contact with

the urban stream, including through leisure-based activities, interpersonal exchange amongst participants and volunteer activities; empathy was reinforced beyond the municipal boundaries where the activities were undertaken (Vall-Casas et al., 2021).

Awareness is rooted in subjective experience, including cognitive and emotional drivers (Koop et al., 2017). As more actors become involved, differing subjective worldviews tend to emerge. The difference in perspectives can influence the way stakeholders think about cause and effect and their preference for solutions (Ostovar, 2019). In the Town of Hawley, USA, residents and municipal officials were divided in their perceptions of how the river should be managed (Warner, 2019). Boundary objects in the form of spatial models or design artifacts, which contain mental and material representations, appear to play some roles in complementing verbal communication, as they allow actors to understand spatial relationships visually and create collective meaning (Plant et al., 2014). Perception of crisis, such as emergencies or extraordinary events, can also play an enabling role in influencing local authorities to take action (Wilk et al., 2017); used as a narrative strategy to legitimise the need for change (Warner, 2019); or engender a sense of urgency (Koop et al., 2017).

3.2. Political and financial commitments

Political and financial commitments emerge as an important enabler for river governance processes at the municipal level, as mentioned in 14 studies. We note a diversity of political systems influencing the urban river governance process differently across contexts. This underscores the importance of contextual factors in shaping the municipal enablers. Explicit and sustained commitments (e.g. from governments, party leaders, or community members) can provide direction and stability to local implementation. A study of river leaders at the prefecture level in China shows that political commitment by the national party was a key enabler for achieving water quality improvements and their performance is tied to financial incentives (Chien & Hong, 2018). In Singapore, research shows that the rapid implementation of infrastructure investments has been enabled by cabinet-level endorsement of integrated urban water strategies and guidance from political executives, which promote cross-agency coordination (Jensen & Nair, 2019). Like the Chinese case, performance monitoring

of the water agency is tied to clear intermediate targets. By contrast, in Hong Kong, where targets and performance indicators are not as well specified, the pace of investments has been slower (Jensen & Nair, 2019). This shows that the exercise of political control is often hand-in-hand with the capacity to mobilise financial resources for implementing actions.

Whilst the examples above highlight the role of state actors at the national level, other cases indicate that political and financial commitments may be demonstrated by community members, city-level governments and the private sector. The City of Dalian in China has set up a water-saving fund that has been used to subsidise water-saving initiatives, including supporting research, purchasing water-saving equipment and supporting awareness-raising programmes (Geng et al., 2010). The Incheon urban river restoration case shows that local NGOs could lock in political commitments by launching civil movements, which subsequently achieved a breakthrough partnership with the city government and experts (Lee & Choi, 2012). A special ordinance was enacted to grant the river restoration group an independent political and financial status. This arrangement was set up to overcome the risk of discontinuous political support, common to more democratised governance contexts, associated with the election cycles. We also identify examples of innovative and non-traditional funding sources. The water conservation authorities in Ontario pivoted towards new sources of revenue through partnerships with the tourism sector, municipal levies, new hydropower ventures and fundraising from charitable foundations. In Peru, the RBO has designed a fund to raise contributions from private entities (Ostovar, 2019).

3.3. Formal authorities

Authorities can be embedded in policy, law and regulations that provide legitimacy to decisions on how to address water challenges (Koop et al., 2017). Laws and regulations can provide a legal basis to control and enforce actions at the municipal level. The enabling role of national laws is clear in these subsequent cases. In Ontario, the passage of the Conservation Authorities Act saw many municipalities partnering with conservation authorities (Mitchell et al., 2014). In the US, the enforcement of the Rivers Protection Act has largely created a shift from the dominant traditional flood management approach towards the protection and stewardship

of rivers (Warner, 2019). In a more hierarchical system, a single agency can provide "deeper institutionalisation of IUWM, clear objectives and a strong monitoring and evaluation framework, alongside a clear allocation of authority may lead to more rapid and significant improvements in performance" (Jensen & Nair, 2019: 14).

By contrast, in less hierarchical systems, the interconnectedness of river governance processes means that no single agency can have the final say or enough authoritative power to enforce implementation. Multiple organisations may work relatively autonomously from one another to tackle common problems. The responsibility of implementing actions may be devolved to municipal governments, e.g. local authorities, to undertake physical and infrastructure improvements along the riverbank (Wicaksono, 2020) to issue warnings, impose sanctions, or even take criminal action against polluters (Geng et al., 2010). Municipal officials could struggle to exercise their authority in the context of administrative ambiguities and technical shortcomings. Inter-municipal cooperation over a shared river basin might also suffer because each municipal jurisdiction is autonomously governed, creating tensions and competition between upstream and downstream cities (Geng et al., 2010). Through an action research approach, Moriarty et al. (2010) show that it was possible to increase the capacity of mid-level bureaucrats—engineers, planners and administrators at the sharp end of service delivery to participate in more strategic issues and decision-making. Others suggest that complementing basin-level organisations, which are based on hydrological boundaries, with district-level forums that derive their authorities from political administrative boundaries may help overcome the difficulty in linking cross-level activities (Fatch et al., 2010).

3.4. Leaders and front-liners

Many papers (13 out of 19) suggest the enabling role of leaders and front-liners to provide strategic and on-ground support to drive policy implementation at the municipal level. Leadership is a broad category that may be characterised by strategic skills to mobilise resources and steer actions (Koop et al., 2017). In distinguishing front-liners, we also capture the on-ground and operational works done by municipal-level actors to enable implementation, which may go beyond leadership by strategic means. However, there may be an overlap between

the two, in the sense that strategic leaders may also take on on-ground roles. The cases show that leaders and front-liners can come from various agencies and backgrounds. This contrasts with the traditional emphasis on the river basin authorities and water professionals, particularly engineers, as the dominant figure in the sector.

Leadership by party cadres at the prefecture level in the case of river pollution control in China was a crucial mechanism for achieving short-term outcomes (Chien & Hong, 2018). The river leaders, who have been directly appointed by the Chinese Communist Party, may face political demotion if they underperform, i.e. their career advancement is tied to water quality outcomes. The hierarchical structure also appears effective in the case of Singapore, where public officials in the water authority have clear performance-based incentives (Jensen & Nair, 2019). In other contexts, leadership appears more fluid. In Indonesia, the RBO can transfer their leadership to other agencies, such as a disaster management agency in an emergency (Ariyanti et al., 2020).

Community members can play an important frontline role in river governance processes by leading smaller-scale direct interventions. Not only can they mobilise like-minded people by word of mouth, but citizen custodians also work at the front line in the stream (Vall-Casas et al., 2021). Led by an activist-academic, communities can help monitor the river condition and strengthen communication to reach upstream and downstream communities (Ariyanti et al., 2020). The role of informal champions, e.g. traditional leaders, community elders, and unregistered water providers and users, is noted as important but largely overlooked by the water reform in the African context (Twinomucunguzi et al., 2020).

Leadership can also be exhibited by city governments. The City authority in Dawson Creek, Canada, played a key role in initiating the re-engagement of all stakeholders, including all levels of government and First Nations (Whiten, 2019). The city was still able to develop some strategic actions, e.g. focusing investment in water research programmes, to build their planning and implementation capacity (Whiten, 2019). Municipal governments work at the front line together with local NGOs in the Incheon, South Korea case to construct waterfront parks along urban streams (Lee & Choi, 2012). There is a sense that leadership is shared in this case,

as decision-making involves a balance of power between government and non-government entities.

3.5. Boundary spanners

Boundary spanners i.e., actors or organisations who work at the interface of multiple disciplines, groups and stakeholders and build useful networks, are found as enablers at the municipal level in several studies. These actors appear as trusted individuals who "convey important messages and hint at priorities for action, they can also secure government sponsorship" (Ariyanti et al., 2020). Local academics play enabling roles as "whisperers", bridging the formal and informal efforts at the municipal level, and host community forums to share information between groups and raise awareness of issues. Learning alliances at the municipal level can be formed to drive local implementation (Evans & Varma, 2009; Moriarty et al., 2010).

Interdisciplinary teams deliberately structured to bring in many perspectives, including engineering and other disciplines, have been put forward as potentially useful (Mitchell et al., 2014; Plant et al., 2014). Whiten (2019) reports that the City of Dawson Creek has focused on employing interdisciplinary methods to develop regional workshops and field tours that contributed to the emergence of a shared research agenda and partnerships for best practice projects. An interdisciplinary team structure was also utilised in Ontario (Mitchell et al., 2014). A multidisciplinary team, led by engineers who partner with various stakeholders, was formed in the Thau Territory, France (Plant et al., 2014). There, the engineering team frequently interacted with technicians from different sub-catchments and municipality levels to build a sense of collaboration and vision towards achieving an eco-territory. To enhance a sense of collaboration, these boundary spanners worked in the same building; they worked on preparing information and syntheses for different audiences (politicians, state engineers, stakeholders and local population); they also organised public exhibitions and debates for water-related events (Plant et al., 2014). Skilled facilitators, with technical and non-technical backgrounds, were key in building the alliance and dialogue (Moriarty et al., 2010; Plant et al., 2014).

3.6. Community participation

Community participation has been well recognised in the water governance literature as a key enabler for various reasons (Koop et al., 2017). Most studies we reviewed affirm this perspective. While community participation is important, *who* they are and *how* they manifest must be determined on a case-by-case basis, not prescribed from the outset. Communities are rarely a homogenous set of actors—there may be significant differences in knowledge, awareness, motivations and capacity to be involved across various groups. It has been suggested that the study of community participation at the municipal level must be mindful of barriers and underlying issues such as the relative power relations within communities and gender relations (Fatch et al., 2010). Vall-Casas et al. (2021) report that citizen involvement through local volunteer groups appears to be associated with better gender balance than through an institutional recruitment method based on a deductive mapping by influential stakeholders (e.g., the water agency).

Self-organisation and direct intervention emerge as key drivers for urban river restoration. Local volunteers—traditionally overlooked by the dominant water sector actors—engage in so-called 'virtuous' practices, including maintenance and improvement (e.g., litter picking, tree planting); political advocacy; environmental awareness raising; knowledge co-creation and monitoring (Vall-Casas et al., 2021). The role of riverbank communities was similarly critical in Indonesian urban rivers through self-help funding schemes, monitoring of rivers, public outreach and communication with communities upstream and downstream, and riverside conservation movements (Ariyanti et al., 2020; Wicaksono, 2020). The Indonesian value of *gotong royong*, i.e. the spirit of mutual help, as well as local knowledge about water management practices, were noted as important in realising the integration of informal activities at the municipal level.

The recognition and involvement of the First Nation communities are featured as an important enabler (Mitchell et al., 2014; Whiten, 2019). First Nations peoples were engaged in regional environmental agreements, including watershed planning (Whiten, 2019) and represented in water resources committees (Mitchell et al., 2014). In Cochabamba, Bolivia, authorised local grassroots organisations were established to manage water services to neighbourhoods in response to the absence of state or municipal water services (Wilk et al., 2017). Whilst self-organisation is important, leadership support (from RBOs), appears to reduce hurdles for communities to participate (e.g. those living far from where meetings were held, daily responsibilities, language barriers, and limited funds to travel) and attract

partnerships with well-respected NGOs to manage and implement actions (Ostovar, 2019).

Communities can also put their weight behind political movements. Urban residents in South Korea started a "civil movement to revitalise local streams in 1997", which was achieved through "a series of campaigns" (Lee & Choi, 2012). This movement was successful in creating a breakthrough multistakeholder partnership at the municipal level. Another study of river politics reports that pro-conservation members of the community managed to stage intra-community protests and petition the state government to enforce regulatory oversight, thus reversing river channelisation by traditionalist members of communities (Warner, 2019). Community members appear to be actively influencing decision-making at the town and state levels, and there were essentially 'two [opposing] communities in one space' (Warner, 2019).

4. DISCUSSION AND CONCLUDING REMARKS

In characterising municipal enablers, our research contributes to an embryonic field of urban river governance. We provide an orienting framework that helps characterise municipal enablers to advance thinking on this topic both in academic and practical terms. Employing an exploratory approach to our review, our intent is to identify starting points and offer case-based illustrations that can guide future studies to advance this topic through a more comprehensive review or comparative empirical research. Next, we discuss the potential utility, value and limitations of our findings.

Our review identifies some generalisable municipal enablers for local implementation across different contexts, emphasising the plural sociopolitical roles of various state and non-state actors, which may be missed when taking a basin view. It is worth emphasising that river governance processes cannot be reduced to a mechanistic exercise of identifying and putting these enablers together to solve techno-managerial problems within a given municipal area. If anything, our review reaffirms the importance of paying serious attention to place-based urban river governance processes that shape local implementation capacities (Novalia et al., 2024). The local embedding of the enablers and their interdependencies suggests that a deep understanding of contextual conditions is necessary for activating these enablers in practice.

Importantly, we note that while identifying the enablers at the municipal level is crucial, it is worth emphasising that urban river governance typically occurs in the context of multi-level interactions. Our review shows that vertical and horizontal coordination emerge as common themes in many contexts (see Table 1) and that a blend of top-down and bottom-up approaches in urban river governance is not uncommon. While municipal authorities primarily implement actions at the local level, interactions with higher level institutions can help generate more resources and contribute to joint decision-making across municipal boundaries. For example, in a Canadian case, a basin-level organisation partners with municipal governments to address funding cuts (at the provincial level) to facilitate water conservation (Mitchell et al., 2014), while in a South Korean case, the city governments formalised partnerships with community-led groups to restore urban streams (Lee & Choi, 2012). Interestingly, some studies offer more critical reflections of the poor municipal capacity in dealing with river governance issues (e.g. Geng et al., 2010; Moriarty et al., 2010; Wilk et al., 2017), highlighting the absence of key enablers.

The cases reviewed consist of a range of political systems representing many regions around the globe. The cases show that under some political regimes, enablers for local implementation were more likely associated with the state authorities—exercised in a classic top-down manner through a single water agency (such as Singapore) or a single political party's leadership (shown in the Chinese cases), reinforced with a performance-based financial incentive system. While this top-down approach enables more effective coordination and implementation, public participation in urban water governance tends to be lacking. By contrast, in more decentralised contexts, such as South Korea, the USA, Canada, Indonesia, Bolivia and Spain, there were noteworthy examples of self-organisations, bottom-up movements and local partnerships, involving residents, NGOs, community-based organisations, municipal officials and council members. These enablers appear instrumental in urban river governance, from driving strategic policymaking and planning decisions to facilitating direct physical interventions in river restoration and the provision of alternative water services. We acknowledge a diversity of political systems worldwide, so this observation does not imply that one political system is better than another (although a normative standpoint can always be made), but simply suggests that the municipal enablers are conditioned by the

broader political contexts. More research is needed to improve our analytical capabilities in studying the range of enablers for better urban river governance under different political systems.

The relationships between the enablers are not clear-cut with interdependencies between categories. Awareness seems to presuppose community participation, and more generally, actors' inclination to take active roles in river governance. Leadership can reinforce other enablers by mobilising political and financial commitments, removing barriers to community participation, and establishing and enforcing rules. Boundary spanners can spread awareness, connect different actors, and leverage resources from different levels. Given the exploratory nature of the review, we can only provide high-level reflections on the relationships between these enablers. We recommend that future research, involving primary case research and comparative approaches, explore in greater depth the relative importance of these enablers in diverse contexts and develop explanations regarding their interdependencies in practice. Additionally, given the limited number of studies included in our review and the keyword-driven method we employed, it is possible that other potential enablers could have been missed as a result. Since we conducted our review in 2021, the field of urban river governance has expanded. Future research can therefore improve upon the methodological limitations of this review with more systematic approaches and expanded search terms and periods that could capture the growing and diverse bodies of urban river literature.

Notwithstanding the above limitations, we believe that our study provides sufficiently robust illustrations of what municipal enablers might look like across contexts. For example, a recent publication on urban stream restoration in Colombian cities confirms the importance of embedding this objective into metropolitan and local planning policies, engaging citizens, while highlighting a shifting perception towards valuing urban rivers in terms of nature-based solutions and their ecosystem services (Pradilla & Hack, 2024). A recent systematic review of urban river recovery literature also confirms that successful measures were mainly related to strong formal legislation and its implementation, exemplified by the EU Water Framework Directive and the Clean Water Act in the USA (Silva et al., 2024). It also highlights the significance of public participation and trust-based relationships between government agencies and the population in the river recovery processes.

Whilst the categories of enablers we identified are not definitive, they provide analytical starting points that can be further tested and refined in future reviews and empirical studies. Because of the variability of geographical contexts (and lack of access to primary data of the individual research), it is not possible to generalise whether some enablers are more important than others; or if the presence/absence of certain enablers indicate *sufficient* conditions for enhancing implementation and engendering legitimacy of river governance processes at the municipal level. Our exploratory review paves a way forward for grounding more comprehensive reviews and in-depth primary research on municipal enablers, their manifestations, and interactions in influencing urban river governance.

Whilst beyond the scope of this paper to test, the orienting framework has the potential to be employed as an evaluative tool in action-oriented and participatory settings, which can help foster critical reflection, learning and collaboration for tackling complex urban river challenges. There is emerging evidence that action research, including the formation of learning alliances and the visioning process, could help enhance local outcomes (Colvin et al., 2009; Evans & Varma, 2009; Fatch et al., 2010; Moriarty et al., 2010; Plant et al., 2014). To this end, the categories of enablers may be utilised to promote dialogues and reflections amongst stakeholders to better grasp the local implementation capabilities and offer a productive way to develop tailored recommendations at the municipal level. We also recommend future studies to co-develop the operationalisation of these categories with decision-makers to guide river governance processes.

Contemporary river governance has focused on establishing formal structures for multi-level coordination at a bioregional scale but offers limited insights into the urban contexts and the associated roles and arrangements that promote local implementation. To fill this gap, our review illustrates a suite of interrelated enablers drawing from urban river cases across the globe, including awareness, political and financial commitments, formal authorities, leaders and front-liners, boundary spanners, and community participation. The proposed categories, whilst non-exhaustive, can serve as starting points to unpack the plurality of enablers at the municipal level, which complements

the traditional basin-level perspective. In doing so, our research contributes to advancing the studies of municipalities and their roles in urban river transformations.

5. ACKNOWLEDGEMENTS

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