‘Taming’ a wicked problem: Selective problematisation of issues of urban water supply in Mumbai

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Abstract:

The lack of universal urban water access in the cities in the global south is a wicked problem. Using the case of Mumbai, this paper illustrates how consistently this wicked problem was chiselled and selectively problematised to turn it into a tame problem—a problem of water shortages at the city level. The chiselling included neglecting the essential aspects of urban water supply, such as supply coverage, pressure, and leakages, which define the quality of urban water service received by citizens. Through chiselling and selective problematisation, the paper illustrates how the problem of providing universal urban water access in Mumbai was ignored for decades and the issues of water shortages were emphasised alone to justify and prioritise the development of dams.

Keywords: wicked problems, tame problems, urban water supply, dams, Mumbai

1. Introduction

While critically examining the performance of social policy programs and discussing the limitations of technical-rational approach, Rittel and Webber (1973) categorised certain policy problems as 'wicked problems' which are complex, dynamic, lack definitive formulation and solutions, linked with larger problems, influenced by multiple and diverging perspectives, do not have an 'end point' as to know when the problem is resolved, and lack a definite cause-effect relationship (Churchman, 1967; Rittel and Webber, 1973). In recent decades, the concept of a wicked problem has been widely used to analyse policy problems, as it provides additional insights and equips analysts with new questions (Head, 2010b). The water related policy problems such as lack of universal urban water access, especially in cities in the global south, are increasingly recognised as wicked problems (Markowska et al., 2020; Smith and Porter, 2010; Head, 2010b; Quentin Grafton, 2017; Lach et al., 2005).

This wickedness is mainly due to twofold complexities associated with water, which are interconnected and difficult to segregate. The first complexity is associated with the physical system of water that involves water stocks and flows and includes several interconnected factors and processes governed by multiple climatic, topographic, and hydrogeological parameters, often not fully known. The unpredictability and nonlinearity associated with water availability further complicates the water related problems. The second fold of the complexity is associated with the interconnections between water and social system involving multiple social aspects and heterogeneous human actors with varying values, perceptions, interests, attitudes, judgements, ideologies, knowledge base, and power dealing with water (Pahl-Wostl, 2007; Hearnshaw et al., 2011). The influence of social aspects such as class, ethnicity, political patronage, land tenure, power relations, and global processes of economic and political reconfiguration on access to water in cities in the global south is widely documented (Kooy and Bakker, 2008; Graham et al., 2015). These social aspects influencing water access are rooted elsewhere with other social problems and are difficult to trace.

Additionally, in the context of cities in the global south, water related policy problems are part of a larger and weak social and political system characterised by a 'quasi' or 'fragile' state with a weak government, lack of transparency and accountability, low adaptive capacity, and politically interfered judiciary, which adds a layer of additional complexity in understanding and addressing these problems (Brinkerhoff, 2016; McCandless, 2013).

Therefore, providing universal urban water access, which is one of the main water policy problems faced by developing countries like India, becomes a wicked problem embedded in complex, dynamic, and unstable physical and social systems involving several sub-systems, factors, actors, and decision-makers. The cause-effect relationships existing in such complex systems are not adequately known. Moreover, the scale of the problem is very difficult to define and the problem is linked with larger problems, which might be another wicked problem (e.g., poverty or climate change). Additionally, the problem has multiple dimensions, including infrastructural (e.g., universal coverage, ageing, and maintenance of the distribution network), organisational (e.g., cost recovery and reducing non-revenue water), and socio-economic and political (e.g., access, affordability, and equity), which are interlinked and increase the complexity of the problem (Alda-Vidal et al., 2018; Coutard, 2008; Boakye-Ansah et al., 2016; Tiwale, 2019). As a result, resolving this wicked problem of providing universal urban water access demands a nuanced understanding of multiple dimensions of the problem in a given context.

However, while addressing the wicked problem of providing universal urban water access, often the proposed solutions, such as urban water reforms, private sector participation, and construction of large dams, prescribed by the experts are techno-managerial in nature. These solutions do not take cognisance of the root causes of the problems lying at various socio-political levels with historical linkages and often neglect their path dependency character (Fuest and Haffner, 2007; Hirvi and Whitfield, 2015). For example, Biswas and Tortajada (2018) argue that planners and engineers are preoccupied with the physical water scarcity in the context of domestic water supply and neglect other crucial aspects (such as quality of water delivered). The diagnosis of urban water reforms that were introduced to improve the conditions of urban water services in the cities in the global south indicates that the reforms were prescribed without understanding the wicked nature of the urban water issues, including local social and political complexity (Suleiman and Khakee, 2017; Dagdeviren, 2008). As a result, in such situations, the proposed solutions aggravate the problem instead of resolving the same (Gustafsson and Koku, 2007).

Therefore, it is essential to examine how wicked problems are diagnosed in practice and how this diagnosis leads to the problematisation of wicked problems in a specific manner that directs towards the proposed solution. In the context of urban water supply, how water supply issues are diagnosed and problematised is not adequately studied, except for studies investigating the prescriptive approach of urban water reforms (Bakker, 2013; Whitfield, 2006). Using the case

of Mumbai, this paper advances the understanding of the problematisation of the wicked problem of providing universal urban water access. This paper argues that the problem of providing universal urban water access in Mumbai is a wicked problem and the official agencies consistently made efforts to chisel this wicked problem into a tame problem—the problem of water shortages at the city level—through selective problematisation.

In the context of this paper, chiselling means reducing the problem to a suitable version through selecting only certain aspects of the problem, neglecting or not recognising other aspects, and portraying the selected version as the only problem to be solved. While explaining the chiselling process in this case, this paper illustrates the critical issues of the water supply of Mumbai, such as poor coverage, inadequate access, and inequitable distribution of water, were neglected.

This paper followed a method of document analysis supplemented with the analysis of the primary data obtained through semi-structured interviews. The documents problematising the water issues of Mumbai were analysed. These documents were mainly prepared by the Brihanmumbai Municipal Corporation (BMC)[1], Mumbai Metropolitan Region Development Authority (MMRDA), international financial institutions, and other experts. These documents included regional plans, city development plans, a master plan for city water supply, and detailed project reports, appraisal reports, and feasibility reports of major infrastructural projects undertaken to improve the water supply of the city. Additionally, eighteen extended semi-structured interviews were conducted with senior officials working in the water supply department of BMC (6), experts (8), academicians (2), and activists (2).

The following section provides a succinct review of the characteristics of wicked and tame problems, followed by a section describing, in brief, the wicked nature of the problem of providing universal urban water access in Mumbai. The subsequent section illustrates how the wicked problem of providing universal urban water access in Mumbai was chiselled through selective problematisation as a problem of water shortages at the city level, followed by a discussion and conclusion.

[1] Before renaming Bombay as Mumbai in 1996, it was known as Bombay Municipal Corporation (BMC). It is also referred as Municipal Corporation of Greater Mumbai (MCGM).

2. Wicked and tame problems

This section reviews the literature describing the wicked and tame problem and illustrates that addressing the problem of water shortages at the city level is a tame problem.

2.1. Understanding wicked problems

The wicked problems, also referred to as 'ill-formulated' problems (Churchman, 1967) and as a 'mess' (Ackoff, 1974), are open-ended, unpredictable, interdependent and nested, intractable, and incorrigible (Duckett et al., 2016; Simbolan and McIntyre-Mills, 2019; Head and Alford, 2015). These problems are associated with multiple stakeholders and are grounded in divergent and often conflicting values, perceptions, aspirations, expectations, knowledge levels, personal interests, ideologies, and cultural aspects. As a result, wicked problems are inherently resistant to clear problem definitions and agreed legitimate solutions, as judgements about the solutions widely differ among stakeholders (Kharel et al., 2019; Suleiman and Khakee, 2017). In addition to divergent and clashing views, wickedness is also associated with institutional structure and processes, including power, authority, and procedural rules (Head, 2010b).

The wicked problems are unstable and the nature of the problem and understanding gained about the problem is constantly changing and evolving in a given context (Fallon et al., 2021). The knowledge base required to define and resolve these problems is weak, fragmented, and contested (Head, 2010b). The problems involve technical and social complexity and challenges associated with coordinating contending stakeholders, disparate information, and diverse activities. Due to ambiguous causal linkages across actors and sectors, the adopted solution can generate waves of undesirable consequences that can be wicked in nature (Suleiman and Khakee, 2017).

While implementing the adopted solution, the wicked nature of the problem offers little or no space for a trial-and-error approach, as revising earlier decisions invites another set of problems (Kharel et al., 2019). Moreover, the adopted solution and associated social context constantly reshape each other, making wicked problems more complicated (Markowska et al., 2020; Duckett et al., 2016).

2.2. Understanding tame problem

The tame or benign problems, in contrast to wicked problems, are definable and solvable using existing disciplinary expertise, authority, and resources, and their solutions are verifiable

through approved methods (Lach et al., 2005; Head, 2019; Fallon et al., 2021). The problems tackled by the science and engineering approach are tame as the logical elements of such finite problems are definable and solutions are verifiable (Head, 2010a; Head and Alford, 2015). The problem of urban water shortages at the city level is one such tame problem, as described below.

Addressing urban water shortages at the city level: A tame problem

Urban water shortages at the city level are defined as the demand-supply gap where water supply capacity is compared against the water demand estimated at the city level. In this case, the procedure of measuring the water supply capacity of the surface water or groundwater sources and estimating domestic and non-domestic water demand at the city level is precise and well-defined (Mays, 2000). Therefore, the problem of water shortages at the city level, often expressed in numbers, is a well-defined problem that engineers can assess, albeit with some uncertainty. This approach frames water supply as a 'quantity' issue (Maria, 2008) and demands the development of new water resources as a logical solution supporting a “supply-side hydrology” (D'Souza, 2003) or a “state-hydraulic paradigm” (Bakker, 2005).

In the context of India, the evidence indicates that as cities grow, they depend more and more on large and distant reservoirs and the increased use of reservoirs assures a higher level of per capita supply to cities (Mukherjee et al., 2010). A global survey of large cities reveals that around 75.5% of urban water comes from surface water sources and around 78% of the urban population primarily depends on surface water to meet their daily demand. Around 12% of the world’s large cities use inter-basin transfers to quench their thirst (McDonald et al., 2014). Urban water shortages are also managed by employing demand management practices; however, it is not a popular approach, particularly in cities in the global south (Garrick et al., 2019; Molle, 2003; Shi et al., 2021).

Thus, the problem of urban water shortages at the city level is addressed by constructing dams or inter-basin transfers, which are preferred and established solutions employed by planners and engineers multiple times in different cities worldwide. These solutions, to some extent, are standardised and can be implemented using existing disciplinary knowledge of civil engineering, authority, and required resources. The stages involved in this problem solving, such as studying the hydrology of the basin, including the accounting of return flows, estimating available water resources, determining the size of the dam, deciding the type of dam, constructing and commissioning the dam, and designing and executing inter-basin transfer, are

clearly defined and documented. These stages are integrated into the curriculum of water supply engineers, and accordingly, engineers are trained to resolve this problem. The elements essential to execute the solution, for example, knowledge base (e.g., construction of large-scale infrastructure), trained human resources (e.g., planners, engineers, consultants, contractors, and skilled workers), and financial instruments needed to raise required capital (e.g., soft loans), are known.

Therefore, the problem of water shortages is a tame problem as it is feasible to solve by constructing a dam or inter-basin transfer. However, we acknowledge several other context-specific complex socio-economic and environmental issues associated with dams and inter-basin transfers, such as displacement, submergence of sensitive ecosystem, and adverse impacts on freshwater ecology and connected livelihoods. Studies show that in the context of developing countries, these issues are neglected, not recognised, or denied by the authorities (Nayak, 2010; McCully, 2001; Nüsser, 2014) to ensure that the tame problem of water shortages remains 'solvable' by using existing disciplinary knowledge of engineering.

Considering these attributes of the wicked and tame problems, it is necessary to distinguish the wicked vis-à-vis tame policy problems and acknowledge the disciplinary limitations of technology-based approaches of problem-solving while addressing the wicked problems. The wicked problems demand non-standard measures for managing and coping with such chaotic problems (Head, 2010b). Some of these non-standard measures include the involvement of multiple disciplines and significant engagement with stakeholders following a bottom-up approach involving dialogue, deliberation, mediation, and conflict resolution that improves the assessment of the problem and facilitates workable consensus and the adoption of well-informed and cooperative solutions (Thompson and Whyte, 2012; Duckett et al., 2016; Fallon et al., 2021; Daviter, 2019).

However, as this paper illustrates, while tackling a wicked problem, the traditional technology-based approach is often followed. The wicked problem of providing universal urban water access in Mumbai is chiselled into a tame problem—the problem of water shortages at the city level—through selective problematisation to make the problem amenable to technological fixes—a water supply dam—as a solution to the tame problem.

3. Water supply in Mumbai: A wicked problem

Providing universal urban water access in Mumbai is a challenge due to several political and infrastructure related issues accumulated over decades, which are widely documented by scholars. A significant population in the city, especially those living in the slums, is suffering due to inadequate access, low pressure, insufficient hours of supply, inappropriate timings, and not reliable supply (Subbaraman et al., 2013; Karn and Harada, 2002). Around two million people are estimated to be not connected to the formal water supply and access water through alternative means (Bhosle, 2021). In some pockets, slum residents consume as low as 20 litres per capita per day (lpcd) (Subbaraman et al., 2015).

The access to water in Mumbai is inequitable and it is influenced by multiple actors having divergent interests, including engineers, planners, consultants, financial institutions, plumbers, elected representatives, political leaders, NGOs, and the dominant middle class of the city and its perception towards slum residents (Bhardwaj, 2013; Bawa, 2011; Anand, 2017; Bapat and Agarwal, 2003). Additionally, this inequity in water access is linked to several social factors, including land tenure and ownership, the approach of the state towards informal housing, class, ethnicity, religion, power relation, and political patronage (Graham et al., 2013; Subbaraman and Murthy, 2015; Wissink, 2013; Gandy, 2008). Moreover, how these social factors precisely influence water access and inequity in Mumbai in terms of a one-to-one cause-effect relationship is not known. This inequity in water distribution is historical and embedded in the distribution network since the inception of the first piped water supply scheme commissioned for the city during colonial times in 1860 (Tiwale, 2021). This historical background, social factors, multiple actors with divergent interests, knowledge base, and perspectives, and unclear cause-effect relationships among these social factors and actors make the problem of universal urban water access in Mumbai a wicked problem. This wicked problem is linked with other larger problems, such as poverty, migration, and the growth of informal settlements in Mumbai, which are themselves wicked in nature (Mahdi and Mazumder, 2023; Spicker, 2016).

Furthermore, the water distribution network in Mumbai is old, leaky, deteriorated, un-mapped, messy with several cross-connections, and haphazardly extended, leading to several operation and management issues (Björkman, 2014; Anand, 2017). The lack of maintenance and rehabilitation of the distribution network has resulted in low pressure, limitations in the extension of the network, and insufficient service hours (MCGM, 2018; MCGM, 2009). Due

to the absence of sophisticated hydraulic modelling and updated network mapping, the functioning of the distribution network is not fully known.

This condition of water infrastructure and lack of information about its functioning further increase the wickedness of the water supply problem. Therefore, the water supply issues in Mumbai are wicked in nature and not amenable to technological fixes alone.

4. Chiselling and taming through selective problematisation

This section describes, historically, how the wicked problem of universal urban water access in Mumbai was chiselled through selective problematisation to turn it into a tame problem. The evidence suggests that the problem of universal urban water access in Mumbai was consistently chiselled by neglecting various crucial aspects of this problem. These neglected aspects mainly include the complex issues of water distribution, such as service coverage, pressure, leakages, and hours, timings, and reliability of supply within the city. These neglected aspects define the quality of water supply service citizens receive at their premises.

After chiselling, the issue of universal urban water access was selectively problematised as the problem of water shortages at the city level—a tame problem. As explained earlier, this is a well-defined problem that engineers can address by employing standardised solutions such as constructing a dam or inter-basin transfer using their disciplinary knowledge, required resources, and authority.

To illustrate how the issue of universal urban water access in Mumbai was chiselled historically through selective problematisation as the problem of water shortages at the city level, this section analyses two regional plans and an appraisal report of Phase II of the Bombay Water Supply and Sewerage Project (BWSSP), as described below. The BWSSP is so far the largest project implemented by the water supply department of BMC to augment the water supply of the city in collaboration with the World Bank. This analysis indicates that while preparing a regional plan and planning large-scale projects, the elements and dimensions of the problem of providing universal urban water access in Mumbai, other than water shortages, were not acknowledged, and if acknowledged, they were not addressed at the implementation stage.

Example 1: Regional plan for Bombay Metropolitan Region 1970-91

In 1974, the Bombay Metropolitan Region Planning Board (1974) released the first regional plan assessing several urban issues of Mumbai and the metropolitan region, including water supply. The plan assessed the total quantity of water supplied, total water demand, and per

capita availability of water at the city level (p. 66). Based on these figures, the plan calculated the water demand-supply gap at the city level, concluded the shortage of water for the city of Mumbai as the only problem, and recommended developing new water resources as a policy solution. However, as discussed below, the plan did not discuss the status of the water supply within the city or issues of water distribution, such as service coverage, access, leakages, and inequity.

The plan assessed the water supply status of Mumbai at the city level and noted that the situation was *miserable* as Mumbai was receiving only a gross 182 lpcd (40 gpcd[2]) at the city level in 1968. The planners concluded that Mumbai needs 227 lpcd (50 gpcd) for domestic use alone and 341 lpcd (75 gpcd) to cover all water uses. Based on these prescribed per capita standards, the planners recommended developing new water resources to overcome the claimed shortages experienced by Mumbai.

However, in the 'Housing' section and not in the 'Water Supply' section of the same regional plan, planners recorded the following observations about the access to water in the slums of Mumbai,

> The recent enumeration of hutment slums made by the Bombay Municipal Corporation indicates that there are over 81 hectares of concentration of zopadpatties [slum] which altogether contain 1,08,273 huts accommodating 6,31,888 persons. It is shocking knowledge that this population of over 6 lacs[3] has amongst themselves only 1353 WCs and 482 water taps. The vast number of people who do not afford the luxury of even a zopada [shanty or shack] are not included in the above enumeration.
>
> - Bombay Metropolitan Region Planning Board (1974: 62)

As per this excerpt, planners were shocked to note that in slums, one water tap is shared by an average 1311 persons. So, for the population living in the slum, it was not possible to fetch and consume the available supply of 182 lpcd or 227 lpcd as desired by planners. The per capita consumption of piped water in slums was significantly low due to shared connections, limited and inconvenient supply hours, and inadequate pressure. The planners also noted that a vast

[2] gpcd: gallons per capita per day; 1 Imperial gallon = 4.546 litre
[3] Lac or lakh means hundred thousand; 1 lac (lakh) = 100,000

number of people could not afford a shanty in the slum. So, it can be fairly assumed that the planners were clear that the piped water was not at all accessible to this vast majority of the population.

Additionally, as per the record, in 1971, the water supply coverage was only 80%, and 20% of the population was not connected to the piped network (World Bank, 1996). Moreover, only 46% of the total population was accessing water through in-house connections. Furthermore, during the same period, even people living in multi-story buildings were experiencing issues of lower terminal pressure (World Bank, 1972). Thus, most of the population was not capable of even accessing 182 lpcd due to the bottlenecks existing in the distribution network (World Bank, 1973; World Bank, 1996).

It seems planners just recorded their shocking observations about the water access in slums but chose not to problematise the issue of lack of universal urban water access in slums of Mumbai in the regional plan. Moreover, without assessing the status of the distribution network and the demand of citizens belonging to different socio-economic strata and their water access, planners recommended the standard of 341 lpcd to cover all water uses, which was very high for Mumbai.

This indicates that planners chiselled and selectively equated the problem of providing universal urban water access in Mumbai to water shortages calculated at the city level. When a significantly large proportion of the population had very limited or no access to piped water supply, the planners problematised the available gross supply of 182 lpcd as *miserable* and insisted for 227 lpcd for domestic use only. However, while doing so, planners did not acknowledge the issues of the inadequate spread of the distribution network connecting all, low pressure, and insufficient numbers of standpipes in slums. As a result, the only intervention that was discussed in the regional plan was the development of new water resources for the city and the metropolitan region and no interventions were suggested to address the issues of the distribution network.

Example 2: Justifying Bombay Water Supply and Sewerage Project (BWSSP) Phase II

This example illustrates how issues associated with providing universal urban water access in Mumbai were selectively problematised as issues of water shortages in the Staff Appraisal Report prepared by the World Bank to justify Phase II of BWSSP augmenting 455 million litres per day (MLD) water for Mumbai from the Bhatsa dam. The example also illustrates how

water augmentation was prioritised and the planned measures for improving the distribution network were subsequently dropped during implementation.

In 1978, while justifying Phase II of the BWSSP, the World Bank experts assessed the water supply conditions and noted that, after excluding non-domestic water use and losses, a total of 955 MLD was available at the city level to fulfil the need of 7.6 million domestic water users in Mumbai. Using these figures, the experts stated, "[t]he resulting average availability of water of 125 litres per capita per day (lpcd) is much less than the average demand" (World Bank, 1978: 4) and justified the Phase II of BWSSP.

However, while arguing that an average of 125 lpcd for domestic use available at the city level was a shortage in 1978, the experts neglected the problem of universal urban water access and the status of the distribution network. In 1976, around 34% city population was accessing water through a standpipe where one standpipe was serving an average of 370 persons. Furthermore, this figure was quoted by the same experts presenting the water shortages in the same report (World Bank, 1978). So, for the 34% population accessing water through a common tap shared by 370 persons, accessing 125 lpcd was not feasible, especially with intermittent service and inadequate pressure. Even in non-slum areas, the supply hours of water service were inconvenient for many citizens and residents living on upper floors had to "wait until others have been satisfied before they can draw a supply" due to inadequate pressure (World Bank, 1972: 10). Moreover, in 1984, the water supply coverage was only 83% (World Bank, 1996). So, a large section of the population was not capable of accessing 125 lpcd due to a lack of coverage of the distribution network, inadequate pressure, and differential access to the piped water supply.

On the contrary, despite the distribution network having several lacunas, in 1976, planners dropped the planned activities of rehabilitation of the distribution network from the BWSSP project and emphasised only water resource augmentation. While conceiving the BWSSP project, at the insistence of the World Bank experts, the planners had included activities to improve the performance of the distribution network (World Bank, 1972). However, these activities were removed when BWSSP encountered cost escalation and went for mid-course redefinition (World Bank, 1996). This clearly indicates that the experts problematised the issues associated with the universal urban water access as water shortages at the city level and linked these with the construction of water resources infrastructure and not with the issues of the distribution network. The impact assessment of the BWSSP project confirmed this, stating,

> Although the projects included components for system rehabilitation there was a clear bias during implementation for major construction, and as a consequence important benefits were foregone which could have accrued from relatively low-cost rehabilitation [of the distribution network].
>
> - World Bank (1996: 25)

So, this undoubtedly shows that, during the large-scale externally funded BWSSP project, planners prioritised only the issues of water shortages at the city level and neglected the issues associated with the distribution network spread across the.

This example demonstrates that planners selectively problematised the problem of providing universal urban water access in Mumbai as water shortages at the city level to justify BWSSP, including the augmentation of additional water resources and neglected the other critical issues of the distribution network.

Example 3: Regional plan for Mumbai Metropolitan Region (MMR) 2016-36

The regional plan for Mumbai Metropolitan Region (2016-36), released in 2021, analysed and addressed the issues of the metropolitan region, including water supply. However, in line with the earlier regional plan, this plan did not acknowledge the issues of the water distribution network adversely affecting universal water access across all municipal councils and corporations of the MMR region, including Mumbai (MMRDA, 2021).

The 'Water' section (p. 62) of the regional plan commenced with assessing figures of water availability in the region and briefly reviewed the earlier efforts of water resources development. Further, the plan assessed available water resources and water supplied to municipal corporations and councils and computed water shortages at the city level. While discussing the case of Mumbai, the planners problematised the key issue before the city as water shortages amounting to 1049 MLD for domestic use and 1142 MLD as gross water shortages at the city level. In response, the regional plan discussed the ongoing and proposed water resources development projects in the pipeline, including the Pinjal and Gargai dams and the Damanganga-Pinjal link project, bringing total additional 2052 MLD water for Mumbai as a remedy (MMRDA, 2021).

However, the regional plan did not comment on or even acknowledge the issues pertaining to lack of universal urban water access, including the status of the water distribution network and problems experienced by the end users. One might argue that the regional plan is only restricted

to ensure adequate water availability for various municipal corporations and councils at the city level. However, we argue that such adequacy cannot be determined or estimated without assessing the water demand of people and the type of access they have (standpipe or in-house connection). The planning of water resources development cannot be done at the city level in isolation without looking into the distribution network of the city.

Thus, over the last five decades, planners and experts have consistently tamed the wicked problem of providing universal urban water access in Mumbai by chiselling it through selective problematisation as a problem of water shortages at the city level while preparing regional plans. There are many such examples in the history of water supply of Mumbai which illustrate how this approach of chiselling through selective problematisation assisted in simplifying the wicked problem of providing universal urban water access in Mumbai and made it amenable to tools and techniques used by planners and water supply engineers.

5. Discussion

The approach of chiselling and selective problematisation allowed equating the wicked problem of providing universal urban water access in Mumbai to the problem of water shortages alone and thus, permitted planners and engineers to justify and prioritise the development of dams over the rehabilitation of the distribution network.

However, one could argue in support of planners and experts that, since water resources augmentation is a capital-intensive activity, the experts prioritised these activities while planning large projects when external financial support was available, for example, the Bombay Water Supply and Sewerage Project (BWSSP) supported by the World Bank. The improvements in the distribution network could be undertaken, possibly using internal funds in subsequent phases, as those are low-cost interventions. Moreover, it could be further argued that the higher per capita standards were used with the intention of providing better services in future for all, including standpipe users—at par with the in-house connection.

To counter the above arguments, we would like to offer the following explanation. If the large-scale project, like BWSSP, was intended to provide better services to all citizens at par with the in-house connection, the project would not have been conceived with standpipes to improve coverage. As per the experts' estimates of 1978, the BWSSP project itself was trying to cover around 45% of Mumbai's total population with standpipes by 1991, where each standpipe was expected to serve 300 persons (World Bank, 1978). Moreover, at the same time, the official

per capita standard of water supply adopted to serve standpipe users was only 45 lpcd. Yet, the experts termed the supply of 125 lpcd available for domestic use as 'much less' while justifying Phase II of BWSSP.

The BWSSP project supported by the World Bank is the biggest water supply project by BMC in its history in terms of the amount of water augmented for Mumbai. The project was implemented in three phases spread over two and half decades from 1971 to 1996 and contributed to the abstraction, conveyance, and treatment of around 1365 MLD, which cover more than one-third of Mumbai's water supply even in 2024.[4] According to the impact assessment report of the BWSSP project prepared by the World Bank (1996), the project only prioritised large infrastructure and did not focus on improving the distribution network. Then the question is, if such a big project could not find an adequate impetus to prioritise the issues of the distribution network addressing the issues of universal urban water access in Mumbai during its considerably long duration of two-and-half decades, what kind of project or alternative arrangement would serve the purpose? Moreover, the evidence suggests the funding agency—the World Bank—was in favour of improving the distribution network against the will of municipal engineers who were not much interested in distribution network improvement (World Bank, 1972).

The literature discussing wicked water related problems elaborates on different dimensions of water problems (e.g. governance) and describes innovative approaches of managing these problems (Hargrove and Heyman, 2020; Fallon et al., 2021). This paper enhances the understanding of the wicked problems by explaining how the wicked problem of providing universal urban water access in Mumbai is dodged by carving out only a tamed, solvable part of the wicked problem and leaving the original wicked problem unattended. However, the *taming* discussed in this paper is different from the taming discussed in the literature, where the latter focuses on gaining more control over or addressing wicked problems (Lach et al., 2005; Maron et al., 2016). In the context of dams supplying water to the cities, Tiwale (2021) described how water shortages are constructed using inflated water demand figures to justify the development of dams. This paper further illustrates how the construction of dams is justified by chiselling and selectively problematising the issues of universal urban water access as water shortages alone and neglecting inequity existing within the city.

[4] Mumbai's total water supply in 2024 is around 3800 MLD.

6. Conclusion

This paper illustrates how a wicked problem of providing universal urban water access in Mumbai was chiselled through selective problematisation as a tame problem—the problem of water shortages at the city level—that demands the development of large dams for Mumbai. While analysing the issues of the water supply of Mumbai, the planners consistently neglected the realities of water distribution existing for decades, such as poor coverage, inadequate pressure, insufficient supply hours, odd hours of water supply, water leakages, and inequitable water distribution across the city which were contributing to the lack of universal urban water access.

The chiselling of the problems of the water supply of Mumbai facilitated the carving off a selected piece of the problem that is amenable to the knowledge and expertise of the water supply department of the municipal corporation, consisting of only civil engineers. As a result, the water supply department could address the problem by using departmental expertise in constructing dams. In this context, additional research is required to understand the intentions and interests of planners and engineers to tame the wicked problems of providing urban water access in Mumbai.

The selective problematisation that does not recognise the wicked nature of water supply issues in Mumbai also discards alternatives and hinders identifying the root causes of the existing situation of water supply in Mumbai, seeking knowledge and expertise from other disciplines, collaborating with other stakeholders (such as community organisations), and identifying new non-standard workable solutions addressing the wicked problem of water supply in Mumbai.

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