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Contextual Practices in City Infrastructure Planning in the US and Indonesia

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Abstract

Contextual Practices in City Infrastructure Planning in the US and Indonesia

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This dissertation contains an international examination of infrastructure planning in context, which applies new institutional economics and transaction cost economic theory in a comparative international study. The chapters include a collection of exemplary social infrastructure practices across the global north and south, and two chapters that compare and contrast economic zone development and the discretionary approach to urban planning in the US city of Seattle and the Indonesian island of Batam, with respect to the make or buy decision and to water infrastructure project outcomes.

This dissertation gathers three studies. The first examines the role of urban and regional planning in the provision of social infrastructure in different economies. The second study discusses the role of the state in the contextual understanding of economic zones as alternatives to traditional urban and infrastructure planning. Specifically, the study compares, in terms of a make or buy decision, the rationale for Seattle's institutional arrangements for public water

supply and Batam's economic zone authority's choice to privatize the water supply system. The third study links the findings in the second study with more detailed assessments of the cost of the two arrangements at the project level, with a discussion on the transaction costs outcomes of simple water supply projects.

Together, the three studies provide planners with an approach for contextualizing the gap in urban planning studies across countries in the global north or south by grounding planning based on comparative practices in city and infrastructure planning in institutional and economic terms, which correspond with variations of institutional environment.

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CHAPTER 1 Introduction

1.1 Introduction

This dissertation is organized around two principles and a theoretical framework provided by the application of institutional economics and transaction cost economics in the field of infrastructure planning and project delivery.

The principles in question arise from the historical trajectory of research questions regarding development that have accrued over time in the global north and south. Literatures have been categorized as contributions in the field of economic development if pertaining to the global north, while those that have pertained to the global south have been generally categorized as contributions to development economics. These are distinctions with differences, that have led authors in applied fields such as planning to have to choose whether to formulate theoretical and empirical works within these existing canons or to deviate from them altogether. As described in the problem statement below, urban planners writing about the global south chose the latter, unmoored from advances in economic theory since Marxism. This dissertation seeks to reunite urban planning researchers interested in the global south with the advances in economic theory that have united these disparate historical epistemologies for economists, and demonstrate the possibilities for comparative international analysis in infrastructure planning and implementation.

In the global north, many research questions in economic development have since been subsumed within the theoretical frameworks provided by institutional economics, as in the work of Douglass North and colleagues, and in transaction cost economics, as developed through the work of Oliver Williamson. Institutional economics has been applied globally in ways that pull together the historical bifurcation of north and south, to answer the question of why nations

differ in their economic performance over time. The answer to this question is that the state plays a role in economic performance: institutions differ, and with those differences so does economic performance. The theoretical basis for this claim is that humans have devised institutions to economize on transaction costs, transaction costs recognizable as the cost of using the price mechanism, or the costs above and beyond the cost of production, as posited by Ronald Coase and Oliver Williamson, respectively.

As a collection of works, this dissertation introduces the field of infrastructure planning through an overview of the purpose and methods of social infrastructure planning in cities around the world. This is followed by two empirical studies comparing water infrastructure planning and development in the US city of Seattle and the Indonesian island of Batam. The first of these comparative analyses examines the institutional arrangements governing water infrastructure development within the special economic zones of these to parts of the world. The final comparative analysis follows through on the comparison with a transaction cost economic analysis of projects in both zones.

1.2 Problem Statement

Existing studies examining comparative planning and development in the global south suggest there are two types of contending theories. One approach, relatively detached from economic theory, argues that southern planning emerges from a collection of experiences and situated knowledge by drawing from social conflicts, informal practices, identity and ethnicity (Watson, 2016), likely shaped (Roy, 2009) by its shared colonial past and future. This approach, perspectivism, rooted in neo-Marxist and Habermasian rationality, argues for theory building in planning at a meso-level. Thus, emerging theory is only applicable when the use of theory is situated in the same context. Prior to this type of perspectivism, urban planning literatures

centered on generalized theories of utilitarian planning typically employed in policy analysis and social learning traditions (Friedmann, 1987). Utilitarian planning within the policy analysis tradition is historically rooted in welfare economics, and assumes a world of frictionless transactions, which rely on an equilibrium function of price and utility to account for the fair distribution of goods and services (O'Sullivan, 2019; Heilbrun and MacGuire, 1987; Yinger (ed), 2018).

Growing empirical and theoretical critiques of planning in the global north and south however find evidence of planning and development experiences distinctly attributable to state decisions, requiring an approach which rejects both the post-positivist assumption that rationalizes cultural path dependencies, and the frictionless world of transactions without the need of the state. These practices include:

- Practices in countries in Latin America, in which the bureaucracy is complicit with elites in sustaining the exploitation of the economy and inequitable social policy. For example, research in Venezuela (Riggirozzi 2010, 74-74), suggests that elites in the bureaucracy provide institutions which favor formal labor and neglect informalities, preferring social policy that only covers menial subsistence for informal labor in the form of cash transfer programs that offer no meaningful attempt at inclusive and equitable access to the labor market.
- Planners (Kooy & Bakker 2007; BraadBaart 2007; Marwa 2019; Lovei and Whittington, 1993) who elevate Jakarta's water supply privatization as an empirical example of an aberration of public goods. These works highlight the contradictions of privatization and contract theory under an authoritarian government, wherein private operators barely

generate profit and are unable to provide efficient solutions for expansion, due to rent-seeking behavior and inefficient government planning.

- Empirical evidence (Müller 2020; Berger 2003; Lin 2005) in the global South describing a market context driven by ruling power or state interest in market exchange through the creation of hybrid firms (state-owned enterprises), suggesting a different form of market created by the state.
- Mechanisms created by multilateral development banks and or foreign aid policy directing development in the form of Special Economic Zones (SEZ) and strategic development areas in the Global South (Hermaputi, Jiajia, & Chen 2017; Bräutigam & Tang 2014; Narins & Agnew 2020). These organizational forms proliferate in port and industrial regions across Asia, posing a challenge to local planning. China's belt and road initiatives (BRI) (Lu et al. 2018) for example, branch out from the roots of development economic theories (Lu et al. 2018, 3) which ignore lessons from the Marshall plan experiences. Similar strategies force state planners and localities to juggle the exogenous forces at play, often to the detriment of the local population.
- Southern markets, in a state of "post-development" (Gibson 2011, 227) are considered a ground for a counter-hegemonic approach to global capitalism. This market is developed through an array of self-help, informal, and non-state organizations manifested in the hierarchy of multilevel market systems. Empirical examples (Guha-Khasnobis et al. 2006; Harvey 2002; Lindell 2010) of non-market and alternative market institutions in the Global South argue that the proliferation of state dominance reduces citizens' rights to access the formal marketplace.

In summary, both Marxist and utilitarian approaches carry an unwarranted assumption about the lack of the role of the state in orienting market transactions, which contrasts with the reality of planning discussions in both the global north and south. Lessons learned from the empirical experiences above also suggest that there are at least three differences rarely utilized in the perspectivist and rationalist approach for grounding planning in a comparative study of the global north and south:

- There are distinct patterns of urban systems which suggest the presence of contrasting institutional environments, as found in studies that contrast the application of theory in economic development from that of development economics, one of which follows the logic of endogenous growth (Schumpeter, 2012; O'Sullivan), while the other examines exogenous influences (Wood, 1986; Sen 1983). For example, studies on urban economics influence the emergence of megacities, regionalism, and mega-regions (Pike, Rodriguez-Pose, & Tomaney 2011; Bhan, Srinivas, & Watson 2016); studies which focus on forms of pluralism and decentralized planning outside of state rule-making (Ostrom 2017); or studies which contrast on local capacity in rule-making and budgeting (Levesque, Bell, & Calhoun 2017) compared to centralized and state-led planning (Hu & Zhou, 2018).
- Differences in epistemological or strong-held beliefs in planning institutions has effects on the variations of hierarchy and methods of planning found across the global north and south. These differences, in turn, have direct influence to the types of planning arrangements observed across the global north and south, such as the use of general plans of land control by the municipal government (Kent, 1964; Elmer and Leigland,

2013) versus the insistence on the use of national planning as means to exercise influence and control, as in the case of China (Zheng 2020);

- Variations of formal and informal constraints on individual rights and professional capacity lead to differing pragmatic choices made by planners and market actors at a microanalytic level. For example, planners may be complicit with discriminatory policy (Escobar 1992; Chatterjee et al. 2021) and exacerbate inequality by continuing to perpetuate informalities (De Soto et al. 1990) due to their own self-interests, bounded by their limitations on removing sectoral policies and institutional constraints. Planners may also rationalize discrimination in the standards or levels of service due to budget constraints (Bjorkman 2018; Chiodelli 2019).

In other words, planning is inseparable from an understanding of the role of the state, and the role of the state vis-à-vis planning offers a defining characteristic for the comparative analysis of planning as it is practiced and evaluated in the global north and south.

1.3 Objective

Infrastructure acts as "sinew" (Tarr, 1984, 4) in the form of urban networks that connect people, places, social institutions, and the natural environment. Infrastructure, such as water supply, education, healthcare, urban parks, and social housing, are open to the public and primarily considered public goods. Congestion in infrastructure services, due to scarcity, or a problem caused by costly investment, can lead to the exclusion of residents, preventing people and organizations from having a similar level of service, or barring them altogether in accessing services.

Empirical examples of planning variations in the global south lead planners to ask how the differing institutional context of planning in the north and south affects city planning and

provision of infrastructure. Yet, studies about infrastructure struggle to define a generalized theory for comparative infrastructure planning to explain how planners across different countries, situated within variations on economic constraints and city planning, make decisions and can support a functioning society. The dissertation aims to answer this question by achieving three goals.

The first goal is to establish a generalizable overview or framework for defining and structuring the study of variants in social infrastructure planning across developed and developing economies, differentiated due to the underlying institutional premise on social justice and the exclusionary criterion, and the differing use of planning tools and policy. The second goal in this dissertation is to inform the rationale for infrastructure privatization in the water supply sector, differentiated by the institutional contexts of economic zones in contrast to the city proper. The third goal is to introduce a cross-country transaction cost analysis of infrastructure links to a distinct make or buy decision in an economic zone- organized system as an alternative to the municipality-owned system; raising awareness of the trade-off in choices, whether it is conducted under a public, private, or a hybrid arrangement. In doing so, this dissertation is designed to move discourse on infrastructure planning in the global north and south to a more unified framework grounded in institutional economics, with a theory of the state that more broadly describes the role of planning in the economic activity of infrastructure development.

1.4 The Structure of the Dissertation

This dissertation is structured in the following order. Chapter 2 defines the role of planning situated in its contextual history and describes the variations of planning tools and approaches in four types of social infrastructure: urban parks, health care, educational facilities,

and social housing. Chapter 2 is the author's preprint of a co-authored paper with Dr. Whittington and Chin-wei Chen, and published in 2024 under the title "Urban and regional development and planning, and the contribution of social infrastructures to development" in the *Handbook of Social Infrastructure* (Chapter 19, pp. 361-390), edited by Anna-Theresa Renner, Leonhard Plank, Michael Getzner, and available through Edward Elgar press. Chapter 3 is an unpublished manuscript that compares and contrasts two variants of urban and infrastructure planning environments separated by histories of economic zone policy, which affect the process and rationale for the make or buy decision-making process for water supply. Chapter 4, also yet to be published, takes the constraints on institutional choice introduced in Chapter 3, and describes the consequences of the decisions in the example of costs of simple projects, for the client, the public, and the private sector. Chapter 5 recommends policy improvements which reflect on my past experience as a public servant, and to my future direction as a scholar and as a agent of infrastructure planning in my country.

CHAPTER 2 Urban and Regional Development and Planning and the Contribution of Social Infrastructure to Development

This is the author's preprint of a published book chapter. The final version is available in: Jan Whittington, Dian Prasetyawati, and Chin-Wei Chen "The Role of Urban and Regional Planning in the Provision of Social Infrastructure." In *Handbook of Social Infrastructure*, 364–93, edited by Anna-Theresa Renner, Leonhard Plank, and Michael Getzner, 2024, Edward Elgar Publishing Ltd. https://doi.org/10.4337/9781800883130.00034

Abstract

Urban planning plays a cross-cutting role in the development and provision of social infrastructure. Planners use models and instruments of urban development to further the efficient and equitable distribution of public facilities and services, applying theories of economics, politics, sociology, and cultural and urban studies to model urban growth and forecast demand for services, while advocating for policies and practices that raise the capacity of cities to sustainably meet the needs of current and future residents and, subsequently, society. The use of planning instruments helps to mitigate the social costs borne by individuals due to market failures and other externalities in the provision of goods and services.

In the effort to achieve a fair distribution and mitigate historical injustice, planners are guided by ethical principles. Whether for physical facilities or programmatic development, the planning function brings together technical and bureaucratic procedures with the engagement of stakeholders to further causes of normative and substantive justice. A review of planning activities in health care, education, parks, and housing in the Global North and South suggest that institutions matter. Well-designed and implemented institutions in planning reduce the transaction costs of urban development and act to close the social and economic gap of marginalized groups and individuals.

2.1 Introduction to urban planning

Social infrastructure has always been part and parcel of planning objectives: for developing infrastructure as public goods (Klosterman, 1985; Samuelson, 1954), internalizing social costs arising from land-use conflicts and market externalities (Coase, 1960), addressing historical injustices in land use planning (Whittemore, 2021), and reducing the impact of climate change (Whittington and Young, 2013). While typically associated with the governance of urban infrastructure such as transportation, energy, water, waste, and land use, urban planning as a discipline and profession is similarly engaged in education, healthcare, housing, recreation, and other areas of social infrastructure, as all embody physical as well as programmatic development to meet demand with supply of services and the physical means to deliver those services (Dowall and Whittington, 2003). Engaged as such, planners navigate complex issues by limiting and expanding development using planning tools and policies, commonly laid out in long-term comprehensive or strategic plans, along with various short-range plans and regulatory instruments, such as capital plans, zoning, land use plans, and the building permitting process (Kent, 1964; Elmer and Legland, 2014).

Historically, planners have operated with a 'positivist' perspective founded on the beliefs of rational behavior (Faludi, 1973) and the ability for people to freely engage in functional markets for improving land, which includes roles for planning within government action to alleviate market failures (Coase, 1960). Planners collect empirical data, establish forecasting methods, and create models mimicking the conditions of the real world to measure and predict the impact of human activities in exhausting resources available for urban spaces and structures (e.g., practices specific to land use planning, transportation, or housing) (Alexander, 1997). In a

communicative turn, theorists in the 1990s aimed to realize the democratic potential of planning as a social, procedural, and place-making activity (Forester, 1989; Fisher and Forester, 1993; Healey, 1996; Mandelbaum, Mazza, and Burchell, 1996). More recent perspectives within planning apply a 'post-positivist' approach, emphasizing normative theories of social justice and improving planning, complementing communicative rationality with policy processes (Allmendinger, 2002; Roy, 2015;1985; Healey, 1997).

Considering the variations in government and market structure around the world, planners tread carefully between embracing the role of supporting existing policy, proposing new urban designs and plans, and becoming active social agents (Lindblom 1959; Alinsky 1971). Planners in bureaucracy, opting for a conventional approach, are instrumental agents to provide policy analysis or assist social learning. At the extreme ends, planners advocate for social reform and promote social mobilization (Friedmann,1987). In developing economies, the hybridity of the market economy with limited institutional capacity creates complex interactions between formal and informal planning measures (Pike et al., 2011). These multifaceted perspectives shape the worldviews of planners in action, with consequences for decisions about the development, design, and implementation of social infrastructure, all embedded in different types of welfare states, that regulate, provide, and fund social infrastructures.

Chapter Overview

This chapter explores the cross-cutting roles and responsibilities of planning in the provision of social infrastructure. Part two provides an overview of the perspectives of urban planning on social infrastructure. Part three reviews the assessment and decision-making approaches commonly used to measure capacity constraints, purpose, and need for social

infrastructure within urban systems. Part four concludes the chapter with suggestions for research at the intersection of planning and social infrastructure services.

2.2 An Urban Planning Perspective of Social Infrastructure

Urban planning activities for social infrastructure correspond with the financial and physical scale of the system in question, shaping how the public views the planning profession and defining what it means to plan (Elmer and Legland, 2013). As perhaps the only discipline to adopt a long-term, multi-decadal horizon for urban governance, planning is the origin of policies and regulatory instruments to optimize resources, such as property rights, ex-ante in the hope of 'controlling' and 'directing' paths of urban development. In doing so, planners seek to define and determine demand and supply of land and its improvements and concern themselves with the roles and responsibilities of the public, private, and non-profit sectors (civil society).

Social infrastructure consists of services that are either delineated by or supported by physical assets, thereby placing planning in a distinct role for its production. As it provides the necessary physical facilities, the process of planning is a 'mid-level' practicality (Alexander, 2016), and the fundamental principles for the provision of social infrastructure address how planners allocate priorities and resources by recognizing sources of market inefficiency and social injustice within land-use policy and regulation (Klosterman, 1985; Hendler, 2017).
As agents of the state, planners devise and apply instruments in a variety of activities to provide social infrastructure for public good. The aim of planning activities is to improve the efficient, equitable, and environmentally sustainable distribution of infrastructure systems, such as transportation, energy, water, and waste, including social infrastructure systems and their underlying physical assets, as in education, healthcare, housing, and parks and recreation.

Planners are ever-focused on the future consequences of today's actions within the bounds set by institutional, economic, social, and environmental conditions. This section highlights perspectives relevant to social infrastructure by discussing the role of the state and the institutions, models, and instruments of planning in the Global North and South.

2.2.1 The Role of the State, Markets, and Planning Institutions

Social infrastructure consists of physical assets and organizations that improve the capacity for and effective delivery of social services. These infrastructures encompass essential goods and services such as facilities and services in public health, primary and secondary education, parks and recreation, and social or affordable housing. The physical requirements, city scale, and fiscal demands of such services, coupled with inadequate provision by the market, form the basis for the public regulation, funding, and provision of social infrastructure. Thus, scholars refer to these facilities and services as public goods (Unger et al., 2017; Elmer and Leigland, 2013; Cowen, 1985; Musgrave, 1973).

In practice, the availability of physical assets for social infrastructure is limited, subject to congestion and failures of inadequate capacity and inequitable distribution by both the market and the state, often exhibiting the characteristics of club goods (Buchanan, 1965). The enjoyment for social infrastructure is dependent on the capacity available to individuals and groups in society, which is in turn dependent on public investment. Social infrastructure promotes social and economic development; public investment is necessary and also, in turn, facilitated by development. Planners justify and reinforce public investment in social infrastructure to improve the livability of urban environments, often doing so through the development and application of

minimum space requirements and standards (e.g., minimum capacity, ratio, size) to cost-effectively provide for the needs of urban residents.

Planners typically calculate the demand and supply for social infrastructure based on the number of beneficiaries, not the primary payees of the services. The most common funding for social infrastructure is a combination of state and local public funding (often with local tax revenue) and welfare state institutions such as social security and social insurance. Large-scale infrastructure is typically funded through central and regional government budgets (Xu and Warner, 2021). Local government budgets, however, are often relied upon for affordable housing and primary education (Kellett and Nunnington, 2019) and for the improvements of social infrastructure outside of urban centers (Wear, 2016). In addition, state or provincial government tends to pay for the costs of the infrastructure connecting local centers within regions (Guild, 2000). Revenues from national tax sharing systems can provide funding to municipalities for local social infrastructures. Local funds for social infrastructure also come from general property and sales tax revenue, special tax assessments, discretionary forms of policy within land-use requirements to generate privately funded public facilities (e.g., homeless shelters, restrooms), and the creation of innovative partnerships with non-profits and private entities to support social infrastructure development (Elmer and Leigland, 2013).

Social infrastructure supports activities in both public and private spaces. Social infrastructure facilities owned and operated by private entities rely on individual payouts and payouts made available by a third party. For accountability reasons, governments typically refrain from providing direct funding to privately owned entities. Following the logic of welfare economics, the government directs benefits to reduce individual costs, and the payouts for these benefits are attached to social services. In the United States, for example, most health facilities

and affordable housing facilities are owned and operated by private entities. To ensure equal access, the state regulates the allocation of land use for these facilities, and state and federal government agencies offer housing subsidies to individuals in the form of vouchers and subsidized healthcare insurance. The health insurance is managed by privately run insurance companies in the marketplace for households that meet the minimum income threshold. These subsidies aim to reduce social costs by increasing the capacity for low-income households to access the health services necessary to support active participation in the marketplace, and to provide health services to those in society who are unemployed or otherwise unable to receive the private health insurance benefits provided by employers (Musgrave, 1959; Arrow, 1963). Of course, the provision and funding of social infrastructures are different in other countries. For example, European welfare states have more direct public provision and funding out of public insurance systems or national government budgets.

Classical economic theories offer market-based explanations of the mechanisms of urban planning (O'Sullivan, 2019), but markets are not costless. Markets generate costs to society beyond the prices paid in the economic exchange of goods and services (Coase, 1960), markets exacerbate inequality (Piketty, 2014), and offer no guarantee that land is allocated to its highest and best use (Glaeser, 2011). Well-designed planning activities minimize social costs and inequality by either engaging strategies to raise and redistribute resources in the development process ex-ante or by imposing ex-post interventions, at geographic scales that vary from the space within individual parcels of land to national policies and international treaties. Planning interventions weigh on the make-or-buy decision in the market for land use and infrastructure, and planners devise incentives to generate income from private taxation or negotiate 'in-kind'

tradeoffs through the permitting process for the public good. These incentives, in turn, contribute funds to improve social infrastructure and promote distributional equity.

Classical economic theories (O'Sullivan, 2019) assume that the state is benevolent, but state intervention in the market is not always benevolent. Political decision-makers do not always act in the public interest; in the absence of a system of checks and balances, public representatives are capable of acting out of self-interest (North, 1990). As agents of the state, planners work within organizations that house overlapping and conflicting coalitions, and deal with complex market institutions influenced by powerful interest groups in society. As planners are individuals, planners are similarly prone to opportunism, especially under conditions of information asymmetry with competing demands of political and private interest groups. Essential in the mechanism of planning institutions is the assumption that planning operates in a democratic institutional environment, astride functioning markets, as opposed to forms of central planning that replace private ordering with rationing. Planning uses models and instruments as guides for providing social infrastructure within politically legitimate procedural processes and democratic governance systems, and planners engage in continuous evaluation to ensure they are up to the task of monitoring and controlling land use allocation, and mitigating or alleviating market failures (Alexander, 2001). To understand the impact of planning institutions, planners borrow frameworks from new institutional economics to measure transactions in the land use market, understand the effects of existing institutions, and determine scenarios for minimizing social costs and safeguarding public interests (Williamson, 1999, p.337). New institutional economics in land use planning and development control uses three approaches: (1) at the micro-level, dealing with the individual; (2) at the meso-level addressing forms of governance and their relative costs; and (3) at the macro-level which examines the institutional environment

(Alexander, 2001, p.49). Transaction costs appear in land market exchange because of the additional costs in making land-use plans or zoning, drafting agreements, and applying for planning permission (Alexander, 2001, p.54-55; Buitelaar, 2007, p.49). In addition, transaction costs can result in infrastructure failure because of human limitations, as planners underestimate the costs of provision or overestimate the benefits (Whittington 2012; Flyvberg, 2009, p. 353). Planners may be engaged in the formation or change of institutions of governance, with the aim of reducing costs to society from a variety of practices, such as the over-exploitation of common pool resources (Ostrom 1990) and the use of public assets for personal gain (North 1990). Planners measure transaction costs ex-post and influence the evolution of regulatory and contractual arrangements with the results of their evaluations (Williamson, 1985), and provide incremental solutions to the externalities that indicate socially inefficient transactions (Lindblom, 1985).

2.2.2 Planning Models

Planners typically model urban plans based on the history of the structure of village and town development. In creating models, planners—and architects operating at urban scale—impose shapes subjectively believed to be bucolic, beautiful, monumental, or modern, thereby differentiating regional and suburban functions from those of the city core (Hall, 2014:1988). The garden city (Howard, 1898), livable city (Jacobs 1961), compact city (Jenks et al., 1996), and city in the fashion of new urbanism (Duany and Plater-Zyberk, 2000), are popular models that emphasize the effective use of space for social and private activities incorporated within the locational choices of the urban center and periphery, and the networks of infrastructure necessary to support urban functions. Such models explain why some social infrastructure services are

concentrated in urban centers and around transit hubs, and why the allocation of public space matters for social equity. It is therefore important to understand the normative and ethical foundations of planning in general, and of single plans in particular.

Planners use models to mimic the arrangement of cities in the real world, and in doing so, closely follow changes in science and technology. With the rise of computing in the Post-World War II period, methods of planning graduated from the drafting table to the tools of ubiquitous computing, 3D modeling, and virtual or augmented reality simulation and visualization, along with the deployment of a panoply of sensors across the urban landscape. Modern information technology is harnessed by planners for data-driven and technology-controlled 'smart' city activities, supported by inputs coming from public and privately-owned equipment, which may include household connections and appliances as well as streetlights, urban service delivery vehicles, and drones (Morris, 1985; Dutta, 2014). These applications have many purposes. In close-knit relation with engineering disciplines, for example, planners today can process, store, and analyze a wealth of information regarding weather changes, earthquakes, floods and even human behaviors to predict the probability of urban risks and their impact on infrastructure services, including climate change. In the Global South, cross-cutting technology for flood control and riverbank engineering results in the planning and development of 'sponge cities' (Yu et al., 2015). In the interest of safe pathways for multi-modal transportation, planners adopt 'complete street' models that cut down the amount of space reserved for private parking (McCann, 2010).

City modeling, however, is just as much art as it is science, and prone to cautionary tales. So-called 'smart' city technology allows governments to increase the pace and narrow the spatial target of social policy, but this is also the apparatus of surveillance, and such applications erode

privacy (Palen and Dourish, 2003). So-called ‘sponge’ cities improve resilience against flood risk and reduce social vulnerability, but scholars question the long-term impact of terraforming on surface water retention capacity (Dong et al. 2018). ‘Complete street’ models complement the requirements for a livable city and new urbanist models but neglect the impacts of traffic congestion and commuting delays (Jordan and Ivey, 2021). Furthermore, planning models are widely complemented by information and knowledge originating from and being created in participatory processes (e.g., public hearings, design charettes, participatory budgeting) or provided directly from residents (e.g., citizen science, public comments in environmental review) and political representatives, including elected officials.

2.2.3 Planning Instruments

Planning instruments are policies in the form of legalized strategies and spatial planning documents to legitimize authority for the development of infrastructure (including social infrastructure), the allocation of space, and the enforcement of compliance in the use of space. The instruments of planning vary, but often include long-term comprehensive or ‘general’ plans (covering the full jurisdiction of the city), zoning regulations, permitting processes, land use plans, ‘master’ plans (covering subareas within cities and areas targeted for expansion), and plans for capital investments, capital improvements, and associated budgetary decision-making. These instruments define the demand and supply of land use and infrastructure, outline the locations of public and private development, and aim to guide the improvement of services and thereby reduce inequality between core and periphery, or between developed and underdeveloped areas.

In calculating the demand and supply of social infrastructure, planners manage demand based on current and projected market conditions to ensure that infrastructure services are sustainable (Dowall and Whittington, 2000; Schumpeter, 2012:1934; Costanza and Patten, 1994); periodically adjusting the long-term and short-term strategies and discretionary policies to identify and conform to desirable paths of development (Khakee, 1998; Mazza and Rydin, 1997). Demand is derived from a number of factors that differ from sector to sector, such as population growth, economic development, market prices, revenue projections, regulatory constraints, available resources, and social change. Planners muddle through assessments of social infrastructure needs today and try to forecast needs into the future, to discern which planning models may be applied to each case of urban form.

Planners also weigh feedback and narratives coming from policy processes (Ingram et al., 2016; Healey, 1997) and may devise mitigation and adaptation strategies to account for the historical impacts of planning instruments (Rothstein, 2017). Policymakers are often concerned with ensuring that the benefits of social infrastructure services reach target groups, and the legalization of planning documents tends to reinforce this policy agenda (Peters, 2016; North, 1981; Lindblom, 1959; Sclar, 2001). Similarly, planning references finance, engineering, and the real estate and construction markets, with concern for shifting demand, changing costs, and economic downturns. Weakening of the tax base, for example, can reduce a city's ability to pay to maintain existing facilities at expected levels of public service, lessening resilience to various shocks and stresses (Audirac and Hackworth, 2021; Barbera et al., 2021).

Planning instruments define the scopes of planning activities within a particular time frame. Instruments of immediate use include land use maps, zoning regulations (defining allowable uses and density of land) and building permitting processes, as these involve the fine-

grained and immediate oversight of the real estate market. Short-term planning instruments have time horizons of five years or less, such as capital improvement plans or programs (i.e., CIPs), which project the costs and other effects of budget allocations for the development of facilities and equipment and often align with a five year strategic development plan in specific policy implementation. Long-term plans, such as comprehensive or 'general' plans, look ahead 10 to 40 years (Kent, 1964; Mathur, 2019) to create profound changes for social infrastructure at a systemic level (e.g., changing in land use allocation and the socio-economic composition of residents, restoring ecosystem functions, transitioning infrastructure to new or more environmentally sustainable technologies), for both local and transboundary jurisdictions.

Planners design zoning regulations and land use maps in fine-grained detail by plotting three-dimensional land-use allocations for specific purposes (e.g., the length, width, and height of plots for housing, parks, commercial development, and other facilities). Zoning is used as a reference for the government and private property owners for issuing permits to subdivide and build on land. Because the three-dimensional requirements in zoning plans are contingent upon many factors (e.g., soil structure, restrictions, approved building design, financing capacity), the actual use of land will vary and require planning discretion. Such discretion may also take the form of bargaining because developers are incentivized to negotiate in the hope of building at greater size or density to maximize profits (Holsen, 2020). Because zoning regulations act as constraints on construction, the actual shape and footprint of the three-dimensional requirements are often negotiable and ruled upon by discretionary planning institutions, within and on the basis of legal frameworks. Given the authority, local governments, for example, set aside income from assessment taxes and 'in-kind' payments by utilizing discretionary power in zoning

adjustments to provide the means to improve social infrastructure capacity (Biggar and Siemiatycki, 2020; Booth, 1995).

Short-term planning tools such as the capital improvement plan (CIP) are often aligned with strategic sectoral policy while supporting the implementation of long-term comprehensive plans (Mathur, 2019). The main product in a CIP is a prioritized program of public infrastructure and facilities and the corresponding annual local government budget for capital expenditures. Planners weigh the immediate need and the impact of programs and allocations of budgets listed in the CIP using multiple assessments methods (e.g., social impact assessments, environmental impact assessments, fiscal impact analysis, cost-benefit analysis, demand analysis). In a democratic setting, policymakers state their preferences by deciding on the programs or projects befitting their constituents in consideration with the availability of funding and finance. A healthy CIP incorporates annual portions of long-term infrastructure investments stated in the general plan (Mathur, 2019), which consider growing infrastructure demand and technology adaptation, the costs for routine expenses in operating and maintaining existing infrastructure to perform at expected levels of service, and contingent budgeting for risk mitigation. The CIP may also be used to quantify equity (Hime and Maiden, 2019), as a benchmark to measure risk mitigation capacity (Nagel and Elenbaas, 2006), to tally the capacity of land use control (Deutsch, 1978), and to forecast the effect of decisions today on longer term externalities, such as greenhouse gas emissions (Whittington and Lynch, 2005).

Long-range planning, exemplified in the comprehensive or ‘general’ plan, reflects the path-dependent nature of cities (‘lock-in’), the indivisibility of infrastructure facilities, and the asset specificity of communities with the social infrastructure they depend on. Long-range plans depend on historically path-dependent forecasts of growth to create a plausible delineation of

development over time. Growth is considered historically path-dependent with land use allocation; firms, individuals, and organizations compete for land because their locational choices affect the scale of their returns (O'Sullivan, 2019). Represented in long-range plans, social infrastructure typically consists of physical assets clustered at the center of neighborhoods, and as such, these assets are indivisible with the social amenities and urban structure of the neighborhood. Because of asset specificity, however, long-range plans also reflect the significance of well-established social connections with existing infrastructure facilities and within the land-use matrix. As the service of social infrastructure is extended, its spatial relationship with the community strengthens, creating bilateral relationships of asset specificity between social infrastructure facilities and the communities they serve. Planners prioritize social infrastructure in long-term planning documents and create more such interventions by recognizing these spatio-historical relationships: how asset specificity of the social infrastructure forms a deeply rooted connection with the urban forms. This is the knowledge that defines how planning instruments can be used, for example, to desegregate gated communities (Ballard et al., 2021), rearrange patterns of transportation and public space (Rokem and Vaughan, 2019), and to trace and preserve the history of the development of parks and amenities (Nugent, 2019).

2.2.4 Planning in the Global North and South

Urban planning's historical theoretical foundations in the Global North stem from the belief that our cities are marketplaces. Its citizens can freely enter into contractual relationships with one another (e.g., to purchase and develop land) and with the state (e.g., to apply for a building permit). The decision to contract is ruled by agreements between organizations and individuals seeking to economize on production and transaction costs. Occasionally, property

rights conflicts occur between individuals and firms, or between firms, which require government intervention through arbitrary contingent solutions or the courts. In addition to the provision of public goods, key functions of the state are to prescribe rules and norms for individuals and firms, settle organizational conflicts in regard to the control of land use, and prevent organizations from causing harm to others while pursuing their interests (Coase, 1937; Williamson, 1975; North,1990).

However, planners in the Global South often face persistent institutional problems that deviate from this theoretical norm, such as a lack of formal and secure property rights, discriminatory policy, lack of democratic governance systems, as well as a dominating state, which feed a vicious cycle of underdevelopment. Non-state development includes formal and secure facilities and services from the private and non-profit sectors, but also informal endeavors that are self-managed, which may take place on disputed land. It can be challenging in the Global South to determine whether non-state social infrastructure facilities, services, and associated rights are available to the citizens of the city. Lack of rights can bar laymen from having an equal chance of securing rights to property and work that can support good living conditions (De Soto et.al., 1990, p24-25 and 59–62), thus creating a vicious cycle (Acemoglu and Robinson 2013, p.357) of inequality and informality, resulting in negative feedback to increasing returns. Institutions that support segregation and discrimination may be inherited from colonial and authoritarian governments, or persist with authoritarian regimes that prevent citizens from enjoying equal rights (Acemoglu & Robinson, 2013; De Soto et al., 1990). The state can, as has been found in parts of South Asia, deliberately maintain a political position that emphasizes the superiority of a particular race or religion as the source of property rights conflict (Dalrymple 2015; Chatterjee, 2009; Ramutsindela 2012). Elite control of resource-based industries, as has

occurred in parts of Africa and Latin America, can lead to informalities and increased vulnerabilities for the urban labor market, and restrict individual access to services (Riggirozzi 2010, p.74-74; Breceda, Rigolini, and Saavedra 2008; Cimoli and Rovira 2008). Authoritarian or otherwise dominant states can place undue and costly restrictions on markets, replacing private ordering with public decision-making. Centralized planning authorities regularly lack the incentives necessary to support fair local policies, while local planning regimes may not have the autonomy or wherewithal to internalize the social costs of informality. Reliance on special economic zones, for example, as has occurred in Asia and Central America, can increase the regional growth dependency on foreign direct investments, create gaps in infrastructure services, and place local labor markets in direct competition with foreign investments (The World Bank, 2019; Narins and Agnew 2020; Lu et al. 2018). More generally, overreliance on centralized planning risks local planners overlooking their obligation to protect private property rights or pursue socially just policies at the local level. The pertinent question is how planners can collaborate across multiple governance sectors to account for much-needed local social infrastructure capacity, overcome funding gaps and corruption, and minimize transaction costs imposed by state and national governments.

Modern planning theory suggests planners can benefit from state policy that accommodates greater democratic freedom and participatory action. The mechanisms of democracy emphasize checks-and-balances on the allocation of public budgets and infrastructure service delivery and reduce risk of self-interest seeking activities. Planning also creates or changes property rights, often with the aim of contributing to sustainable development. As state agents, planners have the responsibility to rectify the impact of inherited histories by developing models that provide a higher level of security in planning for property rights and improved

environmental performance, whether through improving the flexibility of the use of existing land use allocation, improving access to land use information for public use and to support the democratic process or by deliberate acts of land repatriation to marginalized groups (Rothstein, 2017). Planning institutions can also avoid conflicts with existing institutions by accommodating greater public inclusion in planning processes. Place-based planning methods, participatory action research, and similar community-based approaches used in the Global South could be seen as incremental approaches to increase public awareness and promote democratic negotiation between various points in the institutional hierarchy (Healey, 1997). The effectiveness of these approaches, however, remain contingent on the transparent rule of law and some degree of local autonomy in decision-making.

2.3 Planning Assessment for Social Infrastructure

Planning assessments emphasize multiple, sometimes competing social, economic, and environmental sustainability objectives. As noted above, planners implement a variety of planning tools and instruments that can organize public action and induce more just and environmentally sustainable outcomes from private firms, and incentivize participation from non-profit organizations, in general and with respect to social infrastructure. The following sections, including health, education, parks and recreation, and public housing illustrate how planners assess social infrastructure and make use of available decision-making tools to support its growth and evolution.

2.3.1 Healthcare

Healthcare, as an integrated system, aims to improve health and wellness through the prevention, diagnosis, treatment, or cure of disease, illness, and injury, and to assist people with physical and mental impairments (Heather et al., 2004). Healthcare is a public good and merit good; major market failures abound in the financing and service delivery markets of healthcare (Hodgson, 1998; Hsiao 1995). The features of healthcare markets include externalities (e.g., positive externalities from wellness in the population), information asymmetries (i.e., lack of an individual's knowledge of diagnosis and treatment options), high uncertainty for healthcare needs, and its derived demand (e.g., testing and new services that beget consumers) (Hodgson, 1998; e.g., Leeman and Mark 2006; Lee and Alexander, 1999; Chukmaitov et al., 2014; Conrad and Dowling, 1990). As a result, healthcare service providers include governmental, not-for-profit, and for-profit organizations, and social and private insurance for financing, though many in the world lack access to health insurance (Stabile and Thomson, 2014). As part of social infrastructure, healthcare includes many types of physical infrastructure facilities, such as general hospitals, specialized hospitals, district hospitals, and primary healthcare centers (WHO, 2009), providing healthcare services such as primary care, secondary care, tertiary care, and public health (White, 2015). Access to healthcare varies across countries, communities, and individuals, depending on social-economic conditions, health policies, and the funding or financial models for healthcare.

Healthcare systems may be categorized by their financing, the level of governmental agency that intervenes in the healthcare market, or the payers for the healthcare, all of which affect the role and reach of planning in the healthcare system (e.g., Wendt, Frisina, and Rothgang, 2009). Around the world, there are five main healthcare funding methods: general taxation from governmental budgets, national health prepaid insurance, private health insurance,

direct out-of-pocket payments, donations to charities, and other external aid (WHO, 2022). Common institutional arrangements for health care include the single-payer mechanism, defined as a single public authority, often a national authority, that pays for and may also provide health care services. Examples include the United Kingdom's National Health Service, Canada's Medicare, Taiwan's National Health Insurance, and South Korea's National Health Insurance (Axenehp, 2017). Single-payer healthcare is typically universal healthcare and available to all citizens and legal residents. A hybrid system combines single-payer mechanisms with private insurance systems. Healthcare service in Australia is provided by both private and government institutions such as Medicare. The United States is the only industrialized country in the world that does not have universal health coverage for all citizens (Vladeck, 2003). The healthcare system of the United States pulls together public, non-profit, and private providers, who operate services tied to a schedule of fees, with the cost of care partially or fully reimbursed through public and private insurance.

Planning affects the development, financial sustainability, and efficiency of health care facilities and can transform the built environment for better health conditions by enhancing access to healthcare facilities and services and managing social networks with a focus on vulnerable groups in society (Kochtitzky et al, 2006; WHO, 2022). With regard to land use, planning activities improve the welfare and wellbeing of residents by regulating, through zoning and similar instruments, the location of health facilities to optimize equity in the delivery of health services and by arranging land use and infrastructure to avoid nuisances such as exposure to pollution (APA, 1953). The allocation of health care facilities can reflect historical socio-economic conditions at the neighborhood level, especially in regard to the affordability of services (Arrow, 1963; Millborne, 2006). Socially equitable interventions into the market made

by planners have had the expressed purpose of enhancing access to care through the design and allocation of facilities and services across the population. More recently, such efforts have been complemented by more proactive approaches of planning for healthy and active living through city design, for example, with walkability, plentiful parks, tree canopies, adaptations to global warming, and healthy affordable food options (Corburn, 2015; Moudon, 2017).

Urban planning has long been associated with health through the design of urban systems to eliminate waste, provide sanitation, and plan for the development of health facilities. Prior to the 19th Century introduction of modern planning standards, cities were riddled with waterborne and airborne diseases. Early planning movements had the purpose and effect of improving health standards in public infrastructure and amenities (Hall, 2014). In the UK, for example, the concept of healthy cities originates from 1844, as the Health of Towns association in the United Kingdom dealt with poor living conditions in towns and cities (Awofeso, 2003). In the US, the 'Sanitary City' and 'City Beautiful' movements gave rise to the first zoning regulations, enacted in New York City (Howard, 1898; Hall, 2014) which came with new urban standards. Paved roads replaced dirt roads, clean water supply separated from the sewer lines were required to be neatly placed beneath the ample pedestrian space, and the new gravity-fed sewer lines replaced the open sewer canals. These same movements included hospital location and design. For example, planners integrated hospital locations within the zoning plan for the development of the first hospitals in Pennsylvania (1751) and in New York City (1824) (Cutter, 1922). When the Bellevue hospital was integrated into the first zoning plans of New York City in 1916 (Hall, 2014), its street location became one of the main avenues in New York City, and the city made considerable landscape improvements to the riverbank. Cases like this set the precedence of hospital locational choice in modern-day zoning plans and demonstrate the role of planning in

the supply of land for health care facilities in relation to other land use functions in the city (Shilling, 2012).

Over time, as the state became more involved in health care systems, planners developed assessment frameworks to arrange hospitals and related medical facilities by size and location, ownership structure, and purpose and function (APA, 2022:1953). The United States did not formalize state-regulated health care facilities until the mid-1940s (Melhado, 2006) as the majority of healthcare facilities in the US are private businesses. After the mid-1940s, the state began to control and regulate healthcare planning. Most states have their own local health board controlling the requirements for facilities to meet the minimum standard of care. For example, rural hospitals should be located in census tracts that are at least 400 square miles and in areas with population density of 35 or less per square mile (US Federal Office of Rural Health Policy, 2021). By comparison, in the European context, most health care facilities are provided by the state and health facilities must adhere to a set of national, regional, local health plans and strategic plans, with some countries also regulating the allocation of hospital care and ambulatory care, as the case of Denmark, England, New Zealand, and Finland (European Parliament, 1998; Blanpain J. E., 1994).

Network adequacy standards are commonly used planning instruments to ensure that health plans contain a network of health care providers adequate for meaningful access to services conveniently, in a timely or geographical manner. In the US, the Affordable Care Act of 2010 (ACA) required each state to provide minimum network adequacy standards to protect patients from networks with an insufficient number of providers (California Health Care Foundation, 2021; American Medical Association, 2015). California and half of all states in the US support the ACA's standard, providing qualitative measures for reasonable access. The

measures used include the ratio of providers to enrollee population, travel time or distance to providers, and timely access to appointments to set health care service standards. For example, according to the network adequacy standards for state-regulated health plans in California, hospitals have their own geographic access standards, which specify that network hospitals should be available within 30 minutes or 15 miles of each covered person's residence or workplace. The timely standard for special care is that the appointment for non-urgent care should be within 15 business days of request (California Health Care Foundation, 2021).

In addition to the use of comprehensive plans, zoning plans, and network adequacy standards for the provision of health care facilities and services, planners also contribute to the development of urban design standards that support access to healthcare facilities (Steiner and Butler, 2007) and strive to create a supportive environment for healthy communities within urban environments (Lowe et al., 2018). Planners, for example, designate pedestrian pathways and parks in support of increased walking activity (Jacobs, 1961). Planners promote the use of healthy building standards (US GBC, 2009) and develop community plans that aim to achieve a sustainable lifestyle by reducing the use of private automobiles, minimizing on-street parking and increasing social activity by incorporating mixed land uses in residential neighborhoods (Congress for the New Urbanism, 2022). The American Planning Association, for example, developed a toolkit for planners to integrate health and equity into comprehensive plans, emphasizing "Interwoven Equity, Healthy Community, and Authentic Participation" (Shah and Wong, 2020). Such planning guides could be said to promote 'Healthy Cities' (Coburn 2009), by emphasizing the impact of urban design on public health.

Perhaps the most recent area of interface between planning and health has been in the examination and mitigation of the impacts to health that are projected to arise from development

projects. Health impact assessment (HIA) in the United States is a planning instrument that can help decision makers and practitioners prioritize choices to improve public health through community design. The use of HIA links concerns about general public health with neighborhoods and urban infrastructure and addresses economic and social issues through a collaborative process (Dannenberg, 2016). The most recent guidelines for HIA are titled "Minimum elements and practice standards for health impact assessment"; they offer guidance in the design of institutional or regulatory requirements, supports, or incentives for HIA (Bhatia et al., 2014). There are six steps for conducting HIA, which borrow from more established environmental impact reporting processes to evaluate the potential health effects of projects or policies before they are built or implemented (CDC, 2016; National Research Council, Committee on Health Impact Assessment, 2011).

2.3.2 Education

Primary education is a merit good because literacy and self-awareness lay the foundation for a democratic and productive society (Musgrave, 2017). By the same token, education is subject to pervasive market failure for inadequate and costly provision of educational services. In many parts of the world, public educational systems exist to serve these needs and mitigate this market failure, and such services are tailored to demographics, the need for inclusion, the standardization of educational content and facilities, and the proliferation of public options in addition to private offerings across communities.

Planners support education systems within the field of education, and outside the field as planners of urban land use and infrastructure. Within the field, primary and secondary education requires planning for facilities and the planning that supports the standardization of educational

services, especially for the public sector. Such activities tend to mitigate the impact of market failure and align inclusive policy, allowing individual preferences and financial capacity to govern the choice (for some) to enter the private education system (Soldatos, 2020).

Urban planning plays an important role to support education as it directly contributes to the quality of school facilities, the types of services provided, and neighborhood quality. Planners in the US designate locations for primary and secondary public schools and collaborate with fragmented institutions and multiple government agencies on the distribution of public schools and facilities to incorporate walkable environments for students who live nearby and for students who need to access public transportation services (Vincent, 2006). In funding education facilities, local governments, especially in the US, impose assessment taxes or citywide levies in financing public education facilities that have their basis in property tax systems. More generally, formal planning in the UK and in most developed countries, includes the provision of guidelines, utilization of land use permitting systems to control the minimum educational standard of service, and political activities that involve advocating for equity in program and project budgeting. As urban designers, planners theorize about minimum standards for educational facilities and enforce codes and standards to a predetermined worldview of what constitutes an ideal proportion of educational facilities in the city to meet their instrumental role in providing education services (Hall, 2014).

There are several ways planners ensure the distribution of primary and secondary education. For example, planners in the US allocate property in land use and zoning plans for schools following the assessments of growth and demand for services made by school districts. In the US, school districts are special-purpose districts that define the boundaries of local public primary and secondary schools, assess the needs for citywide educational facilities and

discrepancies—the same activities that are undertaken by educational departments in city governments other countries. City planners use comprehensive planning to provide clear boundaries between school districts within and across the city boundaries and to allocate property and financial resources (e.g., the tax base) for educational facilities across different neighborhoods (Temkin, 1972). In the US, comprehensive plans support school district finance as they lay out a detailed zoning plan that comes with a set of specific development impact fees. The educational impact fees correspond to the types of residential zoning (single-family residences, suburban homesteads, and other forms, such as condos, houses and apartments), and are bundled as a sum of payments for any kind of new development during the permit and planning process (York, Kane, and Clark, 2017). The process is similar for public higher education, where planners collect facilities data, and investigate the potential enrollment demands, existing space utilization and physical capacity, costs of maintenance and potential expansion, the need for new facilities, and all the potential funding sources (Dowall & Whittington, 2003).

Planners in the US play many roles in the design of access to educational facilities, guidelines for site selection, and creation of standards and enforcement mechanisms for building construction on the use of playgrounds, fields, classrooms, and cafeterias, with the purpose of catering to the needs of everyone, regardless of their abilities. Universal design standards, developed in accordance with the introduction of the American Rehabilitation Act of 1973 (Dalton et.al., 2019), improve the quality of learning process by providing flexible arrangements for various type of learners (Rao and Meo, 2016). In 1975, the United States passed the IDEA (Individual with Disabilities Education Act) which guarantees the legal right to a free and appropriate public education for children in all publicly funded schools, regardless of disability.

The effect of both acts was reinforced in 1990 with the passage of the Americans with Disabilities Act. Compliance for educational facilities increases the number of accessible amenities on school grounds, reduces mobility barriers in transportation facilities (school bus, ramps, bus stop), and more broadly influences the design of transportation systems in the vicinity of schools, affecting the use of specific standards for crosswalks, access to safe and regular public transport, availability of dedicated biking facilities, regulation for slow lanes and traffic control during rush hour, the need to delineate the safety school zone, and the establishment of neighborhood speed limits (Steiner and Butler, 2014).

However, across countries, there are a variety of barriers that impede access to free and inclusive educational services (e.g., Birger et al. 2009). Inclusion in planning for educational facilities means providing equal opportunity to all in accessing education, whether it is in publicly funded educational facilities or through privately funded schools selected to receive government assistance. Emerging economies and countries historically affected by colonialism often lack free and inclusive educational services due to the path-dependent history of segregation policies, which can lead to continuous segregation along racial and ethnic lines and questionable claims of segregation as a preference, as evidenced for example, in the concept of maintaining 'vernacular' ethnic identity of schools in Malaysia (Ahmad and Yusof, 2010). In some countries, lack of policy support for free and accessible education reinforces a low level of awareness of the importance of education and produces a vicious cycle, resulting in a lack of institutional commitment to provide free primary and secondary education to low-income and often indigenous communities (Birger and Craissati, 2009). Importantly, segregation policies have not been limited to less developed countries. Before the 1950s, public schools in the United States were largely segregated out of racial animus, the misguided belief that racial

characteristics determine human behavior, and claims that racial differences in income drive racial segregation in the school system (Rothstein, 2017) despite the presence of affirmative action policies for post-Civil War reconstruction. A critical juncture occurred in 1954, after the US Supreme Court in the Brown v the Board of Education case declared school segregation to be 'inherently unequal' (Reber, 2005). After this decision, planning for education facilities slowly adapted to racial inclusion. These efforts to break from the history of racial discrimination have continued over time. In 2003, the Supreme Court denounced the practice of race-conscious admission processes in privately funded higher education (Eckes, 2003) and to this day, the embodied experiences related to racial inclusion remain a popular topic of discussion (Endo, 2020).

2.3.3 Parks and Recreation

Parks and recreational goods and services are public goods that provide opportunities for leisure and entertainment and support physically active and healthy lifestyles (Kaczynski and Henderson, 2007). While the provision of parks and recreational amenities pre-dates the discipline of planning (Mumford, 1989), planning adopted concern for such spaces in its earliest days with the 'city beautiful' movement (Hall, 2014; Evelev, 2014; Fairfield, 2018) and accelerated its adoption by acting on the decisive critiques of planning by Jane Jacobs (1961; Banchiero et al, 2020). Jacobs observed how complex social interactions within cities affect quality of life and stressed that, when properly integrated, well-designed parks are the community centers of lively neighborhoods (Putnam and Quinn, 2006). While critical of the statistical approach in planning for parks, which relies on ratios of open space to population, Jacobs urged planners and landscape architects to instead select and design parks to meet the

social purposes of cities (Talen, 2010). In response, contemporary parks and recreation facilities and services—most of which are public lands and facilities—are forms of social infrastructure focusing on creating systems that respond to local values, needs, and circumstances (Steiner and Butler, 2007).

In the U.S., national, state, and local governments delineate and maintain systems of parks. The U.S. National Park Service, a federal governmental agency, was formed according to the National Park Service Organic Act in 1916, for the ownership and operation of national parks, national monuments, and other natural, historical, and recreational properties (U.S. National Park Service, 2015). State governments similarly own and operate park systems within their boundaries. In metropolitan areas, cities design neighborhood parks, parkways, and large urban parks in response to existing and evolving urban form and to meet the expressed needs of residents. In suburban and exurban areas, governments also focus on the richness of natural resources, creating connective systems and networks of greenways, parks, and trails for ecological and preservation functions (Steiner and Butler, 2007).

From an international perspective, parks and recreational facilities could be categorized by function, by the regions of the country where they are located, considering physical settings, landscape features, demographics, and socioeconomic characteristics (Steiner and Butler, 2007). London and Seoul note the functions of parks as green belts to control urban sprawl (Xie et al. 2020), in Shanghai they are extolled for the purpose of reducing greenhouse gas emissions (Ru et al. 2010), and in São Paulo, parks contribute ecological services and are recognized as part of the biosphere reserve (Ribeiro, 2015). The function of parks and facilities are noted to include the conservation of biodiversity and promotion of ecotourism in Indonesia (Anggraini & Gunawan, 2021), and to protect iconic landscapes in China (Shi et al, 2020). In dense urban environments,

parks have been refashioned to enhance food security in Seattle (Hou and Grohmann, 2018), Singapore (Diehl et al., 2020), and parts of Vietnam (Rutten et al., 2014). With climate change, urban parks in many parts of the world are being redesigned to restore or expand the functional capacity of wetlands or floodplains to retain water and absorb excess stormwater for periodic flooding. In the City of Rotterdam, in the Netherlands, non-green open spaces within urban squares and playgrounds have been redesigned to expand floodwater detention functions, to deal with the urban flood risks exacerbated by climate change (Liao, 2014). In many cities, parks also play an important role in providing recreational opportunities, especially for families with low incomes and small flats or apartments for housing, and who do not have other options for recreation. Therefore, the quality of public spaces and parks, and easy access (e.g., public transport), is also crucial from the viewpoint of social justice.

Planning is the first step in the management of parks and recreation services, as it distributes physical areas and facilities to create recreational experiences and ensure access to support services (Christiansen, 1977). Guidelines and comprehensive plans articulate community visions and design principles, offering a framework for the development of the local park and recreational system over time. Planners engage people or groups in the planning process to address community needs for equitable, diverse and inclusive recreational environments (Washington State Recreation & Conservation Funding Board, 2021; Michigan Department of Natural Resources, 2016). Planners meet the demands for park systems today by including plans for special-use function parks, such as dog parks and skateboard parks, to address ever-changing cultural and technological trends (Steiner and Butler, 2012). Within a shorter time horizon, planners represent the need for parks and other public facilities in the CIP, as well as land use planning, zoning regulation, and building permitting systems, and work to ensure that funds,

public land, and the bargaining power of the city can be leveraged to meet the current and future needs of communities for facilities, the maintenance of the properties, and programming for services provided onsite.

Statistical ratios for the allocation of park and recreational space persist in the concept of service radius, or service area, and associated standards for level of service (LOS). The service area of parks and recreation facilities can be described as a circle measuring the residential area and associated numbers of residents served, and quantifies, according to LOS standards, whether current systems are adequate to cover all community areas. According to US National Park and Recreation Association standards, parks and open spaces could be classified by location, size, and application of LOS. For example, the service area of a neighborhood park has a radius of 0.25 to 0.5 miles, and the size of a qualifying park should be 5 to 10 acres (e.g., Washington State Department of Community, Trade and Economic Development, 2005).

Altogether, the types of instruments specific to park planning practice could be divided into four categories: 1) park and recreation planning guidelines; 2) comprehensive plans; 3) design and standards; and 4) implementation programs (MRSC, 2021). The first two categories have a long time scale. Park and recreation planning guidelines and comprehensive plans include general statements, directions, and strategies for the provision of park and recreational facilities and services by organizations. For example, Washington State, in the US, maintains a statewide park and recreation plan which provides a near and long-term vision for the roles and responsibilities of local, regional, state, and federal agencies, private and non-profit partners in the system, and identifies five main directions for implementing park planning (i.e., sustainability, equity, youth participation, cultural diversity, and vitality). The comprehensive plans of State and local agencies contain the long-range vision but also set local standards for

how the park system is operated and maintained over time. Local governments in the US include counties, cities, and special districts (e.g., schools, utilities). City and county plans focus on park system development and financial conditions, such as park capital facilities plan, capital funding plan, and capital and operations funding needs (e.g., Kitsap County, 2018). The plan for the parks of the City of Bellevue in Washington State (2016), for example, focuses on the capital projects for open space, greenways, wildlife corridors and trails, park facilities, active recreation facilities, urban parks systems, and includes lists of projects in order of priority. On a more micro-scale, park design and standards include information for general park and recreation design, LOS standards, resource information, or local design standards for different types of park development. Many communities refer to their local-governmental park and facility guidelines to complete a LOS study to quantify the number of necessary recreational facilities to meet community needs (Steiner and Butler, 2012). Lastly, implementation plans, also called action programs or special programs, express government agency commitment to meeting goals over time, oftentimes including the identification of funding sources and publicly available databases (e.g., Michigan Department of Natural Resources, 2016).

2.3.4 Social Housing

The role of planning is central to the housing delivery system, assessing both the demand for and quality of available housing, including complex issues such as informalities and market failures, and responding to those failures with market interventions, often including the regulation of maximum rents, rent contracts, lease terms, public subsidies, publicly-supported non-profit cooperative housing, or direct public provision of housing (Mekawy, 2014). Planners ascribe to the UN-Habitat's articulation of the 'right to adequate housing', including equal access

to housing and security of tenure (UN Habitat, 2014). As the world's population grows and migrates to urban areas, the provision of adequate social and affordable housing becomes more challenging. In meeting their role, planners undertake assessments of the existing housing stock and forecast the need for future housing by gathering data from site-specific surveys and communities most affected by urban land changes, urban-rural migration, and the level of homelessness in both developed and less developed nations (UN Habitat, 2014).

Many terms and definitions apply to social housing. In many parts of the world, social and publicly provided housing is the norm. The International Union for Housing Finance organization refers to social housing as housing produced below general market prices by the government. The government provides and maintains below-average rental housing by eliminating the need for profit. In many countries in the European Union and the United Kingdom, for example, social housing is provided and maintained by the government to reduce the pressure on citizens who cannot afford to buy or rent housing at market price (Needham and De Kam, 2000). In the United States, social housing is recognized exclusively as government-provided 'public housing', which fell out of favor in the Post-World War II period. Instead, the US government prefers to use the term 'affordable housing', which recognizes the private provision of rental housing with the possibility of public subsidies for eligible low-income families, the elderly, and disadvantaged individuals (HUD, 2022).

Public budgets commonly include funds for publicly provided housing, and where this is the case, public housing prices are set by government agencies, which then develop on publicly owned property. The US is the exception, and the reasons for the shift away from the public provision of housing in the US are instructive. Frieden and Sagalyn (2013) explain how downtown revitalization in the 1950s and 1960s for federal highway construction and urban

renewal projects displaced minority communities, in tandem with the creation of relatively isolated public housing (Fieser, 2013; Frieden and Sagalyn, 2013). By the 1970s, urban planners came to realize that these public housing projects were concentrating poverty, perpetuating inequality, and failing to provide the social mobility and quality of life originally intended. Many public housing developments of the time were eventually destroyed, replaced with a variety of subsidies for developers to build and residents to rent privately provided housing (Stoloff, 2004). Public housing programs quickly transformed into other social government programs (e.g., housing vouchers, housing subsidy, and grants), and the US government began to encourage new affordable housing development in partnership with private entities (e.g., trust funds, non-profit organizations). As a result, the stakeholders in social housing programs in the United States are numerous and can be identified by their distinct roles as renters, homeowners/landlords, housing developers, or regulators and partners for housing development (e.g., the federal government or local authorities). As regulators, the national government intervenes and encourages the market by using the tax system to subsidize homeowners and renters. Among them, planners retain the responsibility for calculating housing subsidies, recommending policies for controlling the price of rental housing, and in planning for and dismantling unsuccessful programs, with the aim to increase the racial and economic mix of neighborhood households.

US housing market interventions are complex but may be reduced to incentives for residents in the form of housing vouchers, and housing developers in the form of a tax credit, both of which are administered by the U.S. Department of Housing and Urban Development. The most common instrument targeting low-income households is the use of the housing voucher, in which households have the freedom to choose their preferred rental housing without the loss of housing assistance. Federal funds are distributed to local public housing agencies,

which operate the voucher program (HUD, 2022). The housing units need to meet all program standards within the program's maximum allowable rents and the owners must be willing to join in the voucher program (Buckley and Schwartz 2011). For developers, a low-income housing tax credit provides financial incentives to invest in low-income rental housing. The main idea of the tax credit is to transform federal income taxes owed by housing developers into tax credits received for the purpose of developing low-income housing. The total tax credit that developers receive depends on the cost and location of the housing development and the proportion of units occupied by low-income households. Developers may receive tax credits for up to 10 years, and the property must remain occupied by low-income households for at least 15 years (Steiner and Butler, 2012). Localities decide what kinds of housing should be subsidized, the household sizes that should receive priority, and where the housing should be built (Steiner and Butler, 2012). In Seattle, for example, local authorities provide incentives in areas designated as incentive zoning or opportunity zones and impose affordability rates based on income level. Additionally, local authorities may release special orders or rules to protect the rights of citizens. For example, the mayor of Seattle, Washington, signed a temporary eviction moratorium on residential evictions, which prohibited charges for late or partial rent payments during the COVID-19 pandemic (City of Seattle, 2020).

In this system, planners regulate housing production in the form of incentives and zoning plans to ensure the private sector provides adequate affordable rental units in desirable locations (e.g., inclusionary zoning in Washington, D.C.). The government refrains from developing large-scale social housing to avoid inefficiency and direct competition with firms. In this system, the US housing market is assumed to be a competitive market as it caters to the preferences set by their customers willing to pay profitable prices. However, this system is built on the neoclassical

economic assumption of infinite resources, and disregards sources of institutional bias such as racism and social exclusion. Cities that periodically experience large urban in-migration and land scarcity (e.g. New York, Seattle, San Francisco, Los Angeles), do not necessarily see a concomitant rise in housing supply from the market. Instead, the increased demand with stagnant supply prices people out of the market, resulting in exorbitant commuting distances to city centers and rising numbers of people suffering from homelessness.

In countries with heavily centralized planning systems for housing (e.g., China, the Netherlands), the government owns a large portion of the land market, thus enabling the country to procure and control the development of most of social housing facilities at low cost. The upside of this approach is that it allows public funds to produce more housing and improve access to housing for low-income households. The risk of this approach means public funds may be used to saturate the real estate market and reduce the market ability to competitively provide high quality housing to customers who are willing to pay at a profitable cost. In addition, the use of public funds often comes with the risk of moral hazards in the form of unchecked spending, a lack of systematic verification and adherence to land use planning, and a lack of compliance with housing standards. The opposite is true for social or affordable housing in Vienna: local government-provided or publicly subsidized cooperative houses have a much higher living quality (and, e.g., lower energy use) than privately financed, free market housing. In brief, planners should realize that social housing production is dependent on the environment of the market system which determines the planning capacity for housing and the ability to shift their strategy from public sector to private sector provision.

Regardless, in both public and private systems, planners are concerned with improving social integration and social cohesion for people living in social housing (Petković-Grozdanović

et al, 2016). Planners assess the location of social housing development and map priority areas in zoning regulations and land use plans. These practices include improving access for people that need assistance such as the elderly, people with disabilities, and people experiencing hardships (e.g., refugees, people transitioning from homelessness, single parents, trafficking survivors, domestic violence survivors). Planners advocate for the development of sufficient community services and consider the preferences of people coming from different social backgrounds. Planning provides an essential part of social housing policy as it reduces the cost of seeking services that match up with the target group's relative ability to pay. In addition, planners improve neighborhood integration by utilizing the various infrastructure services in the area (e.g., transportation services, food services, education services, health care support, and childcare). The availability of infrastructure services provides a support system for people residing in social housing and opens the opportunity to reduce the tension between new tenants in social housing with existing residents. For existing patches of affordable housing located across the city, planners promote the development of transit stations to connect multiple social housing developments in the suburbs with major transit lines in the rural and suburban areas. To deal with scarcity, cities in the US are increasingly deciding to change constraints in zoning regulations to allow higher density development in areas previously designated as 'single family residential', thereby improving locational choices in strategic areas (Glaeser, 2011). To combat historical patterns of discrimination in housing, city planners are using inclusionary zoning practices, encouraging housing development to have certain numbers of the housing for low-income households, e.g., in areas in U.S. cities historically dominated by single family and predominantly white neighborhoods. Inclusionary zoning can stipulate, for example, that when a

developer builds a 100-unit residential complex, a significant portion of its housing units must be dedicated to social housing (Buckley and Schwartz 2011).

2.4 Conclusion and Directions for Future Research

2.4.1 Conclusion

The discipline and practice of urban planning plays critical roles in the provision of social infrastructure facilities and services, attributable to the self-prescribed purpose of planning to alleviate market failures, reduce transaction costs to society, internalize externalities, and ensure the provision of public goods. Planners use models and instruments to recognize path-dependencies in urban growth and development while influencing the movement of growth and development, over the short- and long-term, along more collectively desirable paths of development for the future. The same instruments common to planning, such as comprehensive plans, general or sector-specific urban development plans and strategies, capital improvement plans, zoning regulations, and land use maps, provide a foundation for planners to contribute to the development of social infrastructure goods and services. As they do so, planners strive to deepen the connections between organizations providing services and communities in need, often reaching outside of routine and conservative practice to advocate for improved services and the policies to support them.

2.4.2 Directions for Future Research

As a discipline shaping urbanization as well as rural development, planning evolves with the discoveries in the social and natural sciences, giving rise to new perspectives and methods over time. However, several issues of social infrastructure in planning are worth future research.

Among them are equity in the distribution of social infrastructure services, social justice, and sustainability, especially with regard to climate change.

In our increasingly urbanized world, a lack of planning as well as a lack of sensitivity of planning to the need to develop in ways that ensure environmental integrity, contributes to unplanned urban expansion and sprawl. These are contingent issues, especially in the Global South, relevant to urban planning because planning activities have the potential to alter and shift the course of rapid urbanization. Studies exemplifying social justice and the distribution of services turn planning attention to the conceptual theory of 'the right of the city' in the Global South by researching and reshaping the mechanisms governing cities and paving the way for capacity building for planning practice in these cities (Parnell and Robinson, 2012). These studies highlight how formal planning procedures are responsible for producing informal space, constantly 'unmapping' the spatial value of urban arrangements (Porter, 2011; Roy and Alsayyad, 2004). As noted in this chapter, planners as instrumental agents for social change are equipped with the legitimacy to support equitable social infrastructure development by improving democratic processes in the planning system. Legitimate procedural process helps planning further public interests and reshape the narrative of the 'public interest.' In areas that are underdeveloped, planners have the ability to reshape and negotiate the allocation of land use space beyond the rigid procedural process (Klosterman,1985). Critical to our international readers is the need for planners to rethink how the state and planning institutions can efficiently provide the necessary market freedom for individuals, firms, and organizations in their effort to sustainably improve living conditions and livelihoods. Relatedly, research can reflect on ways to improve the planning and governmental ability to account for the direct and indirect social costs

associated with the demand on infrastructure services caused by migration and influenced by the geography of place (Fuchs et al., 2021; Krugman, 1981; 1999).

Handbooks and studies of infrastructure planning (Elmer and Leigland, 2013; Dowall and Whittington, 2000; Mathur, 2019) show that long-term planning suffers from information asymmetry because it relies on historical data to predict future outcomes. In addition, long-term planning instruments are often unreliable in projecting cities' future conditions, because planners rarely see how issues such as climate change can have a direct impact on markets for land use, infrastructure, and the associated tax base that supports social infrastructure goods and services. Planners often forecast positive economic growth and consider the impact of climate change and other uncertainties as contingent issues, and rarely prepare planning instruments for internalizing the social costs affected by reduced activities and catastrophic events that cause or result from economic downturns. For example, planning instruments hardly integrate climate-related data to account for specific safeguards in the case of extreme weather events (Kim et al, 2021) despite the fact that cities age, infrastructure declines, and the impacts of climate change can be devastating (Kimmelman and Haner, 2017).

Planning has the capacity to improve social justice, and planning professionals observe themselves as playing this role. Still, this is an under-researched area of planning, that threatens to leave planning practitioners disillusioned. Referring to the Rawlsian *Theory of Social Justice* (1971) planners are motivated to seek out fair opportunities for all, and especially for those with the least advantage in society. Planners exercise this moral imperative by applying incentive mechanisms, utilizing planning tools founded on fundamental principles such as equality, needs, demands, preferences, and the (in)ability to pay (Lucy, 1988). Thus, the profession provides an avenue for the democratic process and collaborative reasoning, which may entail reasoning and

negotiating the utility of planning tools (Harper and Stein, 2017; Blanco, 2017). Our rationality can be flawed because of the history of prejudice, or because planning institutions prefer to prioritize majority groups over minorities (Marcuse, 2013; North, 1990). Because social infrastructure is asset specific, the use of long-term comprehensive planning may perpetuate historical injustice (Whittemore, 2012), leaving the most vulnerable groups in our society (e.g., low-income communities, individuals that are historically excluded because of their race, origin, ability, gender, and criminal records) prone to insecurities, because of the flaws in planning instruments. If confined to procedural process, planning has limited capacity in addressing persistent institutional problems (Klosterman, 1985; Harvey, 2003), especially since planning is based on existing frameworks (e.g., welfare state institutions). Areas of research for social justice could include exclusionary and inclusionary policy in the comprehensive and zoning plan (Whittemore, 2021; Holsen, 2020); the effects of development and allocation of social infrastructure projects in areas which are characterized as low-income (Loh and Kim, 2021; Diehl et.al., 2020); devising a mechanism to prioritize the use of public property for people who are historically marginalized (Castells, 1983; Rothstein, 2017); advocating for institutional change to prioritize fair treatment in accessing planning decision-making (Farrell et.al., 2004; Alchian and Demsetz, 1972); improving the use of discretionary policy and informal arrangements (Porter, 2011); and mitigating the costs of local economic displacement (e.g. small kiosk in urban centers, riverfront development; Henry, 1987; Thomas, 2001); and institutional change to improve the coherence of planning decision-making with environmental resources (Jacobs, 2018).

Sustainability concerns the longevity of systems scalable to the carrying capacity of social and environmental services (Costanza and Patten 1995). The Brundtland report concludes

that sustainable development "requires meeting the basic needs of all and extending to all the opportunity to satisfy their aspirations for a better life" (Brundtland, 1987, p.42) Planning studies have emphasized the development of polycentric urban centers in the Global South to disperse urban density (Schlinder and Kanai, 2019), doing 'less' to reduce consumption of resources (Wright, 1996), and incorporating causes of vulnerability to the natural disasters exacerbated by climate change in formal planning (Forsyth and Peiser, 2021; Fink, 2019). Decarbonization and the need to adapt to climate change are underappreciated topics in planning research and practice, in general and in particular for the sectors identified as social infrastructure. The pathways for doing so, though increasingly researched at global and regional scale, as reported by the Intergovernmental Panel on Climate Change, have implications for the Global North and South that differ, and implications for the current and future provision of land, funding, and social programming that are not well-understood at local scales. Such areas of research fall squarely within the cross-cutting functions of urban planning for social infrastructure.

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CHAPTER 3 Infrastructure Arrangements: A Comparative Study Of Batam Free Trade Zone And Seattle Foreign Trade Zone

Abstract

The United States Foreign Trade Zone (FTZ) Law, established in 1934, places stringent rules to restrict FTZ site spillover to local government authority. However, this is not the case with other FTZs in developing nations, such as Indonesia, which build upon a long history of policy discretion in the creation of amalgamated economic zones (e.g., free zone, free port, special economic zones), which nevertheless override the role of municipality in urban planning and the provision of infrastructure.

In this comparative international case study, Seattle and Batam juxtapose the city and the alternatives of urban governance managed under economic zone authority. In Seattle, the city distributes water supply as public goods within the city's boundary, including supply to the Port of Seattle and businesses in the FTZ. Batam's FTZ institutions challenge the role of urban governance in the city proper. Discretionary policy upholds the power of the Batam Industrial Development Authority (BIDA) in establishing rules, distributing land use rights and associated fees at a low cost, and managing the distribution of all state assets, including water supply infrastructure.

Utilizing transaction costs economic (TCE) and new institutional economic (NIE) theory, this paper considers infrastructure planning and development as a comparative make-or-buy decision in water supply system contracting based on institutional data and water supply planning records in Seattle (1910 – 2021), and based on Batam (1973-2021), to understand the role of the state and the concomitant restrictions in planning and development associated with principal-agent relationships, asset specificity, and various levels of hierarchy as forms of safeguards against bounded rationality and opportunism in contracting.

In Seattle the local government, as the principal and agent of city management, created a structure to mitigate private water conflict in the early 1900s, which led to the creation of public utilities for water supply services and the decision to economize on labor by integrating other services such as gas, sewer, and electricity within a collection of municipally-owned utilities. This decision internalized specialized skills within municipal government, safeguarding against bounded rationality and future contractual monitoring problems due to asset specificity.

In Batam, BIDA was created to act as a principal to a city government, while other organizations, such as state-owned enterprises, government businesses, hybrids, and private water supply companies, compete for scarce resources. Lessons learned from this paper suggest that the primacy of national government discretion in formal rules maintains Batam Indonesia's Free Zone Authority's (BIFZA) position as a principal in Batam urban management, which renders local government authority redundant. Analysis suggests that a recent judicial decision to cease water supply privatization across the country has been insufficient to transform water supply into a public utility. This is due to the high cost of turning over dedicated and highly transaction-specific assets previously controlled and managed by the private sector to public management, which raises a concern as to whether BIFZA's planning and budgeting control over privatization has provided sufficient institutional safeguards.

Keywords: FTZ, new institutional economics, infrastructure planning

3.1. Introduction

Literature on water supply privatization (Fay et al., 2021; Pérard, 2009; Gentry and Abuyuan 2000) provides for assumptions related to moral hazard and efficiency that suggest private sector management to be superior to public ownership. However, cross country

comparative studies on water supply privatization (Koumpli and Kanakoudis 2022, 3; Fay et al.al., 2021; Pérard, 2009; Dinar and Saleth, 2004), have yet to provide substantial evidence linking institutional environments to the choice of privatization. Such studies utilize a macroeconomic perspective contrasting the developed and underdeveloped institutions in terms of capital formation and technological prowess, and promote the idea that privatization helps alleviate the investment gap in the water supply sector. Although these studies provide valuable insight into which countries choose to privatize, the impact of idiosyncratic reasoning related to institutional variations at the microanalytic level is missing.

Studies in water supply similarly neglect the observation that there are distinct urban areas in the developing world, solely developed for private investors to promote international trade (Amri et al., 2023). Free trade zones, SEZs, or simply economic zones, gained popularity across East Asia, Southeast Asia, Africa, and the Middle East after the success of China's Special Economic Zone (SEZ) development and the launch of the Belt and Road initiative (Hermaputi et al., 2017 Li. et al., 2020; Yao and Whalley, 2016). In 2019, the US Congressional Service reported that over 90% of the total 5,300 SEZs examined were in developing economies (Bolle and Williams 2019, 3). The development of SEZs in developing economies across Asia, Southeast Asia, and Africa aligns with development economic theorizing of a path of growth, foreseeing manufacturing production as a means for achieving industrial competitiveness and contributing to a surplus of national wealth. The development of free trade zones (FTZ) in Southeast Asia, for example, reflects a broader trend of creating industries operating as fully functioning economic zones at the scale of cities, located near the country’s border or within a designated port area, acting as an economic buffer to absorb the economic spillover from neighboring cities (Chettri et al. 2021; Yeoh, Kwan, and Wong 2004; Hutchinson and Chong

2016). Designed to minimize transaction costs in the production and import of goods, these zones, characterized by McCalla (1990) and Orenstein (2011), utilize an expansive spatial territorial approach, laying the foundation for a type of city and regional development which blurs the lines between urban planning and FTZ territorial development.

Taking the examples of Batam, Indonesia, and Seattle in the United States, this paper compares and contrasts institutional environments leading to city and FTZ development to make the case for comparative institutional analysis of infrastructure decision making. The two institutional environments provide contrasting settings for applying the mechanisms of urban planning and its role in distributing water supply infrastructure. Batam history, initiated by a discretionary policy at the national level (Pranoto Suwiryo, Haripurdaja, and Soeratmi 2021), established state agents (e.g., National government and FTZ authority) as principal rulers of industrial development, bypassing any local power at the provincial or city level. Batam economic zone policy, thereby, presents an example of the use of private funds and hybrid forms of organization (State-owned enterprise), with the premise that this organizational form would provide an efficient way to keep the city's economy running and develop basic infrastructure. Meanwhile, Seattle's water supply development, in contrast, relies on urban planning within municipal government. Municipal governments in the US are creatures of the state. The city charter of Seattle, first created in 1869 with the last amendment registered in 1946, founded under Washington state law, provides the structure for city functions and restricts the privatization of public services such as water, expressing the public intent that it continue to be maintained as a public utility to alleviate water use conflict (Lange, 1999; SPU, 2024).

This paper posits that discretionary restrictions in the FTZ institutional environment, affect spatial planning in Batam and, by extension, the choice of water supply infrastructure

privatization. Utilizing transaction costs economic (TCE) (Willaimson, 1999; 1985) and new institutional economic theory (NIE) (North, 1990; 1993), this paper asks: how do institutional environment differences in Batam economic zone and Seattle city charter and urban management policy establish comparative make-or-buy decisions in water supply development?

To answer the research question, this paper is divided into five sections. The first section provides an overview. Section two describes the two institutional environments, particularly with regard to how planning and infrastructure development institutions in Batam and Seattle, structure constraints and related rules for implementing water supply arrangements. The third section discusses a methodology utilizing the theory of the state (North, 1990; 1981), and decision tree analysis adapted from transaction costs economics (TCE) (Williamson, 1975; 1985) to comparatively examine public bureau decision making processes. Data collection for this study utilizes historical records of policies, recent public documents, statistical data, and publicly available maps on the Google Earth platform. Additionally, data was sourced from interviews with public and private sector participants between February 2022 and September 2024. Section four, discussion and analysis, identifies mechanisms for decision-making.

3.2. Background for Comparative Institutional Analysis of Seattle and Batam

3.2.1. Comparative Urban Governance: Economic Zones and Urban Planning

Indonesian civil law requires that the government operate under hierarchical rules. Therefore, the Presidential order issued in 1971 which designated Batam as a bonded warehouse site was groundbreaking, as this rule was the earliest example of an institutional arrangement for land use planning in Batam. In the decree, Batam Industrial Development Authority (BIDA) was tasked with land management rights related to Batam's development. A revision, under Presidential Order 41 from 1973, ordered BIDA the authority to oversee land use allocation and

infrastructure distribution by accessing both public and private funding (Amri et al.,2023). Batam's FTZ site allocation determine BIDA's assets. In general, BIDA is tasked with organizing all of the national assets in the mainland of Batam, which includes the water supply system.

In 2011, the House of Representatives established laws governing Indonesia's legal hierarchy to stabilize past policies in favor of national interests, placing presidential decrees and government regulations above local ordinances. This had the practical effect of pre-emption of national decrees over local law. The city of Batam had been recognized as an autonomous local government and pushed for its first local elections in 1999. Batam's spatial planning ordinance, which was revised in 2004 to include indigenous land settlements known as "Kampong Tua" (Susiani, 2019), is considered to be secondary to Batam's mainland planning.

Figure 3.1 illustrates the spatial progression of Batam planning, which emerged from a quaint fishing island to be gradually delineated as: (1) the base for the logistical operation for PERTAMINA, a state-owned company for oil and gas (1971); (2) Industrial Port, bonded warehouse, and bonded zone (1971– 1992); (3) Batam Industrial Port, bonded warehouse, and bonded zone jurisdiction (1992-2007): (4) Batam Free Port and Free Trade Zone (2007-2021).

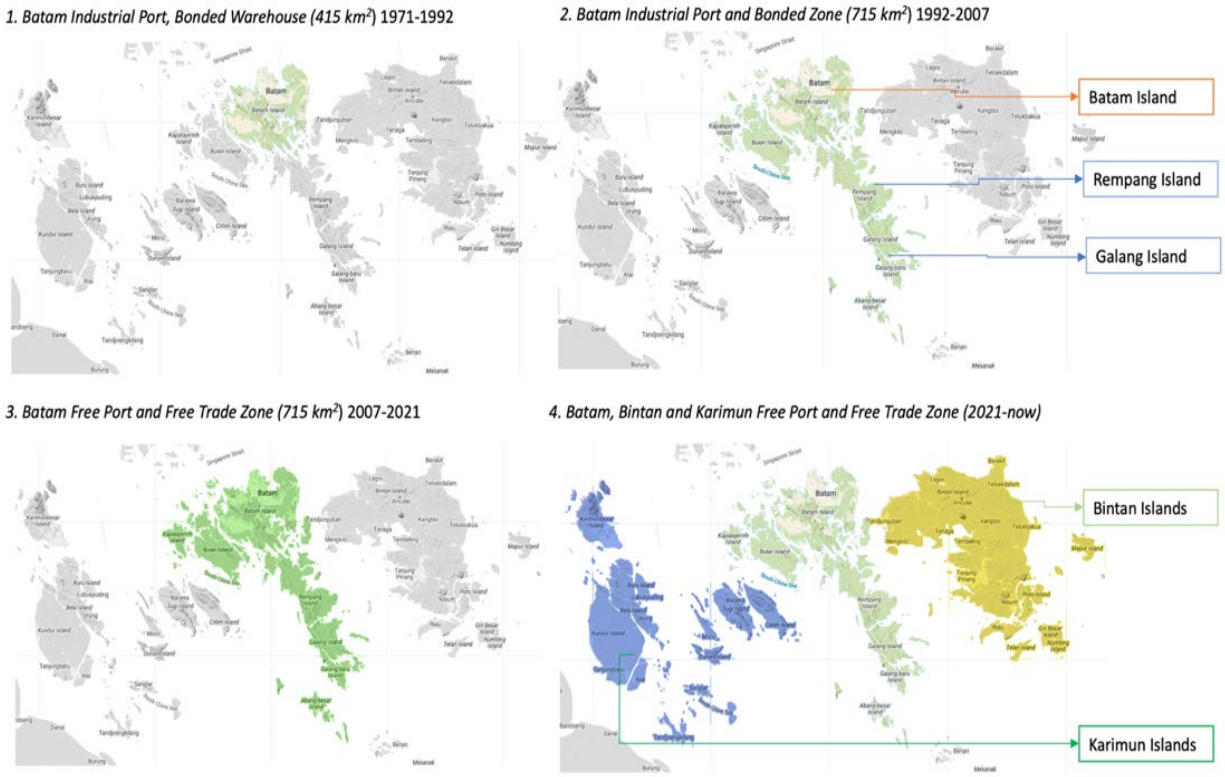

Figure 3. 1 Spatial Progression of Batam Industrial Port, Bonded Zones, FTZ and the expansion of FTZ development in Bintan and Karimun Island (1971 – 2024)

(Author, compiled from government planning regulation, boundaries for Bulan islands are estimates, and published reports)

In 2024, the President issued decree No. 1 Year 2024 detailing Batam, Bintan, and Karimun masterplan as a free port and FTZ, which strengthened the Batam Indonesia Free Zone Authority's (BIFZA) position as the primary caretaker for state assets in Batam.

On Batam island, specific manufacturing activities are clustered in 26 sites, while another 2 sites are designated as Special Economic Zone (SEZ) parks, focusing on tourism, digital industries, and aviation services (see Fig. 3.2). Within these estates, developers construct various facilities, including warehouses, roads, water supply infrastructure, social housing, drainage systems and and logistical transit spaces. Each industrial estate subscribes to one or two master meters and is registered as a Batam water supply client. As of 2024, BIFZA reported 1,309 active

industries registered as Foreign Trade Zone (FTZ) users, most of which receive their water supply from industrial estate developers and pay water use fees to their respective industrial estate management entities.

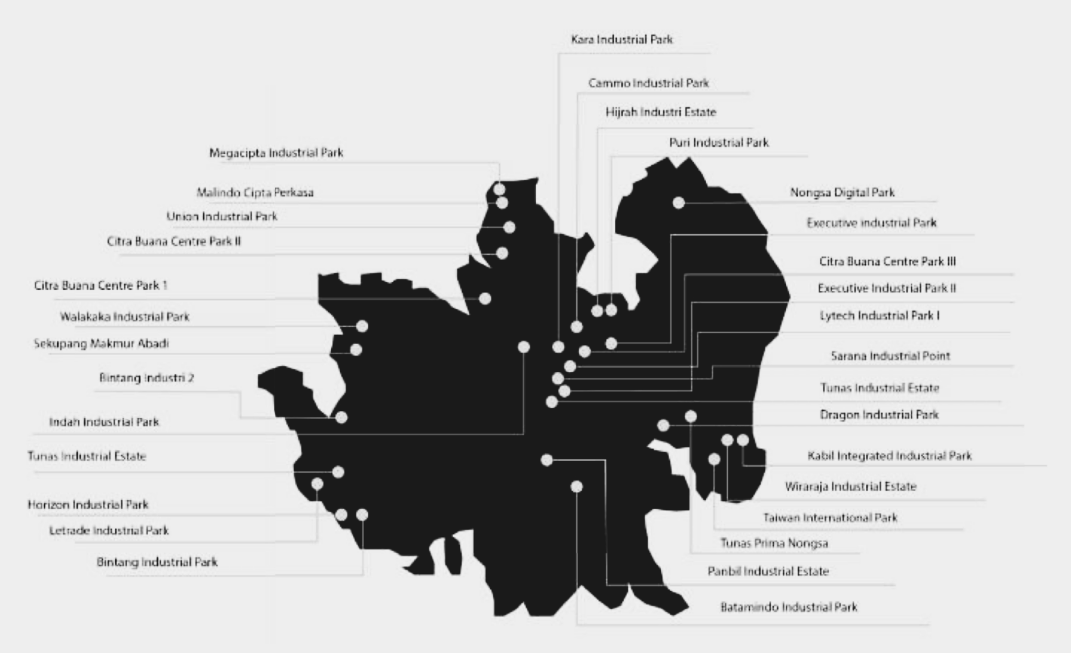

Figure 3. 2 The distribution of 31 Industrial Estates in Batam Island

(Source: BP Batam, June 2024)

In comparison, Seattle was incorporated in the Washington territory in 1869, through a city charter. The latest adoption of the city's charter was in 1946. Rules for city functions are detailed in the Seattle Municipal Code (SMC). In parallel, the Port of Seattle, an autonomous local government created by the Washington state legislature in 1911, operationalized Federal laws on Foreign Trade Zones (FTZ) in Seattle. The Port operates port facilities, assigned by the Foreign Trade Zone Board in 1949 as FTZ site #005. All of the Port's facilities are located in the economic zones designated by the city for industrial or mixed-use purposes, reflecting the established framework for land use and planning in the city and region. Urban planning

mechanisms, dictated by the city's municipal code, facilitate a structured approach to integrating port activities with infrastructure facilities and services within the urban landscape. Figure 3.3 illustrates FTZ site boundaries inside the Port of Seattle (in orange) and one area marked in Seattle's land use plan as industrial land and mixed use (City of Seattle, 2017).

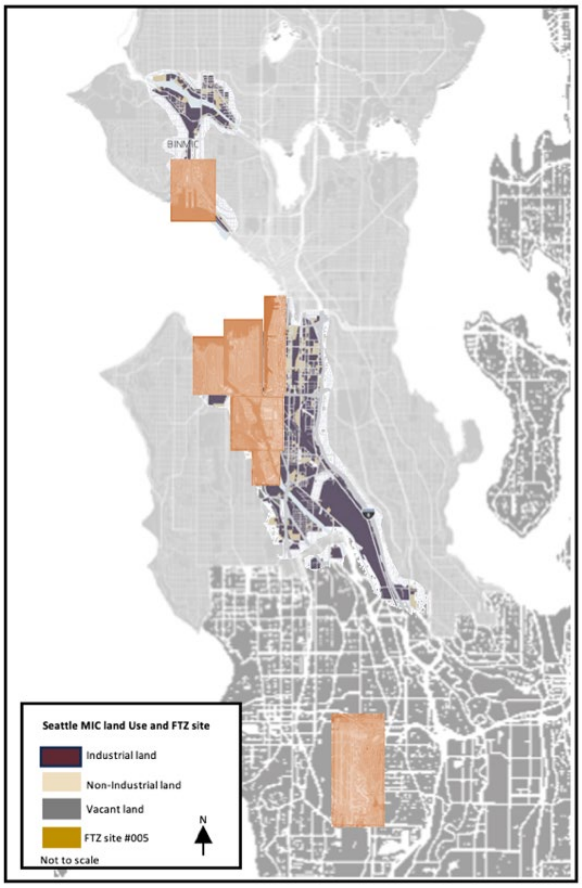

Figure 3. 3 Port of Seattle FTZ site and Seattle Industrial land use

(Source: International Trade Commission (ITC), 2024; City of Seattle, 2017)

The municipal government regulates land use planning across the city, crucial for maintaining an organized urban landscape. Seattle's Foreign Trade Zone (FTZ) site #005, encompassing 955 acres, was opened in 1949. It includes all of the Port of Seattle's terminals and facilities, located along the waterfront. Additionally, both the Ballard and Interbay

Manufacturing/Industrial Center (BINMIC) and the Greater Duwamish Manufacturing/Industrial Center (GDMIC) are significant contributors to the industrial base in Seattle. Over time, the Port of Seattle expanded its FTZ activities by opening new terminals and establishing new FTZs, such as the SeaTac fuel facilities covering 226 acres. This expansion increased the overall FTZ site allocation to 1,390 acres and extended the boundaries of site #005 to include Seattle Airport (FTZ site 10). The city has thoughtfully zoned these industrial activities, ensuring that port operations align with the wider urban planning initiatives (City of Seattle, 2017). This systematic approach has allowed for a harmonious integration of industrial activity within the city's fabric.

3.2.2. Public and Private water supply arrangements in Batam and Seattle

Figure 3.4 illustrates the hierarchical water supply arrangement in Batam Island. Batam water supply management is regulated by a series of executive decisions, Presidential decrees, minister decrees, and government regulations periodically altered based on the incumbent's view of Batam's future.

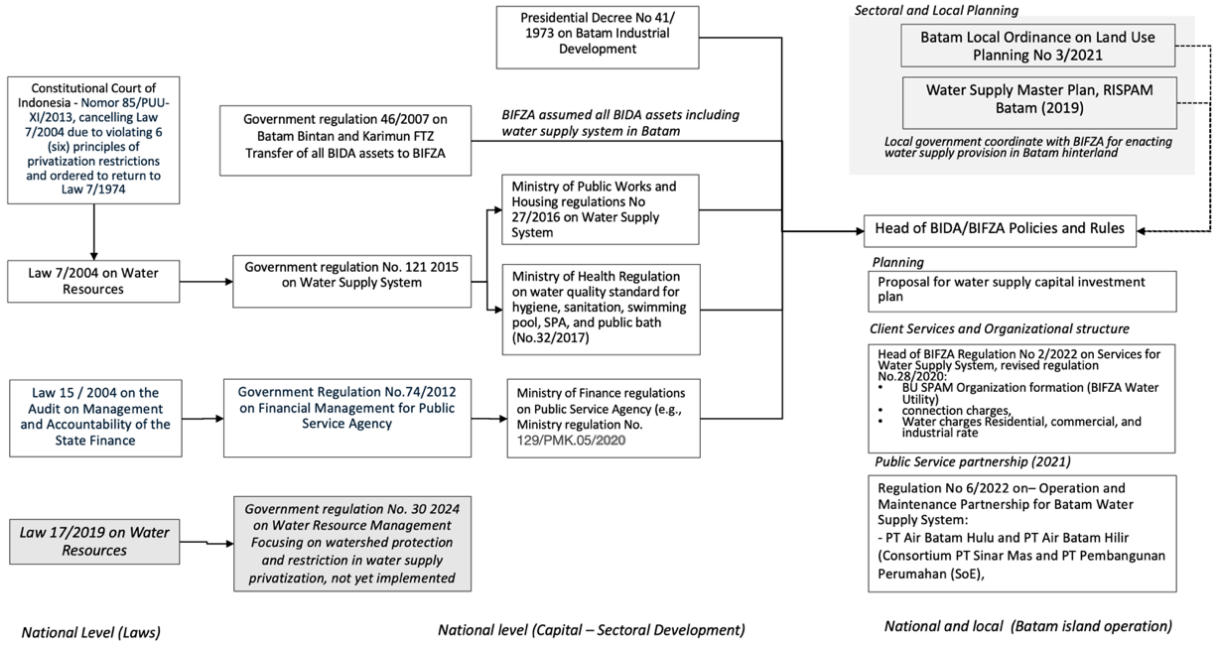

Figure 3. 4 The Hierarchy of rules for BIFZA's managed water supply arrangement in Batam mainland (Source: BIFZA, 2024)

Presidential Decree No. 41 Year 1973, shaped Batam's water supply governance: BIDA is the leading agency which provides infrastructure services and has an uncontested authority to plan, budget, construct, and operate the street and network system, water supply system, and waste and garbage collection system inside Batam mainland. Sectoral development regulation (State minister decree in public works and housing, ministry of health, and ministry of finance) dictates the standards for water supply facilities, water quality, and the organizational structure for BIFZA's water supply utility. The Ministry of Public Works and Housing and Batam Municipality facilitate local government planning and developing local water supply connections in the hinterlands, such as small islands and communities outside of BIFZA's urban pipelines in Batam mainland. The Ministry of Public Works and Housing and Batam Municipality coordinate plans with BIFZA by developing a unified water supply plan. As per regulation, the head of BIFZA oversees and signs regulations, including the imposition of user fees/water charges and connection costs in the service areas managed and operated by BIFZA's partners.

Figure 3.5 diagrams the hierarchy of water supply arrangements in Seattle including the relationship between laws at the federal level, adopted or adjusted with pre-existing water rights arrangements at the Washington state level.

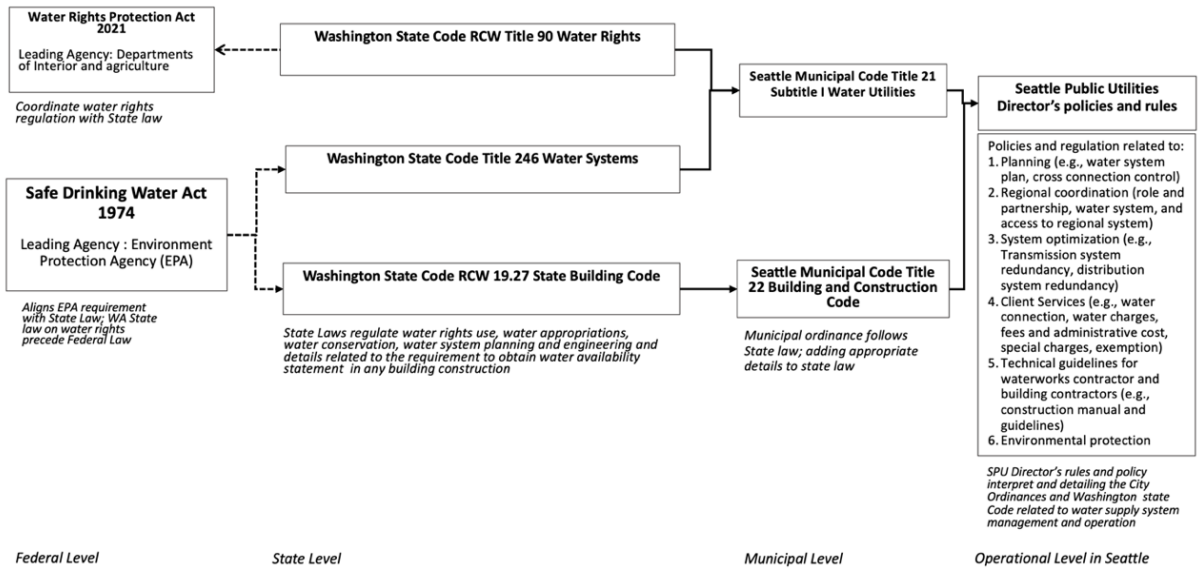

Figure 3. 5 Hierarchy of rules in Seattle's water supply arrangement

Washington state adopted the federal law to the extent that the law does not infringe on pre-existing water use rights in the state of Washington. Seattle municipal code assigns the task for drinking water supply to municipally-owned and governed Seattle Public Utilities (SPU). The SPU Director creates policy and rules detailing the management of water supply utility at its organization, according to the existing Seattle municipal code and the Washington state code, as well as creating policies for optimizing the operations of water supply facilities. SPU Director's policy and rules are laid out to ensure downstream freshwater resources protection, minimizing water use conflict (e.g., cross-connection) in the regional water supply system, creating SPU's guidelines for contractors and SPU internal projects; regulating demand management, and water use savings from system optimization, and providing the public with a detailed list of water connections costs and water charges.

3.3. Methodology and Decision Tree Analysis

3.3.1 Preliminaries: Theory of the state and transaction cost economics

The theory of the state in NIE relates to human behavior in the bureaucracy by positing two states: the benevolent state and the predatory state (North, 1981). In the theory of the state, the ruler of the state or the ruling power maintains stability by establishing the structure or institutions for the distribution of resources (e.g., property rights, state incentives) to groups of constituents in return for loyalty and for maintaining the ruling power's rights to extract rent from their constituents. Strong rivals threaten the ruling power's authority, prompting the ruler to yield its authority or cooperate and share a portion of its authority with its competing rivals. The underlying principle to the theory of the state views the ruling authority as the principal, and the cooperative rivals as state agents, though other configurations are also possible.

Pluralism, or the presence of new rivals, threatens the legitimacy of the ruling power. The ruling power may choose to cooperate or submit in the presence of a stronger rival by power sharing or enabling a mechanism set by the constituents or other competing ruling power to curb arbitrary decisions to ensure fair resource distribution to their constituents in an act of benevolence. Alternatively, the ruling power may wish to impose a set of rules upon themselves to prevent a future ruling power from acting arbitrarily, thus capable of upholding long-term rules and agreements and, by doing so, establishing credibility, and maintaining the legitimacy of the ruling power to extract rent. In the absence of rivals, discretionary restraints on the ruling power can prevent arbitrary decisions, fostering a stable environment for fair market transactions and growth. These restraints support stability and establish credible government commitment (North, 1993).

Williamson's (1999, 307) discussion on the nature of public contracting reiterates North's perspective on the theory of the state. Public bureaus do not always act based on benevolence, despite the fact that the public bureau is expected to weigh in on the role of government in

alleviating market failure as much as on other unforeseen considerations. This theory holds that the flaws or transaction cost inefficiencies of existing forms of organization may only be remedied by reference to alternative, more efficient, existing and feasible forms of organization. This remediableness criterion states "an extant mode of organization for which no superior feasible form of organization can be described and implemented with expected net gains is presumed to be efficient (Williamson, 1996, chap. 8)," suggesting all forms of arrangements, whether making fully public choices or entirely reliant to privatization will incur transaction costs. Unlike the private sector, public bureaus or the government have the power or authority to enforce regulation; hence, public bureau contracting is limited to avoid market disruption. The theory also holds that there are several types of public transactions, and the distinct mode of organization in a public bureau transaction must be recognized, as each type of transaction is unique, posing its own risk and different types of probity hazards, due to politics. In regard to politics, North (1990, 357) states "the political market has been and continues to be, in which the actors have an imperfect understanding of the issues affecting them and equally in which the high cost of transacting prevents the achievement of efficient solutions," suggesting that political decisions are often costly, although the alternatives may be higher, thus all solution contain some degree of inefficiency.

Williamson (1999, 336) explained that a public agency may be inclined to rely more on bureaucratic instruments due to a high level of discretionary decisions allowed by those instruments, and doing so may be efficient when governments must deal with uncertainty from external hazards (e.g., foreign affairs). The safeguarding mechanisms that restrain or allow bureaucratic decision making adjusts in theory to the nature of work in public bureaus. Most agency or public bureau transactions can be recognized for their organizational capacity

concerning safeguards to address moral hazards or provide for integrity rather than being driven by high-powered incentives (e.g., rent-seeking, personal gain at public expense). The contractual arrangements in public bureaus strongly rely on procedures and hierarchy to function, which safeguards staff activities through acting on probity, in contrast to private contracting (profit-taking).

As shown in Table 3.1, the impression of different hazards in public bureaucracy (Williamson 1999, 339) indicates different types of contractual hazards found in various types of government transactions. Transactions in foreign affairs are high in probity, demanding the hierarchy and loyalty obtained through civil service. The market would provide a poor substitute, due to the political nature of national threats and interests. Meanwhile, other transactions such as defense procurement and prisons are high in asset specificity. Defence procurement involves materials which require specialized handling, making the cost greater than prison development. Prisons require expansive forms of oversight to prevent human rights abuses. In contrast, a simple contracting decision, such as for the purchase of office supplies or income tax collection, is not asset specific, resulting in a lesser contractual hazard.

Table 3. 1 The impression of different hazards in public bureaucracy (Williamson 1999, 339)

Composite transaction	Cost Control	Asset Specificity	Probity
Foreign Affairs	+	+	++
Defense Procurement	++	++	+
Office Supplies	+	0	0
Income tax collection	+	0	+
Prisons	+	++[a]	+

[a] physical asset specificity

0 weak
+ semistrong
++ strong

Figure 3.6 shows the contracting schema of transaction cost economics extended from unassisted market exchange to the other extreme of full safeguards on exchange in the form of the public agency (Williamson, 1999, 337, figure 3)

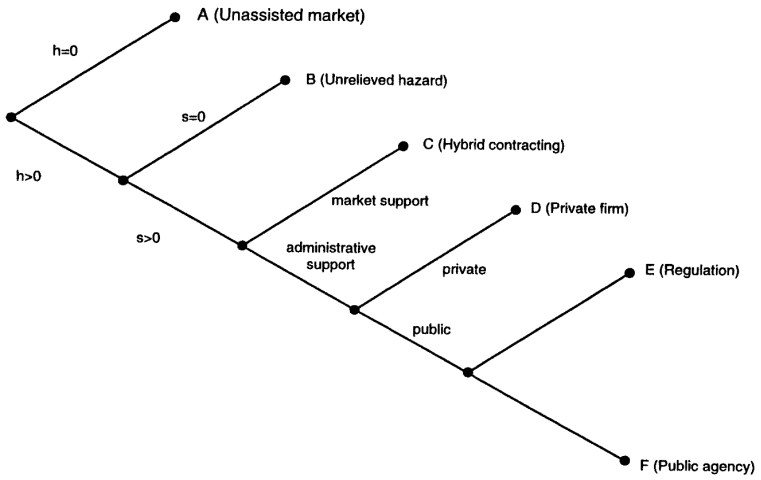

Figure 3. 6 Contracting Schema Extended

(Source: Williamson, 1999, 337, figure 3. Contracting Schema extended)

The schema provides a framework for understanding decision making and guiding the analysis of the make or buy decision, understanding transactions as being governed by alternative organizational relationships. In this figure, *h* denotes hazards (e.g., asset specificity, bounded rationality, opportunism with guile) and *s* denotes contractual safeguards (e.g., constraints in contracting, hierarchy, probity). Transactions efficient in A arrangements are best described as a simple purchases, where it is safe to assume that issues related to integrity and contractual hazard are non-existent (e.g., office supplies), thereby this type of contracting can be outsourced to the market. B indicates a more stringent approach to public contracting relying on a procedure or a mechanism to monitor contractual hazard (e.g., bulk item purchases, specialized

service procurement). Type C typically refers to public bureau partnerships, for example, in the case of infrastructure contracting (Williamson, 1999), in which public bureaus must allocate public assets as non-redeployable dedicated assets for specialized services to function. In such instances, the state may create regulation to guard against strategic behavior (e.g., arbitrary tariff escalation in specialized contracting). On point D, the government may take part of the responsibility for owning and operating public services while sharing the responsibility with the private sector (e.g., the provision of affordable housing in the US). Point E suggests a choice in which the state functions as a regulatory body mediating the behavior of private firms to serve public interests (e.g., antitrust commission). Point F refers to the public bureau as fully responsible for providing services (e.g., foreign affairs, prisons).

Note that the distribution of transactions to points on the schema suggests a discriminating alignment of forms of organization with safeguards against the hazards that drive up transaction costs and thus inefficiency in those transactions. In this way, transaction cost economics is a theory of economic efficiency that explains economic organization, and one that may extend to the public bureau.

3.3.2 Decision Tree Research Guide

Figure 3.7, presented in the form of a decision tree, suggests how relationships between variables in the institutional environment can be used to design the comparative study of water supply privatization and public arrangements (Source: Fay, et.al., 2021; BP Batam, 2024; Kelly et.al., 1998).

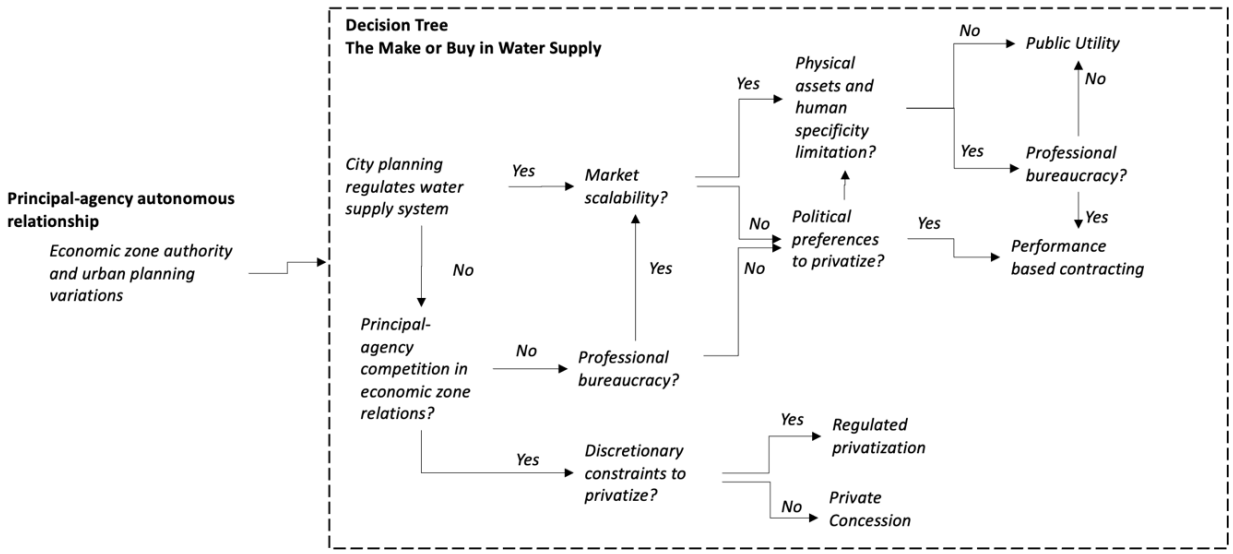

Figure 3. 7 Research guideline for the make or buy decision in water supply system arrangements

(Adapted from:Williamson, 1999, 337, figure 3. Contracting Schema extended; Fay, et.al., 2021; BP Batam, 2024; Kelly et.al., 1998)

It is worth noting that studies in comparative water supply systems (Bjorkman, 2018; Pérard, 2009; Zeitoun et al.,2017; Koumpli & Kanakoudis, 2022) showcase how water supply systems share common development qualities. Water supply systems, in general, apply a similar mechanism—in upstream, water supply system development involves efforts in maintaining water quality at the water sources, processing the extracted water in a treatment facility before being delivered through an intricate the transmission and pump station/reservoirs, and optimizing the distribution of processed water. In downstream systems, interwoven transmission pipes, water reservoirs, and pump stations draw and push water to the distribution system which carry processed water to the client in each water districts/zone.

This study argues that variations in institutional environments (Peters; 1998, 30), effectively created by economic zone authority and urban planning, led to differing rationales for water supply governance in Batam and Seattle. The cases exemplify contrast, with Seattle

situated within the typical urban planning assumptions, of water supply as public goods, distributed to society as means to ensure social welfare. Meanwhile, Batam's choice of privatization is situated in the context of a city governed by an economic zone authority, which sees privatization and hybrid arrangements as mechanisms for sharing responsibility and resources.

Previous studies with cross country comparisons of global water supply privatization (Fay, et.al., 2021; Koumpli and Kanakoudis 2022) have credited factors such as market scalability, experiences in private partnership, a distinctive technological and physical asset specificity dependency to privatization, in addition to an insistence on political leanings with decisions to privatize. Utilizing new institutional economics, this paper adds a principal and agency relationship rationale which reflects economic zone authority perspectives towards the role of foreign investors and the private sector in developing the region. Lacking city planning and regulatory constraints, water supply privatization may stand out as a possible tool for power sharing between the principal and the agent.

3.4. Analysis and Discussion

Table 3.1.2 summarizes the contracting decisions for water supply in Seattle (pre and after 2010) and in Batam (1995-2024) within a public-bureau format of the make-or-buy construct (made by public organization, hybrid contract with private organization, and private contract) from transaction cost economics perspectives.

Table 3. 2 Comparative Summary for the make or buy water supply system

SEATTLE	**MAKE** • 1910 – Seattle Water Departement (SWD)	• Not for profit, revenue returned to fund the operation for public utilities activities

	1997- SWD Incorporated in Seattle Public Utility (SPU)	• Financial records plans and audited capital improvement plan published by the City of Seattle.
BATAM	**BUY** BIFZA appointed PT Adhya Tirta Batam, to Design, Build, Operate water supply system (1995-2020)	• 25 years contract, 15% dividend revenue to fund BIFZA activities (non-earmarked) • Financial records audited by a certified public accountant, audited report undisclosed/ limited access.
	HYBRID BIFZA appointed PT Air Batam Hulu and PT Air Batam Hilir, Private Company joint venture with State owned company (2021 – now)	• 15 years operation and management contract, • Fragmented contracting: (1) upstream with • PT Air Batam Hulu; (2) downstream with PT Air Batam Hilir • 15% profit sharing from user fees to fund BIFZA activities (non-earmarked) • Financial record is audited by BIFZA internal audit; audited report published in BIFZA website.

The privatization of Batam water supply development in a 25-year design-build-operate contract was an example of executive discretionary decision-making. The impression at the time was one of private sector professionalism in the international market of water supply and management, contrasted by a lack of public sector capacity and national-level expressions of desire for the rapid industrial development of Batam.

In 2020, the institutional arrangements for privatization were significantly modified, in an attempt to improve the quality of the work being conducted and instill capacity in the Indonesian government's governance of water supply. The political preference to privatize remained, with

the added purpose of requiring the formation of state-owned enterprises with the participating firms and an internal auditing function within BIFZA.

Seattle's water supply system, created in part as a form of government intervention (Coase, 1960) for alleviating social costs, and as meeting its constituent's requests, is organized through a fully public enterprise (SPU), to ensure water supply is distributed at cost (e.g., the cost of production). Seattle's municipal code, developed after the city charter in 1946, further strengthened the role of Seattle's water department and determined the mechanism for water supply development.

Impressions of contractual hazards in water supply development for Seattle and Batam, and shown in Table 3.3, consider the example of a transaction in the form of an extension to a water supply main. The table offers a comparison of the contractual hazards of cost control, asset specificity, and the need for probity.

Table 3. 3 Impression of Contractual Hazard in water supply development in Batam and Seattle (adapted from Williamson,1999, 339)

Composite Transaction		**Contractual Hazard**		
		Cost Control	**Asset Specificity**	**Probity**
Seattle	Seattle Public Utilities	++ (cost for water main extensions carried by client, unit price contracts for construction only)	++ (physical assets owned and governed by municipality)	+ (procedure is regulated with municipal urban planning)
Batam	Full Privatization (1995-2020)	++ (capital cost carried by private investor)	++ (physical assets, human assets)	+ (water tariff is regulated, private parties economize on production cost)
	Hybrid (2020 - now) audited budget and expenses	++ (capital expenses carried by BIFZA)	++ (physical assets, human assets)	+ (water tariff is regulated private parties haggle ex-post)

0 weak
+ semistrong

++Strong

In all three rows, the transaction involves the public sector and the private sector. The differences in institutional arrangements determine the alleviation of risk from contractual hazards, as described in parentheses within the table. In the Seattle case, SPU as an agent of the municipal government issues contracts to prequalified small firms or laborers limited to construction in unit price contracts. Full public ownership of the assets establishes safeguards for asset specificity, while unit price contracts offer budget control. Public responsibility for urban planning in the governance of water supply provides probity.

Under the economic zone governance, the organization for water supply system in Batam, BIDA is not focused in a generalized way on patterns of urban development. They are focused on industrial expansion on a case-by-case basis. Incremental expansion is discretionary in that it lacks the rational approach favored through urban planning, and thus lacks probity in the governance of water supply expansion. Executive power through BIDA/BIFZA holds unilateral decision authority in Batam's privatization scheme, meaning there is no local government planning or authority. In other words, local urban planning can provide the safeguard of probity to rationalize and provide economic stability in the distribution of water supplies. This reading is in agreement with Williamson's (1999; 1985) suggestion that unchecked executive power is rife with moral hazard. Rules of contracting, urban planning practices, and public ownership and maintenance of the assets in Seattle constrain executive power, but there are no local equivalents providing constraints in Batam.

The concession, which fully privatized the water supply system in Batam, left BIFZA without authority to control the budget in water supply expansion. Under the terms of privatization, BIFZA could demand royalty from water supply revenue (extraction from the

profits of the private water supply company). This measure alone could arguably represent a conflict of interest in budget control for BIFZA. BIFZA happens to control the allowed amount of water tariffs, keeping them at a low rate. As private contractors during the concession period are driven to provide a profit margin, their high powered incentives can lead to maladaptation after the award of the concession. Firms can choose not to invest in expansion, thereby limiting their own expenses. They can also, unless constrained by the contract and its enforcement, substitute substandard materials and labor to lower the cost of delivery of service and increase their chance of recouping costs with profit. As discussed further below, the change in quality that followed privatization was significant: the private sector began placing HDPE pipe in place of the standard cast iron ductile pipe. In Seattle, by contrast, the municipal government has no incentive to reduce the quality of construction to a lower standard of pipe. The ownership structure of build-own-transfer in Batam lacks meaningful control over problems of asset specificity, especially during the concession period. Low tariffs are inadequate mechanisms, in and of themselves, for budget control; and BIFZA had no authority to monitor or control the budgets and material or labor choices of the private sector developers. The principal-agent relationship lacked the probity needed because of this lack of authority and presence of perverse incentives.

After 2021, a hybrid form of privatization ensued. Upstream and downstream contracts were separated, and the contracting entities were to be partially owned (est. 40%) by the national government of Indonesia. This arrangement can have a perverse effect on budget control, as both the government and private entity would have an interest in raising funds from clients consuming water supplies. BIFZA's new rules imposed a unit price on small connections with low flows, and market rate through bidding on larger expansions of the system. There is some form of

budget control through BIFZA's newly created internal affairs unit, which reported to a separate national ministry. As these are long-term engagements that remain controlled by private companies, with assets developed and owned for an indeterminant time by the hybrid companies, asset specificity problems persist for the physical and human assets in these transactions. BIFZA continues to lack an urban planning rationale for development, with limited probity. The private company continues to gain a share from water use fees (whether it is profitable or not), and haggles ex post to increase the allowed cost for expansion of the water supply system. In transaction cost economic terms, such ex post haggling is a sign of maladaptation that arises from problems of asset specificity that are not resolved by the current institutional arrangements.

1) The make of buy decision in Seattle public ownership

Figure 3.8 offers a stylized schema of Seattle's water supply public ownership in its FTZs.

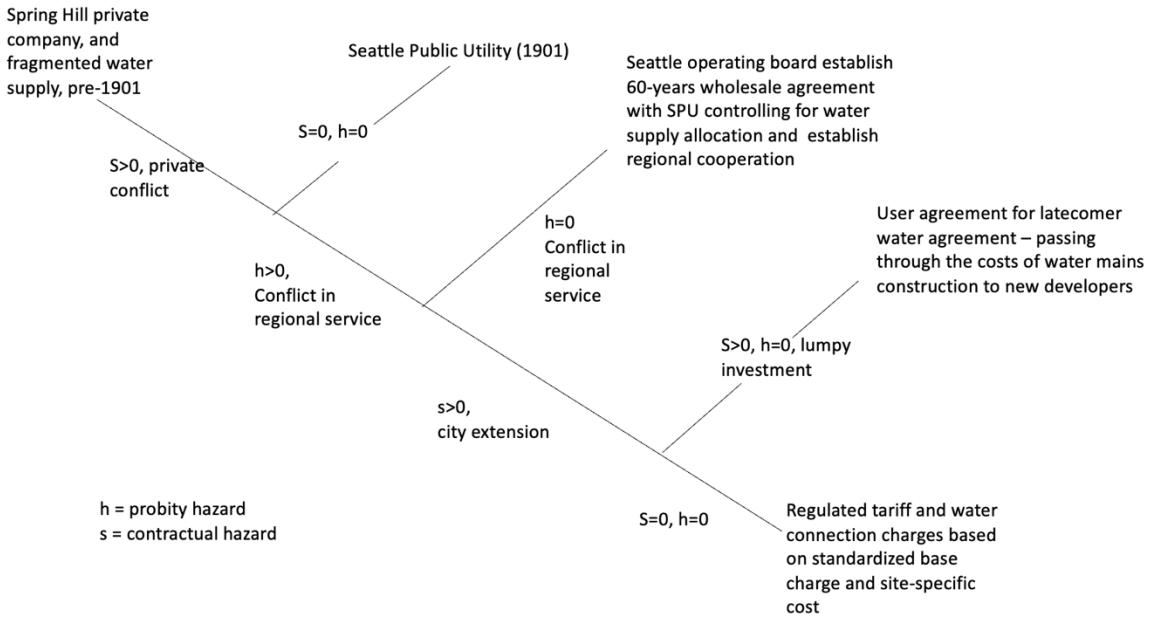

Figure 3. 8 Water Supply Infrastructure schema for Seattle

Initially, the city depended on a private, fragmented water supply arrangement; the largest supplier was the Spring Hill water company. In the late 1800s, rapid population growth escalated the demand for public infrastructure. To address this, the city established the Seattle water department in 1888 and allocated approximately $845,990 through a bond in 1895 to develop the Cedar Watershed Pipeline Project, which finished construction in 1901 (City of Seattle, 2024; Lange, 1999). Over time, the City of Seattle purchased Spring Hill, and various water districts were formed. In 1977 King County passed a Public Water coordination act, to manage future public water development in King County and resolve water use conflict across the region (King County, 2024). In 2001, the City amended its ordinance (Seattle City Council, 2001) related to wholesale and retail water service, and issued a standard contract template (the City of Seattle, 2001) for wholesale clients interested in securing water supply at the same rate as Seattle Public Utility's retail clients, effectively reducing costs discrepancy for its wholesale clients.

In response to population growth, the Seattle Public Utilities has further worked to reduce capital investment costs (Seattle Public Utilities, 2022) by passing the cost for new water main extensions under latecomer agreements (Seattle Public Utilities, 2024). Clients paying for investment receive the returns on their investment, after newer developers come and extend pipelines at their locations.

Seattle public water supply system has strong cost controls. SPU Director's rule provide costs which correspond to a standard material and labor market rate, applicable in Seattle, to minimize contractual hazards and opportunistic behavior in determining site specific costs.

2) The make or buy decision in Batam water supply privatization

Figure 3.9 offers a stylized comparative institutional analysis of privatization in Batam, separating the transaction cost economic features of the instituitonal arrangements during full privatization divide (1995-2020) and a more hybrid form (2021-present).

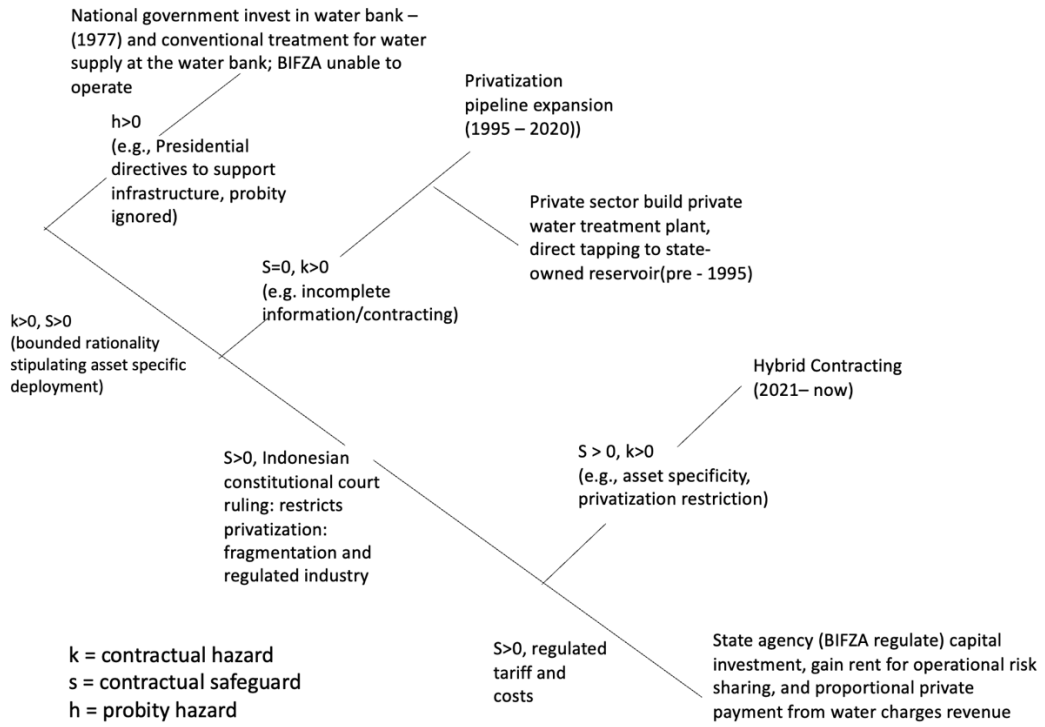

Figure 3. 9 Batam clean water supply system schema

In Batam, the national government initially considered operating the water supply system independently (1973-1995) without requiring private company involvement. The Indonesian government made public investments in the development of several dams (Tembesi, Duriangkan, Sei Harapan, Sei Ladi, Muka Kuning, and Duriangkang) throughout the early 1980s to early 1990s. However, in the early 1990s, the national government did not have a complete picture of water infrastructure plans, nor the necessary skills to develop water treatment plants, water transmissions, and distribution channels as a scale necessary for industrial expansion. BIFZA

lacked the technical skills to operate a water supply business enterprise, and government funding was exhausted by the development of water reservoirs and other infrastructure projects.

In 1995, BIDA signed a private partnership agreement with PT Adhya Tirta Batam (PT ATB), expecting the company would act as an extension to the state, distributing clean water supply to support a national effort for industrializing Batam. The agreement stipulated the condition for PT ATB to build water treatment plants, reservoirs, water mains, and water connections based on an agreed connection rate, specified ex ante. The company collected water charges based on a tariff established by the Batam Authority. Before the privatization, two industrial estates (Batamindo industrial estates and Panbil industrial estates) had developed their own water supply systems by investing in water mains flowing directly from the main estuary reservoir. Despite the impression that a private company would behave as an extension of the state, the privatization of 1995 left PT ATB as the sole proprietor for water supply service (Source: BIDA/BIFZA water utility, 2024; Director's interview PT ATB, 2024). The privatization agreement, as an example of an incomplete contract with a long duration, high in asset specificity, set the government of Indonesia up for ex post complications.

In Batam privatization, a precondition to the agreement stipulated that 15% of dividends would go to BIDA, through its water supply enterprise, implying a profitable outcome preference for continuing the contract and BIDA's risk aversion to bearing the costs (Andrianto, 2024). Under the agreement, PT ATB was required to maintain profitability regardless of the rate of the government-controlled water tariffs.

PT ATB carried out a series of activities designed to lower the cost of water supply systems and services. In carrying out their operation, PT ATB set out to protect their own organization from construction-related risk by vertically integrating with third party contractors

to build and develop water treatment plants, reservoirs, pumping stations, water supply transmission and distribution pipelines, and to maintain the water supply systems. In terms of water supply distribution systems, PT ATB took advantage of other gaps in the contractual arrangements to lower the cost and quality of pipe (ATB, 2024). Any pipe replacement at the time would have been considered a success by simply lowering upstream transmission pipes water losses (1-3%) and reducing non-revenue water, which was about 14% in the distribution pipe mains. The pipe replacement program was considered a success for these reasons, despite significant losses in the lifespan and performance characteristics of the infrastructure.

The program replaced 90% of Batam's water mains made from ductile cast iron pipes (DCIP) with a cheaper high density polyethylene (HDPE) pipe. HDPE pipe is cheaper, more durable and flexible compared to DCIP, having lifespans 50 years shorter than those of cast iron. HDPE pipe is malleable to extreme climates, causing it to break down or melt when exposed to direct sunlight, resulting in chemical releases as the plastics break down. PT ATB chose to retrofit the existing system with HDPE, arguing the average outdoor temperature in Batam is between 24°-35° Celsius (77° - 95° Fahrenheit) and having replacements installed beneath the soil surface where average temperatures are more likely to meet the standard 21°-25° Celsius testing environment.

In 2014, a class action lawsuit was filed against the Constitutional Court, citing that the state or the national government had failed its citizens by allowing private water companies to manage the water supply system and, by doing so, discriminate against citizens' access to water sources and in meeting their daily needs. The Constitutional court, in a landslide decision, annulled the water resource bill No 7/2004 and mandated the state to end water supply privatization, with the exception that if a partnership is necessary, the partnership should not

prevent citizens' rights to access clean water sources. Following the annulment, a new government regulation was passed in 2015, which restricted private water supply businesses, ordering a fragmented business agreement if privatization remained more viable than government ownership. The Constitutional Court also mandated that local governments or similar authorities are to be responsible for the control of water supply management, planning, and development, and environmental protection (Government regulation No. 121 Year 2015; Ministry Decree No. 19 Year 2017). BIFZA ended the contract with PT ATB in 2020.

At the end of the contract, PT ATB's investment estimates suggest, over the span of the contract (25 years), the company invested Rp.1,4 trillion (US$ 90 million) (Andrianto, 2024). BIFZA took over the facilities and water supply operation by creating a BIFZA water supply enterprise, and reassessed the value of PT ATB investment at Rp 1,13 trillion (US$ 85 million). The asset shrinkage was due to the fact that most of the pipeline replacement project was outside the scope of the agreement, as Batam rapid development resulted in water mains extensions carried by private costs (Andrianto, 2024).

Near the end of the agreement in 2019, BIFZA personnel, lacking the expertise to operate the water system, decided to appoint PT Moya, to manage the transitional operation and maintenance of the newly acquired assets from PT ATB. PT Moya was appointed as the company has a successful record in running a potable drinking water supply system in South Tangerang supplying for a private estate.

A year later, BIFZA opened bidding for a new water supply operator. The scope of privatization was split, establishing PT Air Batam Hulu to operate the raw water transmission and water treatment plant and PT Air Batam Hilir to operate the transmission and distribution lines. To establish greater government control, hybrid forms of contract were formed. PT Air

Batam Hulu and PT Air Batam Hilir are two companies created by PT Moya (a subsidiary of PT Sinarmas Land), which joined with PT Pembangunan Perumahan (a state-owned Company). The Consitutional court did not ban profit taking activity, causing BIFZA's agreement with both companies to continue a form of rent-share from the water sales. However, the BIFZA agreement stipulates that BIFZA is responsible for investing capital expenses to develop new water reservoirs and water mains. Individuals and households are responsible for payments related only to water connection.

The result from the selection process was immediately challenged by PT ATB in the Indonesian arbitrary court, which ended unfavorably for PT ATB (Andrianto, 2024; Indonesian arbitrary court ruling number: 44030/V/ARB-BANI/2021). PT ATB claimed to have lost over Rp.600 billion (approximately US$40 million) from its own pipe replacement program, due to BIFZA's refusal to renew their contract under the new regulations.

Within the hybrid contracting arrangement, BIFZA partners: PT Air Batam Hilir and PT Air Batam Hilir, must submit a budget approval form to BIFZA before building each new project. Payments for any new capital projects must be verified and audited based on a standardized budget expense as a means for government control over specialized contracting. BIFZA is required to pay for new pipeline construction after the cost of construction has been audited by the internal affairs unit. The internal affairs unit is a unique department attached to almost all government agencies in Indonesia. It was established in 2005 to safeguard against moral hazards (e.g., corruption, gratification, nepotism).

3.5. Conclusion and Implication for Future Research

The main idea of infrastructure and economic growth in the global north focuses on the local economy, where FTZ policy acts as a complementary to economic development. In

developing countries, the idea of growth is influenced by international trade interests, often supported by national government interests over local interests.

Lessons learned from institutional analysis of water supply development in Batam suggests that FTZ rules which infringe on local markets, blur the connection between the role of the state and the market. FTZ policy is a form of intervention, which may be beneficial for attracting international investments, though it hardly considers local planning. Water supply systems are high in asset specificity, leaving parties vulnerable to ex post maladaptation, arising from bounded rationality and opportunism with guile, observable as problems of cost control and a lack of probity in decision making.

Organized in comparative institutional economic terms, the privatization of water supply in Batam in the 1990s is shown to lack the safeguards of cost control provided by its hybrid replacement in the 2020s. And in turn, the hybrid form of contracting in Batam is shown to lack the safeguards in Seattle's municipally-owned water supply and distribution system. Seattle offers probity in the development process, with adherence to standards through urban planning and public knowledge of system costs and operations. Altogether, these cases suggest that internationally, infrastructure planning can be comparatively analysed through a make-or-buy form of analysis.

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CHAPTER 4 Connecting The Drops: Transaction Costs in Seattle and Batam Drinking Water

Water supply system concerns upstream and downstream water management, requiring complex infrastructure for processing raw unaltered water into drinking water, and for distributing processed water to clients. Adding a new system is lumpy (Turvey, 2000) and costly (Musgrave and Musgrave, 1973). In the United States (Elmer and Leigland, 2013; Fay, Martimort, and Straub, 2021; Dowall and Whittington, 2002), municipalities give the task to public utilities more than private operations, aiming for a fair distribution of services at an affordable rate. Few, due to financial or scalability issues, will partner with the private sector (EPA, 2019).

In general, planning for infrastructure is a study of context, particularly when it is used to theorize about the south (Watson, 2016; Parnell and Robinson, 2012). The distinct practices in the south, of state-led governance (Lal, 2005) and cultural specificity, provide impressions that suggest differing roles of the state than those in the global north. Popular ways of contextualizing planning in the south adopt the social learning tradition (Friedmann, 1987, 75), by choosing to criticize privatization (Nickson 1997; Zeitoun et al. 2017) as the product of a neoliberal agenda, juxtaposing the market and the state as polarizing establishments, against existing pre-colonial, indigenous, and marginalized practices (Téllez Contreras 2025; Acey 2019; Putri and Moulaert 2017; Kooy and Bakker 2008). On other end of the spectrum in planning literature, theories of welfare or distributional equity (Arrow, 1963:2012) appear to be unable to ground the peculiarity of planning in the south (Watson, 2016; Parnell and Robinson, 2012) with theories based on real-life data and empirical observation of "the mundane, ordinary practices" (Parnell and Robinson, 2012, proposition 3, 598) that ensure planning theory is well-informed with granular detail.

An alternative approach, from new institutional economics (NIE) and transaction cost economics (TCE) (Williamson, 1985; Williamson, 1991; North, 1991) combines microeconomic applications and political theory to understand how the structure of institutions, the formal and informal rules, and norms that structure social, political, and economic relations (North, 1991), affect the distribution of services in developing nations (Acemoglu and Robinson, 2013; Levy and Spiller, 1994).

Acknowledging the need for planning context, this paper proposes a comparative analysis of distinct planning practices, to understand how water infrastructure choices vary across different countries. This paper compares water supply infrastructure arrangements and project outcomes in Seattle, United States, and Batam, Indonesia. Seattle water supply, organized as a public utility (Seattle Public Utilities), is nested inside a democratic system of governance with institutions that support robust markets for goods and services. The progression of town and urban planning (Kent, 1964; Hall, 1988) in the global north, as found in Seattle, contrasts with rapidly developing private cities in the form of economic zones in the south (Amri et.al, 2023; Yue and Martin, 2023; Chettri et al., 2021). The water supply system in Batam, Indonesia, is a product of economic zone policy ostensibly organized for the purpose of providing low-cost services (Orenstein, 2011; Wiryawan, 2017).

Employing comparative politics (Peters, 1998; Peters et al., 2018), transaction costs economics (TCE) (Williamson, 1985; 1991), the theory of the state (North, 1991), and inspired by Williamson's (1991) statement, "…how equilibrium distributions of transaction will change in response to disruption in the institutional environment..."(Williamson 1991, 287), this paper asks: in a comparison of water infrastructure development in the Seattle, US and Batam, Indonesia, how do differences in the institutional environment affect the outcomes of projects?

Three simple water connection projects, two located in Seattle and one in Batam, planned, developed, and constructed between 2022 and 2024, are used for comparison. Case study selection controls for error variance by only selecting small-scale household connection projects. The comparison looks at transaction cost data available after project completion, particularly how the economic zone environment is reflected in the project outcome, which can be distinguishable from the alternative. Arguably, there are limitations in understanding the merit of cost comparison between two different economies, owing to currency exchange differences and the scale of economies between Seattle and Indonesia. The focus of this paper is on fiscal policy and political influence in comparative cost outcomes.

4.1.Institutional Environments

Economic zones in Seattle, in the United States and in Batam, Indonesia, can be distinguished from one another. In the US, economic zone policy is attributed to the postwar era in the 1930s, assisting manufacturing companies in economizing on production costs by moving overseas (e.g., the Philippines). The United States Foreign Trade Zone (FTZ) Act is a federal-level law created in 1934, established the FTZ Board Authority, organized under the Department of Commerce, for authorizing new FTZ site applications. FTZ Act aims to prevent domestic manufacturers from moving to foreign ports by offering tariff reduction and import duty waivers for unprocessed manufacturing goods ready for export, if these companies are willing to stay in any FTZ site inside US public ports. In 1949, the FTZ Board Authority granted the Port of Seattle the authority to operate FTZ site #005, consisting all of the Port's facilities.

There is a clear separation of local autonomy between the Port of Seattle and the city of Seattle due to the United States rule of law, following a supremacy clause and doctrine of pre-emption. As a local government entity, the Port of Seattle observes the supremacy clause by adhering to FTZ board regulation. The Port of Seattle, established by the Washington Port

District Act in 1911, is a local government entity responsible for operating Seattle's seaport, airport, cargo terminals, and business services. The Port of Seattle (the Port) observes the doctrine of pre-emption by subscribing to the city's water supply services as its retail clients; therefore, it does not own or operate its own water utility. The city of Seattle manages all public infrastructure services for the city, including water supply.

In contrast, Batam economic zone policy is a top-down national government policy which delineates Batam island and its contiguous islands as a bonded zone (1973-1992), free zone and free ports (1992-2007), or free trade zones and economic zones (2007 – now) (e.g., FTZ institutions in Batam, Indonesia) (Chettri et al., 2021), as a matter of national interest. The national government established Batam Industrial Development Authority (BIDA) with the task of consolidating land resources and capital assets in Batam, with the aim of drawing foreign investors to economize on production costs through low cost land with deep water ports, low cost labor, and infrastructure package (Orenstein, 2011; Aritenang, 2009; Paranoan, 2011). Created in the early 1970s, Batam was made through a Presidential order. At the time the President held the military, the executive, legislative, and judiciary functions. The President appointed BIDA as the sole authority in Batam development, without a recorded account of objection from the local government or its representative. Batam's own administrative government came later in 1983, much needed after Batam's population increased from 6,000 in 1969 to over 125,000 in the late 1970s. Executive power over local government persisted even after Indonesia entered a period of democratic reforms (1997 – 2008). The creation of the law on Batam local government autonomy in 1999 has no effect on Batam's water supply governance. The Law No. 12 Year 2011 on the hierarchy of the rules of law in Indonesia, further strengthens the use of Presidential decree and ministerial decrees above local laws, affecting the management of water supply

continued under BIDA (later known as Batam Industrial Free Port and Free Zone Authority (BIFZA)) privatization arrangements.

4.2.Water Supply System Arrangements

Figure 4.1. outlines three examples of independent water processing systems: two in Seattle, in the US, and one in Batam, Indonesia. In general, there are four stages of water processing: (1) raw water extraction, (2) water treatment, (3) water transmission and processed water storage, and (4) transmission pipes and distribution connections.

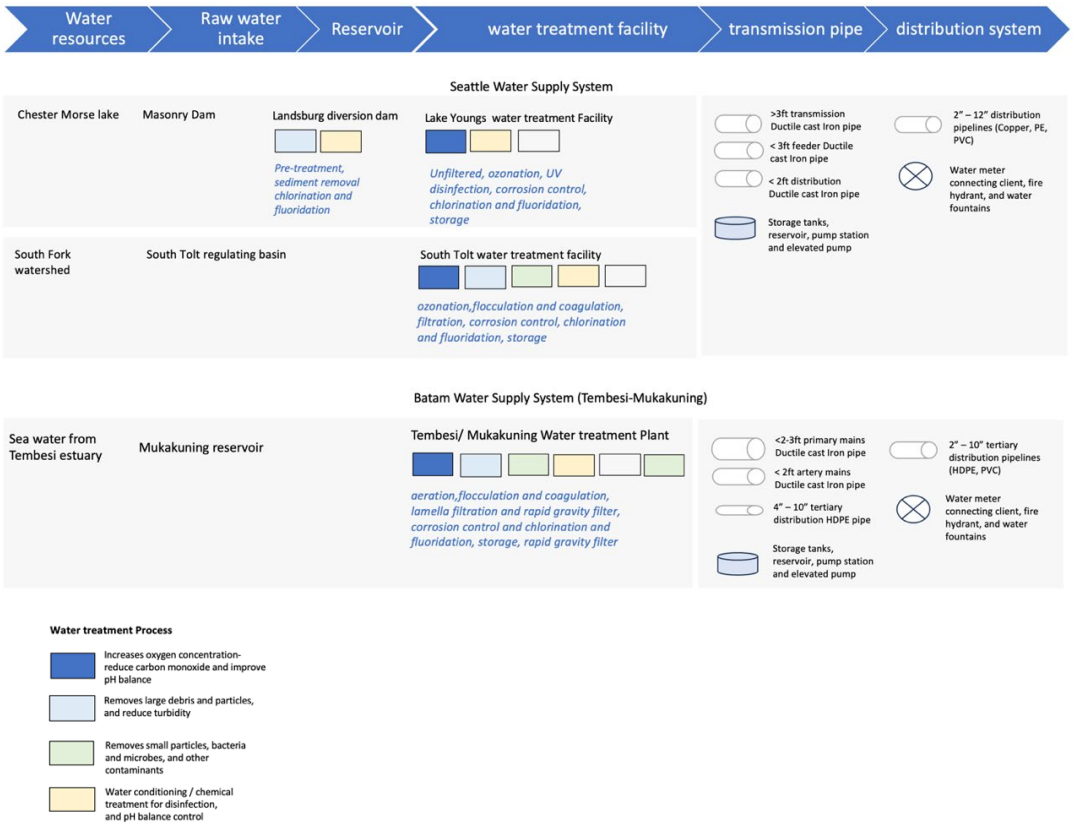

Figure 4. 1 Water Supply System Comparables

(Vicky, 2024; Ministry of Public Works and Housing, 2019; BIFZA, 2024)

Seattle and Batam water processing systems have differences in: (1) the quality and quantity of water resources, Seattle having abundant fresh water and Batam facing scarcity; and

(2) the selection of water treatment process. Figure 4.2 depicts the SPU water service area distributed across 17 cities, water districts, and counties inside the Seattle's regional water supply system.

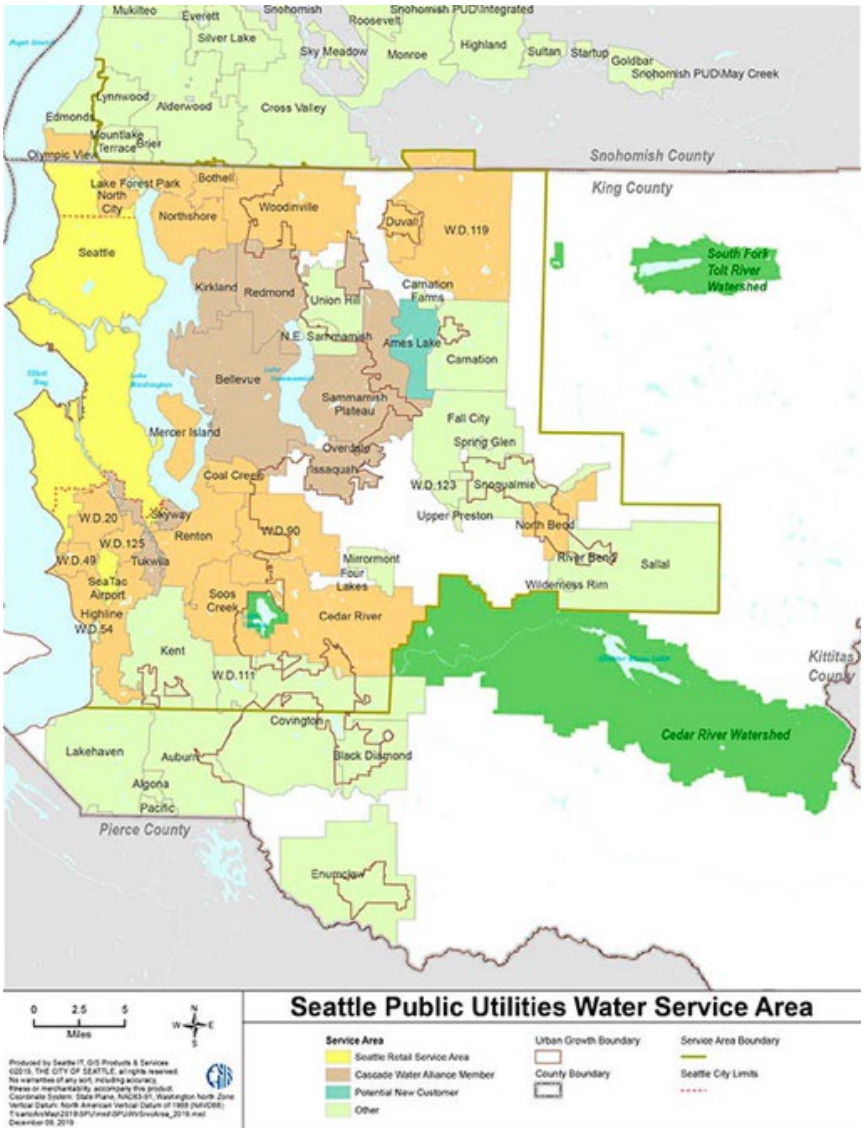

Figure 4. 2 Seattle Public Utilities water service area (SPU, 2024)

The city of Seattle voted for a public ownership in 1888 and created a public bond in 1895 to build Cedar River watershed pipelines. In 1901, the city's water supply department operated Cedar River pipelines, extracting water from Cedar River watershed and collecting it at

Chester Morse Lake to supply clean, unfiltered water to the greater Seattle area. Prior to the creation of the Seattle Water Department, homeowners and businesses relied on individual private services.

In 1987, the Seattle Water Department merged with Seattle's waste, gas, and electrical utility, to be operated as Seattle Public Utilities (SPU). In 1962, the city began building the Tolt River dam and reservoir, and a new water treatment plant was constructed in 2001, effectively increasing SPU's service area (1.5 million customers) (SPU, 2024). The regional water system, is operated by SPU to serve wholesale clients (water districts, cities and counties outside of the city of Seattle and Port of Seattle in Tacoma). Each wholesale client signed a 50 or 60 year agreement with SPU to ensure they receive a standard costs similar to Seattle.

In connection with the Cedar River watershed system, the water source in Chester Morse Lake is continuously monitored, and controlled, thereby removing the need for a membrane filtration system. Water carried to the Landsburg division dam is screened for debris and solids. At Lake Young's water treatment plant, water is processed with ozone to remove impurities and improve taste before being processed in a UV chamber to remove viruses and other biological agents. Later, the water is disinfected with chlorine and treated with fluoride. From the South Fork Tolt River watershed, the raw water source at South Tolt flows to the processing plant and is treated with ozone, sediment removal, and solids remover. Biological agents and metals are filtered using a membrane filtration system, before treated with chlorine and fluoride. The South Fork Tolt River water treatment facility maximum capacity processes 5,258 liters per second, while the Cedar River Water treatment facility at Lake Young processes an equivalent of 7,886 liters per second (SPU, 2024; Kelly et al., 1998; Kelly, 2001). Both water supply systems in Seattle provide 13,144 liters per second, sufficient to supply over 1,6 million SPU clients. SPU

optimization policy helps SPU to reduce its nonrevenue water to an average of 6.5% (SPU, 2022) and maintain water use below the maximum water production capacity of 700 Liters per person per day.

BIDA/BIFZA water service area depicted in Figure 4.3 has six reservoirs and water treatment plants in Batam mainland, supplying water to seven Batam city sub-districts in Batu Aji, Sungai Beduk, Sekupang, Nongsa, Kota Batam, and Sungai Beduk, worked under the privatization agreement (1995-2020) and later, managed under partnership (2021-now). Batam's six operating reservoirs, extract water from two estuary dams, rainwater ponds, and river tributaries to produce a maximum of 3,850 liters per second of raw water.

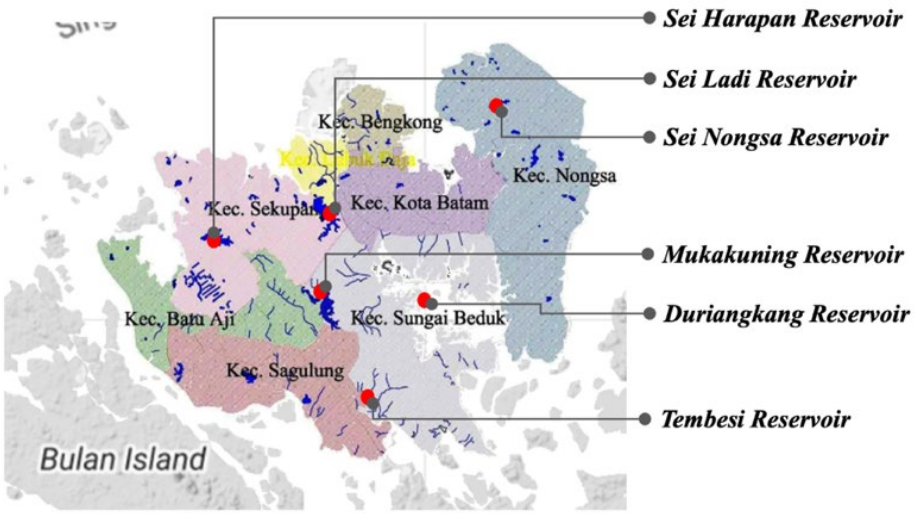

Figure 4. 3 BIDA/BIFZA water utility service area (BIFZA, 2024)

In Tembesi the Duriangkang water treatment plant utilizes a conventional system. Water from the Tembesi reservoir is directed to the Duriangkang reservoir. Raw water intake at the Duriangkang carries water to the water treatment plant, which sieves metals and other alkaloids using an aeration system. Water then flows onto the lamella and gravity filters to produce clean,

non-potable water. Duriangkang, being the largest water treatment plant, produces 2,200 liters per second of processed water and contributes the most for a total 2,961 liters per second (2020 data) of total water to supply Batam's 1,25 million population (residential, commercial, industrial clients). PT Air Batam Hulu and PT Batam Hilir maintain their nonrevenue water rate at 14% (BIFZA, 2024). However, water demand continues to rise above the optimum production capacity at 164 Liters per person per day (BIFZA, 2024), suggesting a need for an immediate solution.

Downstream water supply systems in Seattle and Batam utilize the same principles. Water is carried inside the transmission pipelines, before being distributed from the nearest reservoir using gravity and pumps. The distribution system in both SPU and BIFZA's water supply utilizes similarly sized pipes and water meters, differentiated by standards and decisions to economize.

4.3.Price comparables materials and labor

In Seattle, SPU utilizes American Water Works Association (AWWA) Class C-151 and C-104 standard for ductile cast iron pipe (DCIP) class 52 with larger diameter pipes above 4 inches. BIFZA water utility utilizes ISO 2531 dan BS (British Standard) 4772 for transmission pipes; and ISO 4427 or SNI (Indonesian National Standard) SNI 06-4829-2005 on polyethylene pipe for drinking water (*tentang Pipa Polietilena Untuk Air Minum*). In general, AWWA, ISO, British Standard, and Indonesian National Standard require steel tanks, concrete materials, and ductile cast iron pipe (DCIP) to be lined or coated in non-toxic material to ensure minimum friction, toxic contamination, and sedimentation.

Table 4 shows the material costs for DCIP, HDPE Pipes, copper or steel Pipes, PVC pipe, and water meters found on the market from three known suppliers, adjusted to sales tax rates in Seattle and Batam.

Table 4. 1 DCIP, HDPE, and meters market price in US dollar

(author, market rate in Seattle and Batam, US$ 1 = Rp.15,460)

Materials	Diameter (in mm)	Diameter (in inches)	Seatttle (price per meter)	Batam (price per meter)
DCIP Pipes	150mm	6"	65	48
	200 mm	8"	88	83
	254mm	10"	116	113
	300 mm	12"	146	156
			Made in USA 10,25% tax inclusive	Made in China/Vietnam-FOB import, VAT import, and 11% tax inclusive
HDPE Pipes	63 mm	2"	2.4	4.5
	110 mm	4"	5.9	9.3
	160 mm	6"	11.6	19.4
	200mm	8"	20.2	27.3
	250 mm	10"	30.6	41.8
			Made in USA 10,25% tax inclusive	Made in Indonesia - 11% tax inclusive
Water Meter	50 mm	½”	110	25
	75 mm	¾”	151	34

In general, pipe materials of the same specification have similar quality and base price in Batam as in Seattle. Market cost in Seattle and Batam slightly differ due to reasons such as market supply, importation logistics, and taxes, besides the differences in the cost of labor involved in the production of pipe. For example, a market survey (ICN, 2023) recorded only two companies in Indonesia producing DCIP pipe which meets AWWA and BS standard; PT Krakatau Pipe (custom made) and PT Steel Pipe Industries (up to 8”), which is reason for concern about market scarcity due to lack of supply in Indonesia. Most market prices on DCIP in Indonesia reflect demand for imported pipe from China or Vietnam at a rate higher than that of

locally produced pipe from the United States. Large diameter pipes imported overseas increase the costs for logistics, especially as most of the pipe arrives in Jakarta, Medan, or Surabaya before being shipped to Batam. Smaller pipes are more expensive in Batam because many are produced locally and incorporate kickback fees on top of market rate offers.

Labor rates differ significantly between these study areas. Stigler's (1946) discussion about minimum wage policy assumed that the market is competitive, and market actors freely exchange in the market for work. Minimum wage policy is established as the lowest wage baseline for any type of work. Minimum wage policy helps employers to set an optimum allocation of resources, in a market saturated by low-skilled, low-wage workers. Workers expecting higher salary increase the value of their work and compete in the market by offering specialized services, gathered through professional associations or trainings. Workers seeking jobs in water supply typically complete trade skill trainings, or are certified before entering the labor market to receive a higher wage.

Figure 4.4 GDP comparison shows the scale of market economy in Seattle Metropolitan Statistical Area (MSA) and Batam. Batam economy (9%) of Seattle MSA, thereby, it is expected that most jobs in Batam will be valued lower or receive lower wage compared to Seattle.

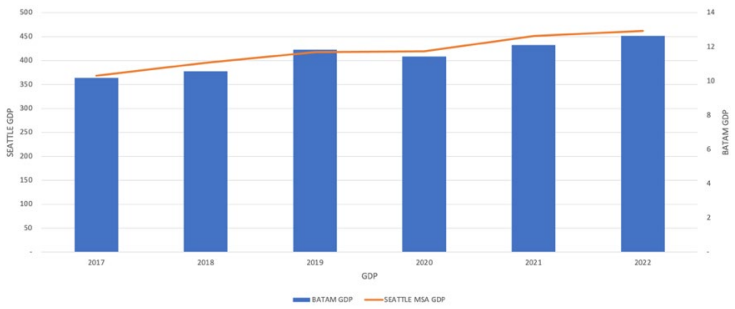

Figure 4. 4 GDP Seattle MSA and Batam

(Source: census.gov, 2024; bps kota batam, 2024)

Figure 4.5 shows the value of wage and GDP per capita in Batam in rupiah and US dollars. The graph indicates the minimum wage grows at a rate below the total GDP growth in Batam. When converted to US dollars, the value for the minimum wage in Batam lies below the minimum wage in Seattle.

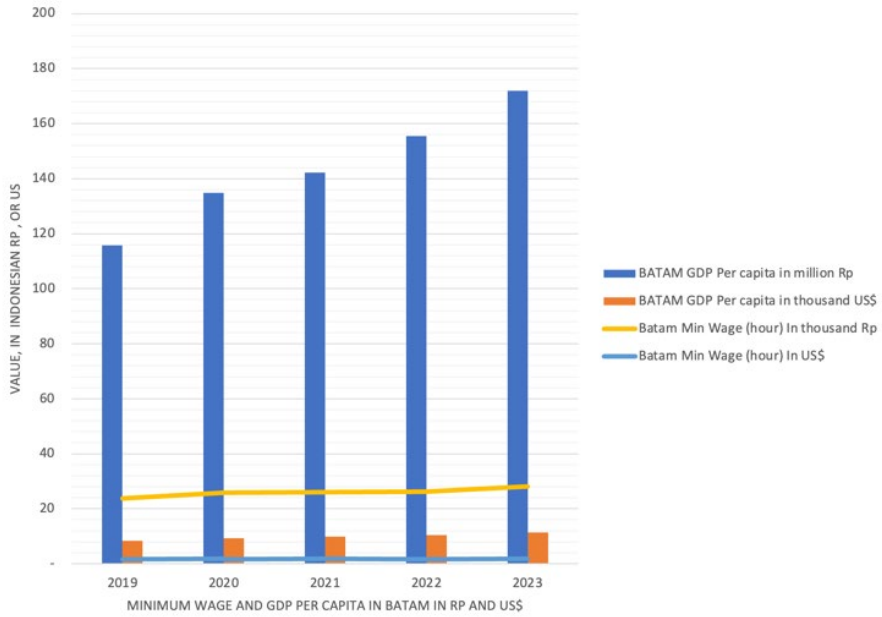

Figure 4. 5 Minimum Wage and GDP per Capita in Batam in Rupiah and US$
(BPS Kota Batam, 2024; BLS, 2024; BIFZA, 2024)

The graph implies that government policy in Indonesia maintains an incremental rise minimum wage policy below the rate of economic growth (GDP) which presumably aims for a two-fold benefit: (1) foreign companies and businesses trading in stronger currencies can maintain the leverage of economizing on low wage policy in Batam, and; (2) local labor markets may receive rising income rates over time, limited to local economic growth.

4.4.Contractual Arrangements for Water Supply Extension

Figure 4.6 illustrates the water supply project lifecycle (Franks, 1998; Whittington, 2012; Jennifer and Mihelcic, 2007) in the context of contractual arrangements. The design build arrangements under a SPU utilize internal organization to arrange water supply connection projects aiming for material and cost recovery, and bill the cost of capital investment to the client. In the design and build arrangement under a private partnership between BIFZA water utility with PT Air Batam Hilir (ABH), ABH works with third party contractors based on an approved budget by billing BIFZA for the capital investment for water main extensions up to the service lines and the client for the cost for water service connection from the water meter to the service lines.

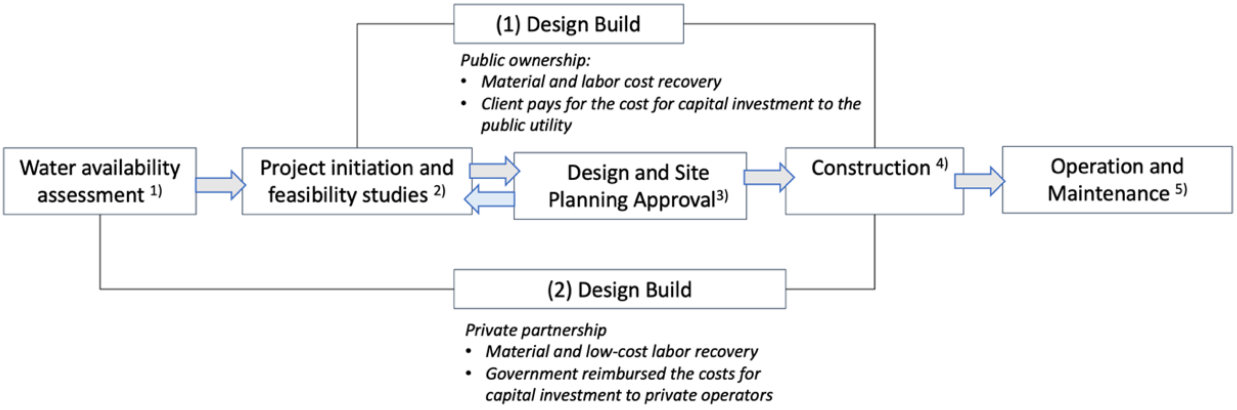

Figure 4. 6 Water Supply Project Lifecycle
(adapted from Franks, 1998; Whittington, 2012; Jennifer and Mihelcic, 2007)

Table 4.2. describes the process in each stage of water supply projects in Seattle and Batam.

Table 4. 2 Water Supply Project Arrangements

(BP Batam, 2024; SPU, 2024)

Project Stage	Project Arrangements	
	Seattle – SPU water connection Project	**Batam – BIFZA water utility partnership with PT Air Batam Hilir**

Water needs assessment	1) SPU received an application for new water connection; 2) SPU appointed site manager for assessing the scope of the project, including the need for water mains extension and an invoice for the commitment to add water mains extension 3) Water availability certificate issued by SPU, evaluated based on site inspection and building permit documents	1) PT Air Batam Hilir announce plans for water supply expansion to a particular neighborhood. 2) PT Air Batam Hilir received an application for new water connection. 3) Clients pays an application deposit and for BIFZA's utility recommendation (processed individually or as a collective)
Project initiation and feasibility studies	1) SPU Issued water availability ceritificate based on site inspection and building permit documents 2) SPU Project managers devise a drawing plan detailing: - The scope of the project; - Permit costs; - Easements The project team provide cost quotation based on the agreed work details	1) PT Air Batam Hilir appoints specialized (third-party) contractor to assess the scope for building new arterial and tertiary distribution pipelines PT Air Batam Hilir produce a quotation detailing: 2) the costs for individual responsibility to pay for connection charges, and 3) the costs for capital investment for arterial distribution pipeline investment and tertiary pipelines extension paid by BIFZA water utility 4) The proposed quotation for a community share and BIFZA capital costs is reported to BIFZA water supply utility for site auditing, to receive BIFZA recommendation; 5) BIFZA's internal affairs evaluate and audits the budget proposal.
Design and site planning approval	1) Client reviews and negotiate on the proposed plan 2) SPU Project manager adjust the proposed project scope and provide cost estimates for approval If water mains extension is necessary, the client signs a latecomer agreement to pay for water mains extension	1) PT Air Batam Hilir received an approval from BIFZA water utility and BIFZAs internal affair unit 2) PT Air Batam Hilir announce the costs for water connection charges to community, Individual clients agrees on the quoted connection charges issued by PT Air Batam Hilir and pays the cost of water connection upfront.
Construction	1) Project managers execute construction based on the agreed plans 2) Client pays for the cost of water connection construction based on progress.	1) PT Air Batam Hilir appoints third party contractor to execute construction; 2) PT Air Batam Hilir evaluate progress and reports to BIFZA's water utility BIFZA water utility and internal affair unit audit approves the project result and reimbursed the costs of capital investment to PT Air Batam Hilir account at the end of the fiscal year

	3) If necessary, the client pays a maintenance deposit and additional works not stated in the agreement.	

In Seattle, homeowners or developers apply for individual water connections as found in single family homes, or to install a master water connection for multiple buildings. A house must have water and electrical connections before being listed for sale, therefore, developers, contractors, building owners, or homeowners apply for a new water availability assessment to SPU.

SPU assigns a project manager to assess the needs for water main extension (WME) by evaluating building permit and water utility plans. If the SPU manager deems new water main extensions necessary, the developers must sign a latecomer agreement to carry the cost for water main extensions up front and pay a commitment fee according to a standardized rate. Afterward, SPU issues water availability certificates at no charge, The scope for a simple water connection project in Seattle, include: the installation of a 6-inch to 12-inch DCIP distribution pipe extension, the installation of a minimum 2-inch copper pipe service line connected to the distribution pipe through creating an opening or a manifold, installing a minimum 4-inch copper pipe for fire service line, installing automated meter reader, and connecting the service line to an individual water meter or a master meter at the lot.

The scope of the project in Seattle, particularly for development in existing parcels, most likely includes the costs of decommissioning of old water pipes at a standard rate as the new connection will replace older pipes. Connection charges also include street restoration works, for restoring excavated area to lay the pipelines, by covering the sidewalk and the planter strip with soil and a thin layer of cement or asphalt. SPU adjusts the plan according to site specifications, and gathers the necessary permit requirements (e.g., street use permit). SPU project managers

issue a quotation for the costs of water supply connection which specifies details of the scope of the construction and estimates costs for materials, equipment, labor, and construction management. SPU clients review the proposals and may receive standard discounts based on SPU's Director rule or apply for a cost waiver (subject to SPU's Director's approval). SPU project managers will review the requests and adjust costs accordingly. Before construction, SPU charges for the cost of planning and design. In the construction stage, SPU starts construction and deploys materials, equipment, and labor, based on the agreed design. A finalized cost is billed ex post, after the construction ended. The client pays the costs for construction based on progress, and if necessary, includes payment of the deposit for maintenance and additional work added in the agreement.

In Batam, the city's building regulation does not stipulate water supply or electricity as a requirement for the sale or use of homes. At the initial stage, PT ABH and third-party contractors assess the water availability in each area in Batam and make announcements to accept new water connection applications. Interested clients register for new water connections by contacting PT ABH and paying an application deposit once water availability has been confirmed. PT ABH collects the application documents and forwards them to BIFZA water utility (BIFZA) for site-specific recommendation, in parallel with the selection of a third-party contractor. PT ABH works with a selected private water supply contractor for water mains expansion, service line installation, and water connections to individual meters. As third parties, the contractors conduct surveys, draw plans, and estimate the cost for individual connections.

BIFZA responds to the (collective) application requests by evaluating building permit documents and assessment results from third-party contractors. BIFZA strategic planning

department is responsible for issuing a recommendation to approve client requests for new applications based on individual assessment of plans, permit documents, and cost estimates.

BIFZA strategic planning department also reviews PT ABH's proposal to conform with the standardized cost stipulated by the Head of BIFZA regulation No. 2 Year 2022, which stipulates a base cost for the smallest water connection. The costs for ½-inch connection are capped to a fix rate, while the costs for ¾-inch and larger is adjusted for material and labor costs, specified to market rate. Any changes or cost adjustment must be approved by BIFZA and audited by the internal affairs department (*Satuan Pengawas Internal*) ex ante, before the Head of BIFZA issues a recommendation for commencing construction. PT ABH and third-party contractor assess water connection needs (e.g., connection size ½-inch, ¾-inch) based on water availability, and agree to receive payment based on the approved budget ex ante, willingly taking the risk of cost overrun or delay.

Following budget approval, PT ABH issues an invoice to the client to pay a standardized connection cost from the water meter to the service line and places an order for the third-party contractor to commence construction. The project scope typically includes extending 10-inch up to 12-inch arterial pipelines to be connected to 8-inch to 10-inch distribution pipes, distributed into 6-inch pipelines or 4-inch smaller distribution pipelines. The connection ends at the 2-inch or 4-inch HDPE service lines in front of each lot. Private contractors then connect ½-inch to ¾-inch PVC plumbing pipes from the 2-inch to 4-inch HDPE service lines to an individual water meter. If a community (min. 150 people) requests a fire hydrant connection, BIFZA will need to assess the application, and create a separate order to PT ABH to prepare a plan and install a community fire hydrant, billed in lump sum to the community. PT ABH issues an invoice for reimbursing the construction costs for water mains extension to BIFZA according to the agreed

budget at the end of the construction. BIFZA's internal affairs unit audits the invoice, and issues payments to PT ABH at the end of the project or nearing the end of BIFZA's fiscal year. Periodically, PT ABH will attach an automated meter reader (AMR) to improve water meter reading, as additional work, after the construction ends.

4.5. Theory and Research Design.

Transaction cost economics (TCE) acknowledges that transactions in the real world are not frictionless (Williamson, 1975). Transaction costs are the associated costs in an exchange, which include the cost of acquiring information to plan the transaction, legal fees, the mobilization of assets, and the cost for maladaptation ex-ante, after a contract is signed. TCE is a branch of microeconomic theory (Williamson, 1985, pp. 30-31) that treats the transaction as the unit of analysis. Humans are assumed to act in their own self-interest, though subject to bounded rationality; even with the best intentions, there is a limit to knowledge of the situation at hand. Taking consideration of self-interest and bounded rationality, in a complex transaction, parties may behave opportunistically. They may behave strategically by deliberately taking advantage of information asymmetry, due to greater knowledge about the specific exchange held by one party, or given bounded rationality for both parties making the exchange, one party may choose to mislead the other by giving false information, hope, or promises they cannot keep.

Williamson sets out scenarios for the world of contracting, in order to isolate the types of transactions of interest in economic organization: (1) planning, (2) promise, (3) competition, and (4) governance (Williamson, 1985, 31, Table 1-1. Attributes in the Contracting Process). If parties are able to plan perfectly, the contract would be complete at ex-ante. A promise is when each party partakes in the agreement with the best intention to meet with the agreed condition, eliminating opportunistic behavior regardless of any future problems arising from bounded

rationality. In a promise, trust between parties is superior to opportunistic behavior; thereby, a contract could be executed efficiently. In competition, bounded rationality abounds. Under competition, discrete market contracting is the most efficient choice.

Asset specificity raises the impact of bounded rationality and opportunism with guile on the cost of transactions, and with it the need for safeguards in governance structures. Due to bounded rationality, planners have limited foresight. Asset specificity generally increases the complexity of contracts, allowing for opportunism with guile and increasing likelihood of information asymmetry. Complex contracts are unavoidably incomplete. With assets specific to the transaction for one or more parties, incentives exist to for parties to diverge from their positions after the contract is signed, leading transaction costs to rise over the course of the contract. Governance structures for transactions high in asset specificity should economize on bounded rationality while subsequently safeguarding against opportunism.

North's theory of the state (1990) in institutional economics (NIE) complements TCE. Institutions are formal and informal constraints which guide social, economic, and political exchange (North, 1990; 1991), thereby affecting economic performance (North, 1992). In the theory of the state, all rulers are assumed to be motivated by self-interest and, without the constraints imposed by institutions or rival authority, the ruling power will engage in rent-seeking behavior. The ruling power devises norms and rules to distribute resources, such as infrastructure, to maintain loyalty from its constituents, and thereby prevent the rise of a rival authority.

The existence of rivals, wielding similar or stronger authority with the incumbent ruling authority, reduces the ruling power's ability to extract rent. The ruling power may yield or cooperate with its rival to maintain its survival. Pluralism brings contestation to the ruling power

and restricts the ruling power from making arbitrary decisions. A long-term restriction to the ruling power in making arbitrary decisions stabilizes market institutions and reduces the overall costs of governance or the costs of transactions (North, 1993). Institutions structure the rules of the game, creating constraints and opportunities. Organizations such as firms, political parties, and public agencies, are the players or the agents that compete with each other for survival and returns (North, 1992).

Figure 4.7 describes the application of TCE and the theory of the state to compare water supply projects. Comparative political analysis may be designed to maximize variance in the institutional environment (Peters; 1998, 30). Differences in the economic zone institutional environments in Seattle and Batam are one form of variation. Another variation is found in the different perspectives of the state, viewing the distribution of water supply as public goods or as low-cost factors of production (Orenstein, 2011; Aritenang, 2009; Cotula and Mouan 2021). This research hypothesizes that both are capable of influencing the distributional structure of water supply project arrangements and associated project costs.

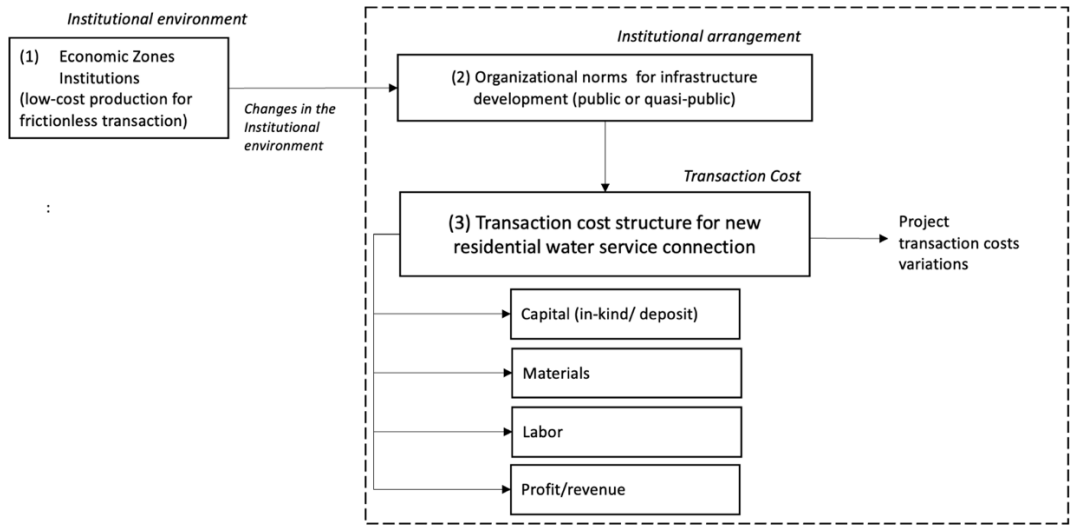

Figure 4. 7 Research design on comparative water supply projects

Water connection projects involve production costs, including capital, materials, labor, and profit. To minimize extraneous variance, this study selected the simplest types of water supply projects for comparison. These are projects that connect small-scale water service lines (2-inch service lines), located in areas dedicated as industries/mixed-use which tap into a distribution system of similar size (6-inch to 12-inch tertiary or secondary distribution pipelines).

Though Seattle and Batam have price differentials due to differing market conditions and standards, both impose a similar rule: small water connection project costs are set at a predetermined rate, at a fixed price, which helps explain cost structure variations. A caveat to this approach is that price differentials between projects in Seattle and Batam must not be considered key factors in determining transaction costs, as this study is designed to examine the impact of the widely varied institutional environment on the structure of arrangements. Transaction costs analysis also examines how rules for project arrangements can structure incentives and opportunities, due to bounded rationality or third-party opportunism, which increases or decreases transaction costs. Hence, the application of other microanalytic analyses to cost, such as price related to market size, or price equilibrium in a competitive and non-competitive market is not the focus of discussion in this paper.

4.6. Project Comparison

1) Water Connection Project in 39th St, Seattle

Figure 4. 8 Water Connection Project in 39th St, Seattle

(Source: Seattle Public Utilities, 2024; google earth, 2024)

The first case study is a simple water connection project in 39th St, Seattle (Figure 4.8). The project was organized by SPU, utilizing its own labor and equipment. The purpose of this design-build project was to create 6-individual water supply connection by drawing water from the adjacent water mains (6-inch DCIP). The project was initiated in November 2023 and completed at the end of 2024. The scope of the project included: (1) the installation of two 1-inch combo service lines (combining domestic and fire service); with each service lines distributed to three 1-inch water connection, and individual water meter in front of each unit. (2) connecting 1-inch combo service pipes with individual water service lines, and to the existing 6-inch (160mm) DCIP distribution at the manifolds; (3) decommissioning two existing ¾-inch service lines. Additionally, the scope of the project also include minor street restoration works (total 3,600 ft^2) for covering the sidewalk and plant strip areas, after finalizing all construction works.

Table 4. 3 Water connection costs at 39th Street, Seattle (SPU, 2024

Cost Category	No	Item	Unit Price in US$	Unit	Total Project Cost (6 units) in US$	Aggregate Cost in US$
Water availability Assessment	1	Water Availability Certificate	0	0	0	
Service Lines Construction	1	Combo, 1" Fire/Domestic pipe	4,975	6	29,850	
	2	Domestic Service Manifold discount	-1,500 19,680	4 1	-6,000 19,680	
	3	Retirement (3/4" to 2" service lines)	2,320	2	4,640	
	4	Water Meter (includes AMR),				
		a. standard costs for 3/4" to 2" water meter (first installed)	330	1	330	
		b. standard costs for 3/4" to 2" water meter (each additional installed)	190	5	950	
	Total Construction Cost				**49,450**	**8,242**

Table 4.3 shows water connection costs at 39th Street, Seattle, with two components: (1) water availability assessment at no cost, and (2) the costs for water supply connection (US$ 49,450). The cost for water supply connection includes installing six combo 1-inch fire/domestic service lines set at a standard rate for non-arterial location ($4,975), connected to four manifolds, entitled to manifold discounts ($6000), the cost for the connection charge ($19,680), the retirement of old ¾-inch service lines ($2,350), and the installation and connection of six water meters (($1,280) based on a standardized charge (SPU Director's Rule, 17 Nov 2023). The connection charge is a standardized cost for connecting water service from the 1-inch combo fire/service lines to domestic connection, calculated by multiplying a standard connection charge for 1-inch combo service lines ($2,400) with the total value of new customer equivalent (CE) of 1-inch connection (6 connection x 1.7) minus the decommissioned service lines CE (2 connection x 1). In this project all associated costs for water project connection follows a base cost stipulated by SPU Director's rule.

2) Water Connection Project in 13th Avenue East, Seattle

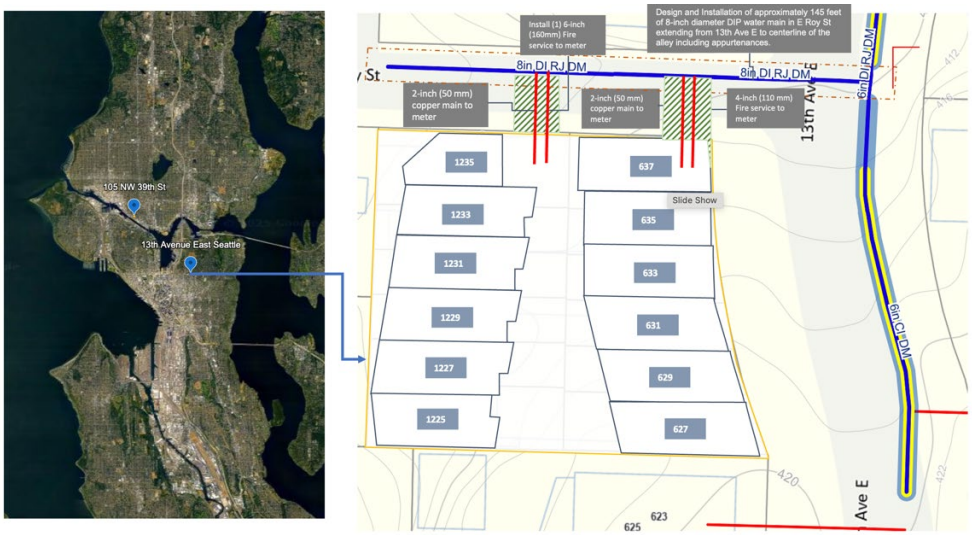

Figure 4. 9 Water Connection Project in 13th Ave E, Seattle

(Source: Seattle Public Utilities, 2024; google earth, 2024)

The second case is a water supply connection project in Seattle is in 13th Avenue East (Figure 4.9), Seattle. This is a design build project, which accommodates the developers plan to connect 12 town homes with service lines connected at 2 master meters. One service line is for 6 town homes facing 13th Avenue East; and the other, services 6 town homes, facing E Roy Street. To qualify for water supply connections, the developer applied for a water availability certificate in late 2019 and in parallel, SPU assigned a project manager to assess water supply needs. The developer signed a contract with SPU committing to 145-ft long, 8-inch water mains extensions. The developer was sent a plan and an invoice for an initial commitment for water main extension construction in December the same year. In January 2020, SPU issued the water availability certificate and assigned a project manager to examine the scope and detailed budget of the project based on the SPU Director's Rule, FIN-220.2, effective per November 1, 2023. The project's 19-week construction period ended in July 2024.

Table 4.4 describes four types of costs for this project: (1) project administration, essentially a commitment fee to pay for water main extension ($3,900), calculated as an upfront deposit which reduced the total construction costs for water mains extension; (2) the construction of service lines from two manifolds, for connecting 8-inch DCIP water mains to two 2-inch copper pipes, each at least 15 meters in length, from the adjacent curb to the middle of the parcel, capped according to SPU Director's rule standard rate in non-arterial location ($17,950).

Table 4. 4 Water connection costs at 13th Ave East, Seattle (SPU, 2024)

Cost Category	No	Items	Unit Price in US$	Unit	Total Project Cost (6 units) in US$	Aggregate Cost in US$
Water availability Assessment	1	Water Availability Certificate	0	1	-	
Administration	2	Water Mains Commitment (Site Specific Cost)	3,900	1	3,900	
	Subtotal (1)				**3,900**	**325**
Service Lines Construction	1	Domestic Non arterial connection, 2" pipes to union (standardized costs per SPU Director's rule)	8,975	2	17.,950	
	2	Domestic Service Contractor's discount	-1,500	2	(3,000)	
	3	Retirement (3/4" to 2" service lines)	2,320	2	4,640	
	4	Water Meter (includes AMR), standard costs for 3/4" to 2" water meter	190	2	380	
	Subtotal (2)				**19,970**	**1,664**
Fire Service Installation	1	4" Fire Service (Site Specific Cost)				
	a.	Labor costs	4,266	1	4,266	
	b.	Materials	8,895	1	8,895	
	c.	Vehicles	0	1	-	
	d.	Permit and Services	580	1	580	
	2	6" Fire Service (Site Specific Cost)				
	a.	Labor costs	7,866	1	7,866	
	b.	Materials	11,030	1	11,030	
	c.	Vehicles	661	1	661	
	d.	Permit and Services	720	1	720	
	Subtotal				**34,019**	**2,835**
Water Mains Construction 145 ft	1	Construction management (labor, per SPU Director's rule standard charge)				

(72.98 meter) 8-Inch distribution Pipe	a.	construction per day (planned 8 days, actual 19 days)	510	19	9,690	
	b.	connection per day	1,630	1	1,630	
	c.	base charge	5,500	1	5,500	
	2	Installation (no new installation)	0	1	-	
	3	Connection to existing water service lines (Site Specific Cost)	5,800	1	5,800	
	Subtotal				**22,620**	**1,885**
Total Construction Cost					**80,509**	**6,709**

The developers planned to connect the installed service lines independently at their own cost and assign the complex's water use management to a Homeowners Association (HoA). SPU costs also consist of the costs for retiring existing fire and service lines, calculated based on site specific costs, by accounting the cost of labor, equipment charge, and materials ($34,019), including providing discounts (2 manifolds) for service line installation ($3000). The calculation for fire service lines utilizes site-specific calculations which include labor costs, material costs, vehicles, and the costs for permits and other services. The last component, listed is a site specific calculation based on labor, installation and connection allowances stipulated by SPU's Director's rule for extending existing water mains (145 ft) to be near the site ($22,620).

3) Water Connection Project in Kavling Kamboja, Batam

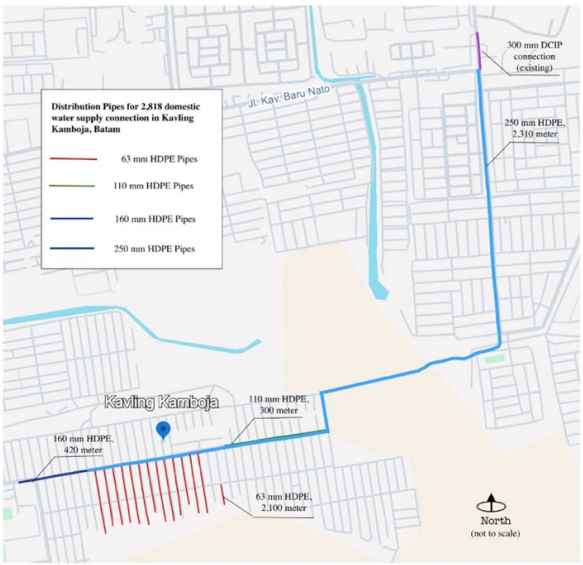

Figure 4. 10 Water Connection Project in in Kavling Kamboja
(BIFZA, 2024; google earth, 2024)

Figure 4.10 illustrates a water supply connection in Kavling Kamboja, Batam. The design build project was initiated in 2019 and completed in 2024. In BIFZA's latest privatization arrangement, BIFZA holds the authority to stipulate the costs for water connection charges and water rate and mediate any conflict between the client and the private operator. As a private operator, PT ABH is bound by a contractual agreement to operate the water supply system in Batam efficiently. PT ABH is tasked with conducting water availability assessment prior to any water supply application, as new water supply applications will be rejected if there indications that the site will be in a water-stressed area, as the supply of water in Batam is limited.

PT ABH organizes the project with a third party contractor that had previously worked for Batam's private water supply company (PT ATB) during the first water supply concession period. Asset specificity played a role in the continued use of the former company as a third-party contractor in this project. Unlike in Seattle, homes in Batam utilize individual septic tanks and wastewater from homes runs to the drainage system. Water supply pipelines crisscross the drainage system below ground and were not installed in specific box culverts, which makes the water supply pipeline information very site specific. Though PT ABH retained most of the previous company's employees, third-party contractors retained full knowledge on the location and condition of the underground pipelines in Batam.

The project assessment began in 2019. Residents in Kavling Kamboja contacted PT ATB (1995-2020) to access water supply. Located the furthest from the water reservoir with the least capacity, Kavling Kamboja lies in a water-stressed area. The expansive development strategy in Batam has caused a surge of new home development in the area, which requires new connections. However, third party contractor assessments deemed that existing pipelines had

degraded, which meant that BIFZA would have to allocate funds for new pipeline expansion. To meet water demands, BIFZA ordered its private partners to supply the community with a drop-off water lorry, and ration the use of water. In 2021, BIFZA appointed PT ABH to commence water availability assessment by assigning third party contractor to prepare plans and conduct a community hearing.

In 2020, BIFZA planned to add a new water treatment plant near Duriangkang dam, which would add to the total water production capacity in Batam up to 300 to 500 liters per second. Supplies would serve the proposed project location in Sagulung water service area. By late 2021, 1,501 residents signed up to participate. Third party contractors estimated the residents would pay 1.5 million for each individual connection, and the government (BIFZA) would allocate Rp.2.1 billion (US$ 139 thousand) to construct new water service lines. In 2022, the Head of BIFZA issued a rule which standardized the application process and the costs for new connections. When PT ABH started opening application processing in February 2023, the total number of applicants in Kavling Kamboja reached 2,818 households.

BIFZA's internal affair department conducted a budget audit review for the old plan assessment created in 2021, and adjust the capital investment budget from Rp.2,1 billion (US$ 139 thousand) to Rp 6,24 billion (US$407 thousand), and stipulated a minimum connection base cost of Rp. 1,471 million (US$ 83) based on the Head of BIFZA regulation No 2, Year 2022. the Head of BIFZA regulation No 2, Year 2022 also stipulated the condition for adjustments to the base cost (½-inch connection) to be site specific according to market rate. An informal communication with BIFZA's water utility suggests that discretion for costs charged for larger water connection (3/4-inch and above) was permitted, if BIFZA provided approval for any adjustment.

The project scope included installing 2,301 meter 8-inch HDPE distribution pipes, connected to the standard 12-inch DCIP transmission pipes, and distributed to 420 meters of 6-inch HDPE pipes and 300 meter 4-inch HDPE pipes and; 2,100 meters of 2-inch distribution pipes (equivalent to service lines in Seattle). The pipeline contract included street restoration for large trench excavation, and to connect 2,818 homes to a ½ inch water meter (without AMR). Individual street restoration in front of the curb was excluded. Most of the connection was assumed to utilize a standard ½-inch connection; there were no records for ¾" water meter, although ex post adjustment is allowed.

Table 4.5 shows the costs for the water supply connection project in Kavling Kamboja, Batam. The project cost breakdown has several components: (1) Water availability assessment, in the form of BIFZA recommendation cots Rp 100,000 or US$ 6 per application; (2) Administration, which consists of a deposit for construction and decommissioning any service lines, and an administrative fees (paperwork) (US$11); (3) Service lines construction, capped for 1/2-inch water meter connection to Rp. 1,471,000 (US$ 83); and (4) water mains construction, to supply water for 2,828 residents, paid by BIFZA for Rp.6.284 billion (US$ 406 thousand). If the residents wish to change their connection at for a larger water meter ex post (typically ¾-inch), third party contractors must appeal for a new material and labor cost approval to PT ABH. The information for individual water meter changes will be retained by the third party contractor.

Table 4. 5 Cost for water supply connection project in Kavling Kamboja, Batam
(BIFZA, 2024)

Cost Category	No	Items	Unit Price in Rupiah	Unit	Total Project Cost (2,818 units) in Rupiah	Aggregate Cost in Rupiah	Aggregate Cost in US$	Aggregate Cost in US$ (PPP)*)
Water availability Assessment	1	Water assessment / BIFZA	100,000	2,818	281,800,000			

		recommendation						
	Subtotal (1)				**281,800,000**	**100,000**	**6**	**36.53**
Administration	1	Deposit (refundable after disconnecting service)	150,000	2,818	422,700,000			
	2	Administration fees	16,500	2,818	46,497,000			
	Subtotal (2)				**469,197,000**	**166,500**	**11**	**66.97**
Service Lines Construction	1	Labor cost						
	a.	Labor for 1/2" connection	400,000	2,818	1,127,200,000			
	b.	Labor for 3/4" and above, third party contractor may receive adjustment order at ex post	market rate, PT ABH consult with BIFZA at ex post, labor market rate between 400,000 - 500,000 for additional working days	No formal record ex-post	No formal record ex-post			
	2	Material package						
	a.	meter 1/2"	364,000	2,818	1,025,752,000			
	b.	meter 3/4" above, third party contractor may receive adjustment order at ex post if approved by PT ABH	market rate, PT ABH consult with BIFZA at ex post, market rate depends on current pipe and pipefitting price ranges between 300,000 – 1,000,000	No formal record ex-post	No formal record ex-post			
	3.	Water meter 1/2"	541,000	2,818	1,524,538,000			

	a.	Water meter 3/4", typically for larger homes, third party contractor may receive adjustment order at ex post if approved by PT ABH	591,000	No formal record ex-post	No formal record ex-post			
	b.	Water meter 2", third party contractor may receive adjustment order at ex post if approved by PT ABH	7,000,000					
	Subtotal (3)				**2,152,952,000**	**764,000**	**50**	**304.4**
Water mains construction Ex-post Costs adjustment restricted to government regulation, additional works cannot exceed 10% of the agreed budget	1	Materials, excavations, and labor		3	5,893,096,191			
	a.	HDPE diameter 250 mm (8")		2,301 m				
	b.	HDPE diameter 160 mm (6")		420 m				
	c.	HDPE diameter 110 mm (4")		300 m				
	d.	HDPE diameter 63 (2")		2,100 m				
	e.	Accessories: Gate Valve DN 800, Air valve DN 800, PRV DN 250 double pilot, FM DN 250 + Logger, Gate Valve Wash out DN 100mm, PRV DN 200			391,362,642			
	Subtotal (4)				**6,284,458,833**	**1,952,354**	**145**	**882**
Total Construction Cost					**9,188,407,833**	**3,260,613**	**212**	**1290.6**

*) PPP for based on IMF data, 6,088099538

Water mains construction cost Rp 6,25 billion (US$ 407,000). The third-party contractor proposal folded the cost of labor, equipment, street restoration, and construction management inside the cost of water mains extension and pipeline installation. Utilizing a market rate approach, HDPE materials for the projects cost $2.6 billion (US$ 172,000), while the cost for construction management, labor, equipment, permit, traffic control, and street restoration would be $3.6 billion (US$235,000).

In Batam, fire service lines are only mandated for complex buildings. A community that exceeds 150 people may apply for a community fire hydrant. The cost is capped at Rp 20 million (US$ 1,300). However, the community in this project did not apply for a community fire hydrant.

4.7 Aggregate Cost Analysis

Table 4.6 compares costs in water supply connection projects in 19th street, 13th Ave E, Seattle and the project in Kavling Kamboja, carried out between 2019 – 2024. It summarizes key components in the cost structure, affected by their respective institutional environments, differentiated by the availability of urban planning, detailed water supply infrastructure plans, and embedded constraints within water charges rules.

Table 4. 6 Costs comparable, Seattle and Batam Water Connection Project

Cost Comparable	39th St	13th Ave	Kavling Kamboja	
			In US $	In US$, adjust with PPP
Water Availability Assessment	Not required	**US$325**, developers pays a commitment for WME construction	**US$6,** client pays for BIFZA water availability recommendation, paid to PT ABH	**US$36.53**
Administrative Costs	Not required	Not required	**US$11** client pays for a deposit and an administrative fee to PT ABH	**US$66.97**
	US$ 8,242	**US$ 1,664**	**US$106**	**US$304.4**

Aggregate Service lines cost	US$ 2,400 (base) for ¾-inch connection, discounted if there is an existing connection. Labor cost included	US$ 8,975 (base) for building 2-inch master meter, serving 6 lines	Material is capped for ½-inch US$24 Labor cost for ½-inch is capped US$ 3.24	
Fire services	Combo Fire Service included in service lines connection costs	**US$ 2,835** Separate Fire Service lines	**US$26** Non-compulsory domestic fire hydrant, voluntary application per 150 residential	**US$ 158.29** (every 150 residents)
Aggregate Water Mains costs (per unit)	**Not required**	**US$ 3,770**	**US$ 145**	**US$ 882**
materials per meter (includes installation costs)	**Not required**	**US$ 79**	**US$ 16**	**US$ 97.4**
Capped Construction costs	US$ 2,400 (base) for ¾-inch connection, discounted if there is an existing connectionLabor cost included	Construction management standardized according to Seattle's labor costsAdditional labor cost is capped US$63.75 ($510 per day)	Third party contractor work based on the approved costs for labor at ex-ante	
Total Aggregate Costs	**US$ 8,242**	**US$ 6,709** excluding individual water meter connected at the unit	**US$ 212**	**US$1,290.67** or **US$ 1,448.96** with fire services

When adjusted to show purchasing power parity (IMF, 2024), the aggregate cost of water supply connection in Batam is equivalent to $1,290. This price is lower than Seattle, although it is worth noting that water connections in Batam lack fire services at individual units. The selection of HDPE pipe, is costlier than Seattle, substantially decreasing the cost for water mains extension. Labor costs drive the differences. Batam's policy caps labor costs slightly above the minimum wage reducing the cost for water supply connection and water mains extension.

1) Water supply infrastructure plans and water charge rules exercise probity and safeguard against maladaptation

The institutional constraints on the choices of project arrangement result in differing project outcomes. Institutions constrain ex-post haggling by informing the clients about specific

information related to planning. Urban planning, including infrastructure map, is a form of information which transfers asset-specific information to the public.

Prior to construction, SPU project teams assess the site location based on a water supply map. Water infrastructure data provides for an informed decision. Projects are carried out in small scale incremental additions, safeguarding against risks in assessing the cost of expansion. In both cases in Seattle, SPU directors' rule provided safeguards, to inform both parties (SPU and the client) that the contract would be incomplete ex ante and subject to additional costs, such as the cost for decommissioning/retirement of old service lines, street and plant strip restoration, including additional requirement related to fire safety. SPU's director rule provides a standard base rate for the simplest base connection, and a standardized calculation model for a more complex connection. The calculation model helps reduce uncertainty, as well as the risk of incomplete contracting and ex post maladaptation.

For example, in Seattle, the costs for water supply are specified with detailed plans created by assessing water supply plans and a site visit, A cost calculation is based on standardized base costs regulated by the SPU Director's rule. The set of institutions, infrastructure plans, SPU Director's rules and site-specific plans allow for an informed decision in determining specific project costs in a specific plot, ex ante.

In Batam, third party contractors continue to assume the task of developing plans, conducting community assessments, assessing the cost of installation, and constructing the water supply system, as specialized firms which bind their work with the appointed private operators (PT ATB and PT ABH). A prolonged system relying on third party contractors increases bounded rationality within BIFZA as an organization. As of now, BIFZA does not hold records for water

supply installation at hand, and is in the process of mapping its water supply infrastructure (LPSE BP Batam, 2024).

Lacking water supply plans, BIFZA must assess each project individually, which adds to the cost of water supply plans. An accumulation of large-scale administrative costs is a form of rent seeking activity. The total sum of recommendation fees are collected as a revenue and paid to the Ministry of Finance and returned to BIFZA as an non earmarked budget. The lack of physical assets mapping and the mechanisms for installation, means that BIFZA can impose deposit fees, claiming the fund will be returned to the client in case of a decommissioning order and a replacement by the client. However, the procedures for deposit returns are still being drafted, and currently the deposit sits in a special bank account. Every year, BIFZA reports the deposit balance to the Indonesian audit agency.

In addition to project administration costs, clients must pay administrative fees ($1), utilized for processing legal stamps and documents. BIFZA deviations from administrative costs are less likely to occur due to a constraint imposed by the Ministry of Finance. The structure of the costs in Batam suggests that the choice for BIFZA privatization arrangements is regulated to alleviate the costs of production. It also increases transaction costs, though government and private administrative transactions are monitored.

2) Detailed water supply as safeguard against maladaptation ex post

The Head of BIFZA rules, which focus on low-cost connection at the client's end and lack a detailed water supply plan for the region, provides PT ABH and its third party contractors an opportunity to capitalize on their past accrual of local information. The head of BIFZA regulation stipulates stringent low-cost budget control at the client's end. The proposal for large-

scale water expansion economises on scale. Although the proposal will be audited, the third party contractor will be able to realize the actual costs of construction ex-post by haggling, because BIFZA makes payment to services after project completion.

Third party opportunism looms large over this project, because the scale of the project opens the possibility for obtaining kickback fees from pipe suppliers. Large quantity sales for any types of production in Indonesia, typically include kickback fees, or rebates that are distributed between the selling agent and construction companies (Apriyanti and Rais 2020; Sohail and Cavill 2008), which may explain why the market rate for HDPE is higher in Batam, compared to Seattle, despite the fact that the majority of the market production in Indonesia will be completed at market rates inherently lower than those in the United States.

Asset specificity also affects the cost structure in Batam. The rule assumes the private sector will plan and fund its own infrastructure services, including providing its own fire safety (e.g., fire hydrant and fire service lines) within the area. When applied to a community, this rules creates a hostage situation. Low-cost wage policy, and an emphasis to improve investment by relying on investors, has caused Batam GDP per capita to grow at a flatter rate compared to international inflation. Communities, on average receiving wages slightly above the minimum wage, will be unlikely agree to pay the cost for fire hydrants.

3) Enforcement, ex post maladaptation, and the state of infrastructure

Another important aspect of institutions, related to asset specificity, requires the government or public bureau to have the ability to enforce standards. Studies about contractual arrangements suggest, privatization may be detrimental to the state of infrastructure (Koumpli and Kanakoudis 2022; Pérard 2009).

SPU standards on pipes and water meters, are specified to meet the American Water Works Association (AWWA) standard. SPU Director's rule also has a stringent specification against any permanent use of HDPE pipe, limiting the opportunity for SPU to lower quality and lower the costs of construction by substitution. A water meter must have a built-in automatic meter reader (AMR). Additionally, a set of rules and regulations in building and neighborhood zoning plans in Seattle, views fire service lines and fire hydrants as necessary building accoutrement that must be in place for habitable space. Water supply in essence is a necessity for the functioning of livable space, thereby, the added costs for service lines is adjusted to account for standardized material and labor costs.

In contrast, although the choice of water meters and pipelines in Indonesia refers to the Indonesian national standard (Sarbini et al., 2014), this standard is rarely enforced. PT ABH requires each water meter meet a minimum quality threshold (>98% accuracy) without an automated meter reader attachment (Irawan W., 2021). PT ABH is not restricted from arbitrarily adding the costs of AMR at existing home connections at individual client costs, because the condition is not stipulated in the contract with BIFZA.

4) Institutional environment and probity

The institutional environment in Seattle is does not impose a low cost and low quality solution. In Seattle, there are no costs for water availability certificates or additional charges for administration, because long-term capital investment can rely on regulation which considers proportionate cost allocation.

Table 4.7 records the minimum wage and for occupational employment related to water supply projects in Seattle and the United States (Seattle office of Labor Standards, 2024; the US Bureau of Labor Statistics; BPS Provinsi Kepulauan Riau, 2024; BP Batam, 2024).

Table 4. 7 Wage for water supply projects in Seattle
(BPS Provinsi Kepulauan Riau, 2024; BLS, 2024; BIFZA, 2024; The city of Seattle, 2024)

Job Title	Seattle (US$)	Batam (Rp (1 USS = 15,416)	Batam (Rp) Adjusting to PPP
Price Controlled			
Minimum Wage (hourly)	16.50	1.82	11.08
Market Rate*			
Project Managers	61	5.34	32.51
First Line Supervisor	36.90	3.58	21.79
Construction	30.45	3.33	20.27
Plumbers, pipefitters, and steamfitters	29.59	3.49	21.25

*) market rate in Seattle refers to US median occupational wage report from the Bureau of Labor Statistics, 2023

The use of SPU's director's rules suggests the costs of the water main extension for 13th Street Ave East in Seattle correspond with the hourly wage for construction management in Seattle and the United States. The use of standardized costs and site-specific cost calculations means haggling ex post is not necessary. Though it may be possible to bring down costs through competition in the absence of standards, the standards alleviate risk and provide a livable wage.

4.8. Conclusion and Future Recommendation

Institutions provide structure for distributing benefits, as well as for rent-seeking activities. Rules form the structures for incentives which, in terms of water supply, may benefit or be controlled by politics. This comparative case analysis juxtaposes projects (See Williamson, 1999 for ex-Soviet collective farming) in Seattle, set in a decentralized system, and Batam, set in an environment focusing on centralized provision of low cost production. The finding in this paper confirms North's (1993) theory of the state, suggesting that rules or norms for the distribution of resources, specify contracting decisions. Asset specificity in water supply

arrangements, provide an avenue for understanding how institutional arrangements, provide credibility and constrain parties from making arbitrary decisions, which reduce transaction costs from ex post maladaptation and stabilize the market.

Public utilities, provide services for the community populating the city. Their efficiency is not restricted within the confines of a production function of cost maximization. Public utilities may choose to internalize the cost of recurrent specialized contracting for all types of water supply projects and gain efficiency from organizing services. However, when it is conducted under privatization, a private company may gain efficiency by negotiating specialized contracting through cutting the cost for maintenance and investment, which destabilizes long-term water supply services.

A valuable insight from SPU's policy suggests that while the rules and policy for SPU operation reflect real costs and consider the long-term deployment of assets, SPU market friendly arrangements may lack the foresight to account for market externalities. A frequent cost adjustment to inflation adds the costs to housing, for both renters and homeownership. Exercise in government restraints (North, 1985) or other forms of government may be needed, to ensure that the costs increases in public services do not add the cost for other amenities (e.g. housing) needed to sustain economic growth.

This study confirms Koumpli and Kanakoudis (2022) finding, which argues that weak institutions, unable to maintain long-term commitment, eventually cause private agreements to weaken in the long run, resulting in rising water costs. Many countries, which tried to pivot and return to water supply municipalization, evidently must do so at greater costs, as private companies seek cost optimization, which in the long run leads to a declining infrastructure at the end of the private contracting period. In the Batam case, a nationalization of the water utility at

Batam mainland brought challenges as the bureaucracy was left to cope with a learning curve in managing a crumbling infrastructure, due to a long period of private reliance. Externally, the challenge from private companies and political lobbies could weaken the resolution to nationalize, which can lead to BIFZA rolling back privatization. Privatization in Indonesia (Pokja AMPL, 2009), particularly in Batam, should consider adding stringent institutional constraints, to better informed agents about the physical asset distribution, its intended distribution of benefit, and the consideration for market-friendly outcome, which aim at cost recovery.

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CHAPTER 5 Conclusion

This dissertation bridges the theoretical gap in planning, development economics, and public policy for building theory about the south with international comparative studies situated in different institutional environments. This is done firstly, by rejecting divisive assumptions sourced from cultural or technological bias toward north and south planning, and secondly, by contextualizing theory derived from comparative microanalytic observation of the effects of variations in institutional arrangements.

This dissertation meets three objectives. The first is to introduce the application of new institutional economics and transaction economics theory for international comparative analysis, contextualizing planning practice based on mundane and daily practices at a microanalytic level. The second is to analyze the rationale for the state and market actors in the make-or-buy decision, with one case situated in economic zone policy that economizes on the cost of labor and production and the other within the typical city and infrastructure planning context. A notable attention in this dissertation sheds light on the effect large-scale economic zone planning has on infrastructure, particularly as state agents adopt a contradiction: either perceive water supply as public goods or as a burden to the cost of production. The third objective is to present a critique and build on knowledge of the actual costs of decisions for policymakers and the private sector, based on the observation of facts about the cost of minor infrastructure projects.

All three studies synchronize in the approach to the theory of the state and transaction costs economics. Initially developed in the US free market context, this dissertation examined its applicability in analysing planning practices in the south. The first paper utilizes the perspective of state planning and its relationship with the market by applying the theory of the state from new institutional economics and transaction costs economics to social infrastructure planning

decisions. These theories complement the classical economic perspective for exercising social welfare and individual well-being policy across the United States, European countries, and their counterparts in the global south. Infrastructure decisions inherently vary due to their differing institutional endowment, most notably caused by actors' decisions.

The second paper utilizes transaction cost economics theories, extending the use of decision tree analysis, for analysing make or buy decisions in water supply in two institutional environments: one heavily emphasizing lowering the factors of production to support economic zone policy in Batam, and the alternative in the City of Seattle, emphasizing fair distribution of public goods. The two examples juxtapose two governance structures: in Batam, there is nationally-led infrastructure planning, and the municipal government leads the alternative in Seattle. Water supply arrangements are high in asset specificity and are costly to build. Discretionary decisions and third-party opportunism further aggravate the choice to privatize in Batam; the alternative in Seattle imposes stringent cost control to alleviate transaction costs by operating a water supply system as a public utility.

The third paper tests the key traits in existing arrangements that account for contractual hazards (probity, asset specificity, and cost control) to alleviate transaction costs. Extending the use of transaction costs economics theory, this paper observes three empirical cases to examine the interplay of asset specificity, bounded rationality, and third-party opportunism in two types of contracting arrangements. One is fully operated by public ownership-which relieves profit-taking consideration and human asset specificity issues; the other is structured under a hybrid mechanism, regulated to suppress the costs of capital investment.

The finding in this dissertation suggests that a well-informed decision, structured by formal rules guides the decision and reduces risks for the water supply system, whether to costs or to the

system's sustainability. Institutions structure the incentives to enforce criteria, provide constraints for opportunistic behavior, and avoid short-term infrastructure breakdown.

Although the empirical examination of cases gathers from visible planning differences between countries, this dissertation forms a small locus of study interests, emphasizing state planning. Lagging interest in this type of analysis might be due to a lack of common access or data sharing. Improved access to project-level data can inform planning about the consequences of institutional development in the south in ways that travel beyond the promotion of democratic ideals. Another important insight from conducting data collection for this study is that it cautiously reminds the reader to acknowledge that a lack of discussion about the role of the state in the south might be due to other factors related to the challenges in accessing detailed information. Southern scholars may gravitate toward cultural and historical institutionalism due to the lack of courage, if not fear, instilled by agents of state-led planning, notable in environments with a history of authoritarian control.

As an individual, this dissertation raises awareness about the role of planners, which prepares me as a researcher and a professional after graduating and returning to my work as a civil servant in Indonesia. The process of shaping the content of this dissertation helped me acknowledge institutional limitations within the state organization in the south due to discretionary practices and the proliferation of self-interested behavior, which needs to be addressed for improvement. My future in research and as a state agent will enable me to take on a positive role in promoting infrastructure governance, which aims for a fair distribution of resources, supporting local planning, and advising for a scalable and sustainable infrastructure system.