Public finance for water infrastructure development and its practical challenges for small towns

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Abstract

The small and fluctuating population, the economic characteristics and administrative capacity of small towns not only pose infrastructural challenges for providing services, but also limit the possibilities for generating local revenues for financing water infrastructure development and maintenance. This limited ability to generate local resources for water infrastructure is exacerbated by the way in which scarce public funds are allocated. A first concern is linked to an urban bias that characterizes allocation of funds by central governments. A second concerns the prioritization of other sectors by allocation decisions of local governments. These local governments often prioritize other sectors such as education, health and agriculture for the use of scarce local public resources. What this discussion highlights is that existing models used for financing water infrastructure development do not seem very applicable to the realities of small towns. Additional research and models are necessary to allow for solutions that are better tailored to these realities.

Keywords: Financing; Public finance; Small towns; Water infrastructure

1. Introduction

Although it has a demonstrated an important role in infrastructure development, public finance has largely gone unaddressed in the literature. Instead, focus on financing has largely linked to the public-private debates over the past 25 years and concentrated on the promise and limitations of private sector investments (Winpenny, 2003). In line with this trend, research on public finance has largely been in terms of its deficiencies and the need for alternatives. This emphasis on private and blended finance stands in stark contrast with a finding from the World Bank, which states that two-thirds of all infrastructure in Africa was financed from domestically generated public revenue, with external aid supplying the remaining third (Foster & Briceno-Garmendia, 2009; Hall & Lobina, 2012). Data from the 1990s corroborate this finding as they demonstrate that almost 70 percent of infrastructure investments were

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sourced from the domestic public sector (Winpenny, 2003). Moreover, public finance will likely continue to be of importance as there has been a demonstrated lack of interest from the private sector to invest in water infrastructure in developing countries (Hall & Lobina, 2009).

Public finance is distinctly different from private finance as it is able to cheaply finance projects that benefit the public good (Hall & Lobina, 2012). Public finance is able to do this as it is backed by stable tax revenues and is able to invest in poorer areas, which are unattractive to commercial lenders (Massarutto et al., 2008). However, while the initial investment may be sourced from public finance, it must be clarified that public investment does not necessarily mean that the services provided will be managed by a public entity. These services provide social and economic benefits beyond the individual private benefits of connecting to water and sanitation services. Apart from public health benefits, it is estimated that for each US$1 worth of investment US$7 is generated in economic returns (OECD, 2011). As the social and economic benefits are spread over society rather than just the individual user, having these services as a focus of government investment would appear justified (Gunther & Fink, 2010). The nature of public finance and of water and sanitation services indicate that public revenue remains an important source of financing for this sector.

1.1. Sustainable Development Goal 6 and public finance

With the adoption of the United Nations’ (UN’s) document on Transforming Our World through the Sustainable Development Goals (SDG) (UNGA 2015), the SDG were introduced as successor of the Millennium Development Goals (MDG). Sustainable Development Goal 6, ensuring availability and sustainable management of water and sanitation for all, addresses perceived shortcomings of the MDG target by emphasising universal water services by 2030. Recent estimates of the global coverage of basic water services, however, remain far below the goals of the SDGs. For example, basic water services have been provided to 87 percent of people living in urban areas and 76 percent of people living in rural areas (Hutton & Varughese, 2016). However, these numbers reduce to 68 and 20 percent, respectively for those who have access to safely managed water (Hutton & Varughese, 2016). For sanitation, more progress is needed as 26 percent of those living in rural areas have access to safely managed sanitation and only 34 percent of people living in urban areas have access to safely managed sanitation (Hutton & Varughese, 2016).

However, for this ambitious target to be achieved a considerable financing gap needs to be bridged. There is an estimated US$1.7 trillion investment gap for water and sanitation (Kolker & Trémolet, 2016a). As public finance comprises two-thirds of the available finance for water infrastructure, it is clear that the achievement of SDG 6 can only be achieved through significant public investment. This extremely large sum of money will likely be financed by the users, taxpayers, or from external aid (Winpenny, 2003).

1.2. Small towns

As global attention moves from the UN’s MDGs to achieving the target of the SDGs, small towns must receive increased attention if universal access to water and sanitation is to be achieved (Habitat, 2006). Over the past decades, literature has mainly focused on water and sanitation in either urban or rural settings and largely ignored water services in small towns (WSP, 2002; Pilgrim, 2007). Small towns require specific attention because they straddle both urban and rural characteristics. Therefore
research focusing solely on either rural or urban contexts may create recommendations inappropriate for small towns (Caplan & Harvey, 2010). In addition, small towns are of increasing importance as the number of small towns is growing due to increased urbanization. In fact, it has been estimated that 20–40 percent of the population in Africa and Asia lives in this grey area between urban and rural settings (Pilgrim, 2007).

Despite the importance of public funding in water supply and sanitation and the increasing prominence of small towns, both topics have received little attention in recent years. This article, which is based on a thorough review of existing (grey) literature, contributes to filling this gap. Public finance is used for both the development of infrastructure and on-going operations and maintenance. However, this paper primarily focuses on its role in infrastructure development. In doing so, this paper seeks to clarify the role of public finance through a review of the current sources of generation for public revenue, the different allocative theories, and the associated lines of accountability. This article then contextualizes the challenges of public finance for both infrastructure development in reference to small towns. Accordingly, this article highlights that while public finance plays an important role in the financing of water and sanitation infrastructure and should not be overlooked, there are significant challenges for its use in small towns.

2. Public finance

Public finance refers to the government’s role in the economy, which acts to minimize undesirable effects of a market economy (market failure) and maximize desirable effects (Gruber, 2004). Public revenues are generated to finance public expenditures. There are two main sources of domestic public revenue: taxation and tariffs. However these standard sources of revenue may be insufficient to generate the needed revenue to match the lump investment needed for infrastructure development. To fill this gap, borrowing instruments have been promoted to fund governmental services (OECD, 2009). While this paper focuses on sources of revenue channelled through the government, there are additional revenue flows from external transfers, not discussed in this article, that are provided on a ‘project by project’ basis.

2.1. Revenue generation: taxes and tariffs

At its most basic, taxation is the assessment of a levy by the government on an individual or legal entity (OECD, 2014). The main justifications for the levying of taxes are to generate revenues for public services, redistribute revenue for equity, internalize the externalities of the production of certain goods, and to ensure representation (Taxation and Finance, 2013). The revenues collected from these individuals or legal entities are then used to support general services for which the market will not provide (Hall & Lobina, 2009). Taxation comes in many forms; from sales taxes on the purchase of goods to the assessment of royalties on natural resource extraction. Taxes can be collected at the different levels of government, from local sales taxes to centrally collected income taxes (McLure Jr, 2001).

1 The Camdessus Report on Financing of water infrastructure cites three main sources of funding for the water sector: taxation, tariffs and transfers. Transfers can be categorized as international public finance, while taxation and tariffs are both sources of domestic public finance (Winpenny, 2003).
The amount of revenue generated through taxation will depend on the size of the tax base. Therefore taxes collected at the central government level will provide a larger pool of money than those collected at the local level (Alm, 2015). Taxation is typically considered a relatively stable form of public revenue generation, as non-payment typically can lead to civil penalties (Taxation and Finance, 2013). However, to ensure proper enforcement, taxation systems require administrative capacity to manage the financial flows and properly assess taxes. Taxation typically makes up the significant portion of the public revenue generated for public services.

Tariffs are the other primary source of public revenue (Winpenny, 2003). In short, tariffs are payments for access to or use of services. This can be as simple as the use of a toll road or payment for water supply from a tap or piped network. These tariffs support the operations and maintenance of these services and can be used to cross-subsidize services (Winpenny, 2003). However as a source of public finance, tariff collection can be subject to instability. The instability is caused by conditions of uncertainty regarding the user base. If the user base decreases then tariffs may be insufficient to adequately fund the operations and maintenance of the service. Therefore while tariffs are an important source of public revenue they are likely less stable than revenues from taxation.

2.2. Loans

While revenue generated through taxation and tariffs is the foundation of public finance, they are typically insufficient to finance particular large capital expenditures needed for infrastructure works. Accordingly, governments at the central, subnational, and local level can take on debt to finance these capital expenditures. Governments will issue debt, when a large capital expenditure requires a lump investment upfront, but the benefits from the investment will be long lasting (Alm, 2015). These debt obligations attract investment from external and internal investors and are backed by promises of repayment from user fees issued on the infrastructure (USAID, 2003; Kolker & Trémolet, 2016b). Borrowing is based on the theory of intergenerational equity, which specifies that burden and risk of financing such projects should be shared by those who benefit now and those who benefit in the future (Martell, 2000).

Borrowing can be problematic as it poses a number of risks and challenges. For governments to access capital markets through the issuing of bonds, they must demonstrate a number of characteristics including credit worthiness, insurance against default, and other risk mitigation measures (Winpenny, 2003). However, these characteristics that enable national, subnational and local governments to access capital markets are often lacking, making it a challenge to attract investors (Cardone & Fonseca, 2006). When these characteristics are lacking, governments must attract investors by offering higher than average interest rates and other credit enhancements (Securities and Exchange Commission, 2012). These mitigations drive up the price of municipal debt.

2.3. Allocation: subsidiarity and distributive equity

Public revenue generated through these sources can be allocated consistent with different allocation principles of public finance. Broadly speaking, allocation happens in two ways. The first (subsidiarity principle) refers to the level of government that makes allocative decisions about the use of public revenue. The second (distributive equity) principle refers to specific allocative purposes for the use of the public finance.
The subsidiarity principle states that public service provision should be the responsibility of the lowest level of government that can do so effectively. This principle assumes that the local government is in the best position to understand the needs of their constituency and therefore will provide services efficiently by matching the supply of services with the demand for services. While this theory primarily addresses the management of public services, it has also been applied to infrastructure financing (Alm, 2015). As local governments are best positioned to understand the infrastructure needs of their populations, they are also in the best position to distribute the costs according to who benefits from the development of infrastructure. This is echoed by McLure Jr (2001), who argues that local governments are often better able to make tax decisions than central governments as they are closer to the people and therefore can efficiently provide government services. Regardless of the source of public revenue, allocation decisions are made with relative freedom by the local government as they are not constrained by earmarks or conditionalities by regional or central government authorities. Accordingly for water infrastructure, local governments have autonomy to determine the location and type of water infrastructure investments.

The principle of distributive equity is informed by the priorities and targets national governments set for certain sectors. In order to ensure that these priorities are realized the government attributes financial resources for their achievement (Aboma, 2010). The distribution of this public revenue, thus, is accompanied by strict requirements that govern the use of the funds. Under this principle central allocation seeks to address horizontal imbalances through redistribution. These horizontal imbalances are created when local governments differ in their ability to raise local revenue. By maintaining minimum funding levels for the nationally established priority areas, the central government ensures that the local governments have access to sufficient resources, which they are required to spend on specified activities.

2.4. Upward and downward accountability

Similarly to how private finance must respond to their shareholders and investors about the use of funds, the institutions that use public finance are accountable for their decisions. However the direction of accountability of public funding is also informed by the allocative theories that govern its use. These theories shape the pathways of accountability and can steer the use of public finance towards different purposes. While revenue generation can happen through taxation, tariff collection, and borrowing, the direction of accountability is often defined by the allocative theory for the use of public finance.

Under the first allocative theory of subsidiarity, accountability is downward; linked to the constituents that are receiving the services. As the decisions of allocation under this theory are made at the lowest possible level, accountability is oriented towards fulfilling the needs of the constituency. This is primarily because these constituents are, in theory, able to hold their elected officials accountable for their actions therefore they are incentivized to make decisions that best serve their constituents (Tullock, 2005).

In contrast, in systems where allocation of public revenue mirrors distributional equity, accountability on the use of public revenue focuses upward. As stipulations and earmarks are determined by the national government, the recipients of public revenue are then required to report the use of these funds according to the priorities (Aboma, 2010). Therefore the monitoring and enforcement of the use of public revenue are then focused on the national government (Mehta & Mehta, 2008). Accountability helps determine the development of infrastructure as it develops according to the national priorities rather than based on the input of the constituency.
3. The challenge of water infrastructure development in small towns

Small towns are particularly challenged by infrastructure development and maintenance because of their characteristic low density and small, but fluctuating populations. Franceys et al. (2016: 84) attribute challenges of water service provision in small towns to ‘higher costs (reduced economies of scale, more expensive access to professional support) and lower resources/willingness to pay due to lower average incomes as well as better alternative water sources than in larger towns’.

3.1. Population size and water infrastructure development

The most frequently used characteristics to describe small towns is population size (Caplan & Harvey, 2010). Typically, the population size considered to define small towns can be as low as 2,000 to 20,000 people (Habitat, 2006), or as high as 5,000 to 50,000 people (Ndaw, 2016). The discrepancy in these population ranges demonstrates the challenges of defining small towns, as a small town in India is likely to be much larger than a small town in Ethiopia (Caplan & Harvey, 2010). Despite the different understandings of population size as a defining factor for small towns, it remains important as small towns typically cannot benefit from the economies of scale unless they reach a certain size (Ndaw, 2016). Economies of scale refers to the concept that the unit costs of service provision reduces as the user base increases\(^2\). Population size is then an important characteristic for small towns since it determines the user base over which service provisioning costs can be spread (Habitat, 2006). While population size is important for determining economies of scale, the contestations over the exact population that makes a small town has led to criticism of only using population size to define small towns (Owusu, 2005). Accordingly, some governments have included characteristics such as density or economic activities as well as population to define small towns (Caplan & Harvey, 2010). However, the population size of small towns is important, as it affects the types of infrastructure available in the small town.

3.2. Population density and water infrastructure development

Another characteristic of small towns that affects infrastructure development is their low population density (Caplan & Harvey, 2010). Typically the development of a small town begins around the commercial centre (Hopkins, 2003). In the areas surrounding the centre, settlements develop with reducing density on the fringes. The development of infrastructure typically follows a similar pattern with the population density (Adank et al., 2016). The centre of the towns are typically served by piped infrastructure. However, given the low density on the outskirts of town, piped service is often not expanded (Caplan & Harvey, 2010). Accordingly the small towns are also serviced by standpipe infrastructure (Adank et al., 2015). In their spatial distribution, small towns mimic both urban and rural characteristics. Some authors have linked the low population density to the lower price of land on the fringes of small towns (Ndaw, 2016). However the low population density (but larger population than rural areas) creates

\(^2\) Economies of scale tend to exist where production requires high fixed costs relative to variable costs, so that average costs for service provision decline continuously over the relevant range of output.
a number of challenges for service provisioning in small towns, as uniform infrastructure is often not economically viable.

3.3. Population fluctuation and water infrastructure development

Related to the density characteristics of small towns, the population of small towns are typically in flux. They are subject not only to periods of immigration, but also population reductions due to emigration (Caplan & Harvey, 2010). Some authors have focused on the growth of small towns as being the centres for urbanization (Adank et al., 2015), while others state that small towns are pass-throughs for migration to larger urban centres (Trager, 1988). The causes of rapid population growth in small towns have been attributed to both natural disaster events and to policy decisions (Caplan & Harvey, 2010). Emigration from small towns has been attributed to the limited economic activities that exist in such towns (Owusu, 2005). Regardless of the cause, these fluctuations challenge infrastructure development in small towns as the nature of water infrastructure development is that it is somewhat permanent. Incorporating flexibly to meet these population changes is then a significant challenge.

4. Discussion: the challenge of public finance of water infrastructure in small towns

Small towns have small populations, which means that their revenue generation capacity is limited by the size of their tax base. In addition, the mix of both rural and urban economic activities (Caplan & Harvey, 2010) further limits their revenue generation capacity. While the exact mix of activities varies from small town to small town, the common economic activities in a small town are often light industry, trade and agricultural activities (Caplan & Harvey, 2010). Often, farmers sell their local agricultural commodities, sometimes at wholesale, to traders (Trager, 1988). These traders and farmers create the linkages between urban and rural areas, creating outlets for goods and agricultural commodities. This contrasts with more rural economies where the primary activity is agriculture and with urban areas where the economic activities can be classified as trade and industry based. Accordingly, the economy in small towns is both cash based and self-provisioning (Trager, 1988; Hopkins, 2003). The mixture of both trade, industry, and agricultural economic activities means that local government faces challenges in collecting taxes on the sale of goods in the marketplace (Englebert & Sangare, 2010).

These economic activities also inform the household income characteristics in small towns, as some have salaried work, while others rely on informal activities like day-labour or agricultural self-provisioning to sustain themselves (Adank et al., 2015). In addition, due to their linkage to urban areas, households in small towns sometimes rely on remittances from relatives working outside the small town (Trager, 1988). The heterogeneity of the sources of household income leads to challenges in local revenue generation for several reasons. First of all, many households are unlikely to have a steady and reliable source of income (Caplan & Harvey, 2010), which create challenges for tax collection as taxation relies on regular administration of taxes. These irregular incomes also affect the ability to pay user fees for basic services (Caplan & Harvey, 2010; Franceys et al., 2016). If residents are subject to a monthly water tariff for water and sanitation services, they will be constrained to pay these fees as it would take financial management to ensure that they could meet the schedule of tariffs. As small towns already have a smaller tax base, it is clear that typical systems of taxation and tariff collection are
highly challenging for small towns. Second, despite remittances, small towns are defined by their high rates of poverty, attributed to the fact that a portion of the population is self-provisioning and that there is a small labour market (Ndaw, 2016). A study in India found that nearly one-fifth of residents in a sampling of small towns were living below the poverty line (Tiwari, 2016). Similarly, a study of small towns in Ethiopia found that women were the head of the households in approximately 24–48% of households. This contributes to low revenue generation, as female-headed households frequently have more incomes below the poverty line than in male-headed households (Adank et al., 2015).

Apart from the challenges of raising local revenues, many local governments prioritize other sectors for the use of municipal resources over the water services sector. A WaterAid study examining the development of water infrastructure in Sub-Saharan Africa raises concerns about ‘the effective use or targeting of the scarce resources that are available to the sector’ (WaterAid, 2014). The study suggests that ‘in practice districts prioritise other sectors, in particular health, education and agriculture’.

4.1. The limited capacity to access other sources of public finance

The limited capacity to locally generate sufficient public finance to invest in water infrastructure means that small towns depend on central sources of public finance or borrowing. However, also accessing these sources of public financing proves challenging for small towns.

4.1.1. The variability of centrally raised public finance. Despite the larger tax base of centrally generated public revenue, centrally raised public funds for water infrastructure are still subject to variations and periodic reductions. These varying or decreasing levels of funding lead to a piecemeal approach in water and sanitation services in small towns, as small towns are required to meet the funding stipulations and maintain their existing services with fluctuating levels of funding. An example from Uganda illustrates the variation in the level of water and sanitation funding, which varies from year to year. Central government funding has decreased from 7 percent of gross domestic product in 2004/05 to 2½ percent in 2011/12. In addition to these budget cuts, the depreciation of Ugandan currency has also contributed to the further reductions in available funding for water and sanitation infrastructure (Matyama, 2012). Variation of revenue generation are also likely to occur on locally generated sources of public finance due to their dynamic economic characteristics.

Small towns often struggle to manage the varying schedules and varying amounts of the different sources of revenue. In addition to the management of several funds, the transfers of centralized sources of revenue are sometimes delayed, which creates instability for small towns. For example, in Ghana, small towns receive support from the District Assemblies Common Fund, which is a centrally generated revenue source. This fund has been subject to a number of management challenges as the disbursements to the district assemblies are often delayed for up to a year (Abbey et al., 2010). These delays are especially problematic in small towns due to their limited revenue generation, unlike larger urban areas, which are able to redirect their locally generated revenue to augment these transfers. Accordingly, the use of centralized public finance tends to favour recurrent expenditures like salaries rather than capital expenditures for infrastructure development (Mehta & Mehta, 2008). Others, however, find that, in situations where local governments lack the capacity to spend their budgeted resources and risk being subject to budget cuts from the central government, they often rush to expend the remaining revenues on unsustainable or poorly planned projects (Das et al., 2016). In addition, without adequate accountability
measures, local allocative decisions can favour a select few rather than the needs of the public (Das et al., 2016).

4.1.2. The limited capacity to access capital markets. Small towns have been argued to have low administrative capacity, which further limits their ability to use public finance (Cardone & Fonseca, 2006; Ndaw, 2016). This limited administrative capacity is described in relation to access to and the management of borrowing instruments (OECD, 2009). Typically, debt financing with outside investment requires that investor confidence is guaranteed through state-backing, credit enhancements, or otherwise high interest rates (Peterson, 1998; Securities and Exchange Commission, 2012). To access capital markets, municipalities must guarantee the repayment of debt through effective and complete user fees or tax collection (Peterson, 1998). While it is clear that small towns are challenged even with collecting sufficient revenue, they also lack sufficient financial management capacities to provide investor confidence. Illustrative of the limitations of administrative capacity are the low levels of local repayment for subnational pooled financing vehicles. In Ghana, repayment was about 32% for a revolving fund administered by the Association of Water and Sanitation Development Boards (Agbenorheri & Fonseca, 2005). In Burkina Faso, repayment rates were low at about 20 percent but were improved to 80 percent through an awareness campaign (Cardone & Fonseca, 2006). Given that the rate base is small and that the populations are in flux, small towns typically do not demonstrate the necessary credit-worthiness to access subnational pooled finance vehicles or to issue municipal debt without significant external support (USAID, 2003; Platz, 2009; Kolker & Trémollet, 2016b). It is also unlikely that they have the necessary accounting and financial management capacities to meet the obligations of debt service.

4.2. The limited influence of small towns on national agendas

When public finance is allocated to achieve distributional equity, small towns are challenged to engage with the national government to ensure that their needs are captured in these nationally established funding priorities. Small towns are unlikely to be able to maintain a lobby presence at the national level, which means that their funding priorities and interests may be overlooked. This is reflected by Gugler (1997) who finds that governments (re)allocate resources to achieve three different goals: (1) to improve the environment of decision-makers (placating behaviour); (2) to assure the continued collaboration of the middle class; and (3) to placate strategic elements of labour. This results ‘in public resources being spent disproportionately on the privileged consumption of the few and conspicuous investment for the few in cities’ (Gugler, 1997; Bakker, 2003).

As small towns are constrained in their ability to register their funding needs at the national level, the allocative decisions may not reflect the context of small towns or the needs of the inhabitants of small towns. Illustrative is an example from Uganda, where funding decisions for water and sanitation are primarily made in conjunction with the development of a national sector investment plan (WSP, 2011). These plans have strongly prioritized the development of infrastructure to the detriment of the maintenance of existing infrastructure, which leads to the waste of public resources (Matyama, 2012). This waste is demonstrated by an anecdote, which described the new construction of a water tank only 20 meters from an existing tank (KOIS Development Consultants, 2011).
5. Conclusion

The challenge for public financing of development of water infrastructure in small towns consists of a number of interrelated dimensions. The relatively small and fluctuating population, the economic characteristics and administrative capacity not only pose infrastructural challenges for providing services, but also limit the possibilities for generating local revenues for financing water infrastructure development and maintenance. At the same time, two biases that characterize most countries lead to the limited availability of scarce public funds for water infrastructure in small towns. The first concern is linked to the distributive equity principle. Under this principle central allocation seeks to address horizontal imbalances through redistribution. However, central governments may not necessarily have a desire to strive for the reduction of horizontal imbalances. The urban bias discussed above suggests that these horizontal imbalances may not be reduced, as central government prioritize certain geographical spaces and regions over others.

The second concern is more related to the subsidiarity principle and focuses on the ability of local government to better match supply and demand for services. Existing research on local government expenditure in small towns, however, in principle suggests that local governments often prioritize other sectors such as education, health and agriculture for the use of scarce local public resources. The demand for other services is thus prioritized over the demand for water services. The principle of subsidiarity then does not necessarily lead to additional funding for water infrastructure.

The challenges of public financing do not lead to easy solutions. Although commercial financing is increasingly being promoted as a way to address the financing gap in the water services sector, the question remains to what extent such commercial financing is really suitable for small towns. Without external support, few small towns are likely to be able to access commercial financing. What this discussion highlights is that existing models used for financing water infrastructure development do not seem very applicable to the realities of small towns. Additional research and models are necessary to allow for solutions that are better tailored to these realities.

References


