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Policy Note: Water Affordability and Accessibility in Baltimore, Maryland*

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Water system revenue losses, inefficiency, mismanagement, lack of productivity, and federal mandates are rapidly escalating the cost of water and wastewater for Baltimore consumers. Baltimore's water and wastewater systems are municipally owned and poorly managed by Baltimore City. Due to a lack of maintenance, these systems are plagued by an immense number of leaks, main breaks, and sewage backups. In addition, the billing system has a long history of errors. The overall deterioration of the systems, inadequate capital management, and operational problems are symptomatic of the fact that the Baltimore City Department of Public Works lacks proper accounts, including a balance sheet. Despite these glaring flaws, the systems have been politicized and are now protected by an amendment to the Baltimore City Charter that prohibits the assistance of private enterprise and markets in addressing Baltimore's endemic water and wastewater problems by tapping the competency and skills available in the private marketplace. In order to reverse the politicization of Baltimore's water system, which will only make operation and capital mismanagement problems worse as well as increase costs for the citizens of Baltimore, the charter amendment must be eliminated, allowing for the private provision of infrastructure

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and its maintenance. We recommend that this private provision is based on the centuries-old tried and tested French model.

Keywords: Water; wastewater; water leakage; mismanagement; revenue losses; politicization; privatization.

1. Introduction

Increased attention has been placed on problems of water affordability, especially for minority communities. Water system revenue losses, inefficiency, mismanagement, lack of productivity, and federal mandates, to name a few problems, are rapidly escalating the cost of water for consumers.

There have been serious problems with the water and wastewater systems in Baltimore for decades. These problems are endemic, growing, and will continue to adversely affect the affordability of water until their root causes — mismanagement and system deterioration — are addressed. We submit that recent radical policy interventions to treat the symptoms of these problems will only make matters worse and that the cost of water will continue to rise until and unless private enterprise is able to aid the City in fixing its failing and cost-ineffective water and wastewater systems.

2. Baltimore's Water System

Baltimore's water distribution system is municipally owned and managed by Baltimore City. It delivers treated water to Baltimore and the surrounding metropolitan area. The service area is approximately 560 square miles and provides potable water to approximately 1.8 million people (about 30% of Maryland's population). The water distribution system contains over 4,500 miles of water mains. The water mains connect to a series of pumping stations, reservoirs, and storage tanks. This system provides water to Baltimore City as well as parts of Baltimore County, Howard County, and Anne Arundel County (Baltimore City Department of Public Works 2020).

3. System Maintenance Mismanagement

Baltimore has been in the grip of a water system crisis for a number of years. This is well documented in the press (Duncan 2018; Dance and Brown 2019; Reed *et al.* 2019).

In December 2018, the *Baltimore Sun* published "By the Numbers: The Toll Winter Takes on Baltimore's infrastructure" (Zhang 2018). This piece included a comprehensive list of water main breaks in Baltimore from January 2, 2015 to

November 30, 2018. Over that period, 4,234 water main breaks were reported (Zhang 2018). Most water main breaks occur in the winter, with February as the most active month for breaks (Simpson 2021). In January 2018, there were 508 main breaks in Baltimore City and County, with as many as three dozen in one day (Zhang 2018). In February 2021, a spokesperson for Baltimore City's Department of Public Works (DPW) reported that the DPW was dealing with an average of 40–45 water main breaks every day (Simpson 2021). By comparison, New York City, which has a somewhat older and much larger water distribution system, serves almost five times as many residents as Baltimore's system but experienced only 347 water main breaks for the entire fiscal year 2020 (New York City Department of Environmental Protection 2020).

There is a reason for Baltimore's immense number of leaks, breaks, and water loss. Baltimore's water infrastructure remains outdated, with some of the oldest parts of the system built in 1855. In short, the system has not been properly maintained. Indeed, deferred maintenance has been an endemic problem for decades. And, to make matters worse, Baltimore has no systematic program for leak detection and control in which benefits and costs are properly calculated (Hanke 1982). Enormous amounts of water are being wasted in Baltimore, increasing the cost for all consumers. To control leaks, Baltimore would have to continuously repair and maintain the current water distribution infrastructure, which it does not do properly. Without proper leak detection and control practices, Baltimore is in a doom loop.

Starting in 2014, the DPW has been rehabilitating over 4000 miles of underground water infrastructure at a rate of 40 miles per year (Qureshi 2018). At this rate, the system would more than take 100 years to be fully updated. At that point, the watermains that were renovated at the beginning of this process will likely already be overdue for an update.

The Maryland Department of the Environment requires water systems serving more than 10,000 people to submit a water audit report. These audits are conducted in order to determine a system's demand for water and assess whether it has the capacity to meet that demand. Audits are used to provide water utilities with a profile of their distribution system and water uses in order to carry out more effective management of their water and infrastructure (MD Dept. of Environment 2019). Among other things, these audits contain data on water loss caused by leaks. If more than 10% of water withdrawn from a system is unaccounted for, a water loss reduction plan must be submitted (MD Dept. of Environment 2019).

However, for some reason we have not been able to document, Baltimore City is statutorily exempt from complying with this state-mandated water audit (MD Dept. of Environment 2019). Despite this lack of transparency, researchers at the Johns

Hopkins Institute for Applied Economics, Global Health, and the Study of Business Enterprise were able to obtain an internal water audit for Baltimore that the DPW had prepared for 2018, after spending hours haggling with DPW staff via email and at their offices. According to the report, 73,016 million gallons (MG) of water were produced by Baltimore's three water treatment plants in 2018. Of those, 8,483.05 MG of this water was exported to Howard County, which pays a lump sum for its water. This leaves 64,533.01 MG of water supplied to Baltimore City and County. However, only 72% of this water generated revenue. Water main leaks and breaks caused 16,602.02 MG of losses. This means that 26% of the total water supply of Baltimore was simply wasted away. In addition, another 2% of water supplied did not generate any revenue due to miscellaneous problems and system errors (Baltimore City Department of Public Works 2019).

It's clear why this information was not available to the public: since the city's unaccounted-for water far exceeds the state's 10% limit, a public audit would require Baltimore to submit a water loss reduction plan — which it does not possess and likely would not have the expertise and wherewithal to implement if it did.

Given these numbers, it is logical to wonder if this level of water loss is normal for utility systems like Baltimore. The American Water Works Association's (AWWA) annual report allows for a comparison of Baltimore's losses to other cities. Baltimore's losses are significantly greater than most comparable systems (American Water Works Association 2016).

The water that is wasted in the Baltimore system, is, among other things, a result of mismanagement and negligence. As mentioned above, there is no regular, comprehensive leak detection and control program employed by the Baltimore DPW (Hanke 1981).

Although Baltimore's water and wastewater systems are in an extreme state of disrepair, it is worth mentioning that most public infrastructure suffers from maintenance deficits (Kahn and Levinson 2011). Why are repair, maintenance, rehabilitation, and reconstruction neglected? With publicly owned capital, "ownership" is tenuous. Politicians who act as the public's agents and are responsible for budgets face election cycles that are much shorter than the rated lives of infrastructure projects. As a result, politicians have high rates of time preference; today counts most and tomorrow little. Not surprisingly, therefore, public infrastructure maintenance budgets are neglected, and maintenance deficits are common.

When long-lived water and wastewater systems, which are for the most part underground and out-of-sight, finally fall apart, the politicians who were responsible for maintenance budgets that could have financed repair rehabilitations and could have extended the life of infrastructure will have been long gone.

4. Operational Mismanagement

Baltimore's DPW is prone to operational mismanagement. One manifestation of that mismanagement deals with billing for water. In an attempt to fix these problems, former Mayor Stephanie Rawlings Blake hailed the installation of a new digital system for billing that cost more than $80 million, which now sends readings directly to city managers, as a solution to the long history of billing errors (Opilo 2021).

However, the system that was installed in 2013 is not trouble-free. Meters are often broken, delivering readings that indicate that no water was being consumed. This results in millions of dollars lost in uncollected bills. A joint report from the Baltimore City and Baltimore County inspectors general in December 2020 found that of the 8,650 repair requests for water meters, 95% of them went unresolved for more than a year (Opilo 2021). Additionally, 14,000 meters were malfunctioning at the time of the writing of that report (Opilo 2021). This lack of billing resulted in significant revenue loss. If that's not bad enough, the system occasionally sends customers bills that are tens of thousands of dollars over their proper bill amounts (Broadwater 2016).

Furthermore, the new digitized system is vulnerable to hacking. In May 2019, there was a ransomware attack on Baltimore's computer network, preventing Baltimore from issuing water bills for three months (Duncan 2019).

The billing problems go on and on. For example, in November 2019, the wrong due dates were printed on 15,000 water bills for Baltimore County residents (Knezevich 2019). More recently, it has been reported that Baltimore City had no process for collecting on customers with delinquent water bills for years (Opilo 2022b).

5. Wastewater System Mismanagement

Baltimore's wastewater system is arguably in worse shape than its water system. In 2004, there were 622 sewage backups reported in Baltimore. By 2015, the number had grown close to 5,000 (Dance 2016). In 2018, over 189 million gallons of sewage tainted water leaked into Baltimore's waterways (Baltimore City Department of Public Works 2018).

This problem is so great that the City of Baltimore was slapped with a federal consent decree to reduce sewage pollution and modernize the City's century's old system by 2016 (United States of America and State of Maryland v. Mayor and City Council of Baltimore, Maryland 2002). Interestingly, at the time of the original consent decree in 2002, the city did not even have complete maps of its

wastewater distribution system and was unaware of the conditions of pipes underground (Pelton 2016)

Following the consent decree, one of Baltimore's first sewage pollution reduction projects was the repair of a misaligned pipe at the head of the Back River wastewater treatment plant, which was causing a sewage backup for 10 miles. By the 2016 deadline, this and other major projects had cost about $900 million and were incomplete (Qureshi 2018). Since the City failed to meet the original deadline, a new deadline of 2030 for all projects to be completed was agreed upon.

Just one result of Baltimore's sewage nightmare is soaring rates for sewage treatment. On average, customers in 2017 paid three times as much as they paid in 2002 for wastewater services (Dance 2017).

6. Financial Mismanagement

The DPW's budget is divided into operating and capital budgets. Operating costs include day to day costs of running the utilities and administrative costs, while the capital budget is primarily for maintenance and repair.

The DPW's operating budget allocated to water and wastewater alone is a stunning 84% of the total. This amounts to 14% of the City's total operating budget of $3.8 billion. That's roughly equal to the Baltimore Police Department's portion of the City's operating budget. The Baltimore Fire Department, by comparison, accounts for only 8% of Baltimore City's operating budget (Baltimore City Council Bill #21-0080).

Of the City's total capital budget, which is $487.5 million, the DPW's allocation to water and wastewater takes up an incredible 56%. Baltimore City Transportation, by comparison, takes up only 15% of the City's total capital budget (City of Baltimore 2021).

By all metrics, the quality of the system is deteriorating, and the quality of service is low despite the large portion of the budget allocated to water and wastewater in Baltimore.

Given the deterioration of Baltimore's infrastructure, if the problem is going to be fixed, the capital budget will need to increase dramatically. But, increased by how much? We don't know the answer to that question because there has never been an analysis of the long-run marginal cost of water and sewage in Baltimore of the type that one of us (Hanke) has conducted in the past (Hanke and Wentworth 1981).

In this section, we had hoped to include a discussion of the Baltimore DPW's balance sheet in order to further assess Baltimore's methods of depreciating and managing its capital assets. After all, our view is the same as that of the high priest

of economic theory and Nobelist Sir John Hicks: there is nothing more important than a balance sheet (Klamer 1989). But, as it turns out, the Baltimore DPW does not even have a balance sheet in its possession. We know this because we engaged in an attempt to obtain those records. It is worth elaborating on those efforts.

In early January 2022, we began to contact a variety of personnel employed by Baltimore City via telephone. On January 20, 2022, after many calls, we were finally directed to submit a written request under the Maryland Public Information Act in order to review or obtain copies of records in the custody of the Baltimore City DPW. So, on January 21, 2022 we submitted a request for the DPW's disaggregated balance sheet to the DPW's Public Information Act representative via email. After a follow-up email sent on January 25th, we received a response confirming receipt of our request. Then, finally, on February 7, 2022, after another email inquiring as to the status of our request, we received notice that:

> "In your January 21, 2022 message to the Baltimore City Department of Public Works ("DPW"), you requested a copy of DPW's disaggregated balance sheet. . . . This response is on behalf of DPW. After review, DPW has determined that it has no records that are responsive to your request. . . .You may contest this response by filing a complaint in Circuit Court pursuant to GP §4-362" (D. Lamartina, personal communication, February 7, 2022).

7. Politicization of Baltimore's Water and Wastewater Systems and the Rewarding of Failure

Not only has Baltimore ignored the deterioration of the system and the gross mismanagement of its operations, but political activists have engaged in protecting the current mismanaged system by advocating against the use of the private sector and markets to assist the City of Baltimore in fixing and efficiently managing its system (Wenger 2014; Gwynn 2020). This has further politicized the operation of the water and wastewater systems in Baltimore. To our knowledge, Baltimore is the only city in the United States that prohibits competition, private companies, and markets from mitigating the costs associated with remedying a serious problem.

In 2018, Baltimoreans voted in favor of Ballot Question E; a charter amendment "For the purpose of declaring the inalienability of the City's sewer system and water-supply system; excepting the sewer and water-supply systems, their operations and uses, from the Charter provisions otherwise authorizing the

grant of franchises or rights relating to the operation or use of public property or places; and submitting this amendment to the qualified voters of the City for adoption or rejection" (Baltimore City Charter Amendment 2018). While this led many to consider Baltimore a "public water hero," in reality, banning privatization will not solve any of Baltimore's problems. According to Robert Powelson, president and chief executive officer of the National Association of Water Companies, "With the passage of Ballot Question E, Baltimore has summarily taken proven solutions for its water and wastewater system off the table. Baltimore leaders have allowed activists to turn its water services into a political issue instead of working to address system deficiencies and improve services to residents" (Powelson 2020). We are in full agreement with Powelson's statement. It is backed by a significant body of research and evidence (Hanke and Walters 2011a,b).

The charter amendment flies in the face of common sense and all expert advice, including the World Bank's. In 2006, the World Bank published "The Challenge of Reducing Non-Revenue Water (NRW) in Developing Countries — How the Private Sector Can Help: A Look at Performance-Based Service Contracting." Indeed, the World Bank, an organization concerned with, among other things, making water affordable in developing nations, draws the conclusion that "In a well-designed NRW reduction strategy, the continued use of the private sector should be a matter of choice for the public utility" (Kingdom *et al.* 2006). The charter amendment has made this choice impossible. It also contradicts a recent, definitive publication by the Brookings Institution: *Gaining Ground: Markets Helping Government* (Winston 2021). In Dr. Winston's book, numerous examples from various public sectors illustrate the advantages of involving private firms in the management and operation of municipal enterprises.

It is clear that the problems of Baltimore's water and sanitation systems have been misdiagnosed. The root of the City's water nightmare is the current institutions that are in place, namely the DPW. It is the municipal water utility's inability to properly manage the system that is causing Baltimore's current dysfunctional state of affairs and the rising cost of water. All the charter amendment has accomplished is the protection of the very system that has brought Baltimore's public water and wastewater monopoly to its knees. In short, the change in the City charter rewards failure.

As further evidence of the politicization of Baltimore's water system, Baltimore enacted the Water Accountability and Equity Act in January 2020 (Tuser 2020). This law created an Office of the Customer Advocate, which is designed to solve issues of unaffordable or inaccurate bills. The Act specifies that Baltimore residents will not be required to spend more than 3% of their household income on water

services. Many supporters of the Act were also advocates for Baltimore's law banning the utilization of private water utilities and their services.

This law will not solve the "problems" that it addresses but will further aggravate the operational mismanagement that plagues Baltimore's water and wastewater systems.

The Water4All billing program was launched in February 2022 as a part of the Water Accountability and Equity Act after many delays and missed deadlines (Opilo 2022a). This portion of the Act specifies that water bills will be capped at 1%, 2% or 3% of a residential household's income depending on household size. The Water4All benefits are available to those residents with incomes less than 200% of the federal poverty level (Baltimore City Department of Public Works 2022). The proper implementation of this program will prove to be infeasible. The DPW will have to continuously obtain and update information about household income and cross-tabulate it with poverty thresholds by household size. Since these metrics are constantly changing, the Water4All program will fall victim to a significant amount of waste, fraud, and abuse.

8. The Solution for Baltimore's Ailing Water and Wastewater Systems

In order to reverse the politicization of Baltimore's water system, which will only make operation and capital mismanagement problems worse as well as increase costs for the citizens of Baltimore, the charter amendment must be eliminated. This would allow for private enterprise and markets to assist the city in addressing its endemic water problems by tapping the competency and skills available in the private marketplace. And just how would that work?

Comparative cost analyses of private versus public provision of goods and services give support to the conclusion that private firms are more cost-effective than public firms. Considerable evidence suggests that the public cost incurred in providing a given quantity and quality of output is about twice as great as private provision (Block and Nelson 2015). This result occurs with such frequency that it has given rise to a rule-of-thumb: "The Bureaucratic Rule of Two" (Hanke 1987).

With the private provision of infrastructure, however, there is a potential problem: introducing and maintaining competition. This potential problem can arise because of the so-called natural monopoly character of many infrastructure projects.

There is a way to solve the natural monopoly problem and introduce competition into the provision of private infrastructure. It involves a system of competitive bidding for privately-owned infrastructure franchises.

So long as there is vigorous bidding for an infrastructure franchise, the best of both worlds — avoidance of redundant facilities together with competitive prices — can be had. Such a system could ensure that the favorable incentive effect normally associated with private ownership and management of a firm (i.e., that private owners will control costs, enhance efficiency, etc. as a way of maximizing their profits) will actually come about.

The key to the franchise bidding approach to natural monopolies is the following: bidding for the monopoly franchise should not be in terms of a sum to be paid for the franchise, but in terms of the prices that the franchisee would charge and the services the franchise would provide the public on the award of the right to be the exclusive supplier.

If the franchises were merely awarded to the bidder willing to pay the highest price for this exclusive right, competition would drive bids up to an amount equal to the present value of expected future monopoly profits in the market. This would transfer monopoly profits from the franchisee to whatever authority granted the franchise in the first place, but consumers would still pay monopoly prices.

Instead, an auction should be held in which the franchise is awarded to whichever bidder promises the best combination of price and quality to consumers. Here, competition would drive bid prices down to competitive levels for each possible level of service quality.

Theory is not necessarily reality, however. Indeed, some scholars have expressed reservations about franchise bidding. One set of concerns relates to the bidding process itself. Selecting a winner (i.e., determining an optimal price structure and mix of products) may be exceedingly complex, and there is no guarantee that bidding will be truly competitive. For example, new firms may be reluctant to bid on a franchise that has expired when the previous franchisee is also in the bidding since the previous supplier is almost certain to be better informed about actual cost and demand conditions than are its rivals.

Another set of concerns relates to the likely behavior of the winning bidder during the term of the franchise contract. If the contract is for a reasonably long term, there must be some formula to allow for rate changes as costs, demands, and technologies change over time — or renegotiation must be allowed. If a formula approach is impractical and renegotiation allowed, the need for some sort of agency similar to a regulatory commission becomes apparent. Such an agency will also be needed to police the franchise contract, since the agreement will not be self-enforcing. Further problems can arise as the end of the contract approaches, as the franchisee may curtail maintenance operations and under-invest in new assets, leaving “the next guy” to cope with any resulting problems.

These are important but not intractable problems. Three aspects (the difficulty of selecting a winning bidder, the difficulty of specifying or renegotiating contracts, and the need to police the contract) require the existence of some sort of "buyers' agency" to represent consumers. These buyers' agents must be well-rewarded for monitoring the terms of the franchise contract. France provides evidence that highly skilled and highly paid civil servants can perform this task effectively.

However, critics of franchise bidding have asserted that such an agency would simply be reduced to performing the same tasks assigned to traditional government regulators — with the same difficulties and potential for inefficiency, abuse, and corruption — leaving consumers no better off than they are now. This is not necessarily the case. The degree of technological complexity and the swiftness of technological change in the relevant industry are the crucial variables.

Selecting a winning bidder may be difficult where technology has created myriad potential service options. But where it is possible to specify a limited number of service standards, awarding the franchise may not be troublesome at all. And where the pace of technological change is not too rapid, it may be quite easy to agree on some sort of formula for price increases, and the possibility of mid-contract renegotiation may never arise. Furthermore, enforcing the contract also will be facilitated in industries where the number of specified service standards is relatively limited. These three factors make the water supply a perfect example of an ideal candidate for franchise bidding.

The technology of water supply is well known and relatively static, and specifications about service standards and quality are readily formulable. The critics' qualms about the practicability of franchise bidding recede in such a context. All one has to do is look at the operation of water and wastewater systems in France to confirm this (Hanke and Walters 2011a,b).

To implement the system, the government need only create such a buyers' agency with a mandate to conduct the auction and devise the contracts for the construction, maintenance, or operation of the facilities. Once the franchise is granted, enforcement of the contract can itself be privatized (if enforcement is not done by the agency). An accounting and/or engineering firm, for example, could be retained to audit the franchisee and confirm that the terms of the contract have been observed.

To create additional incentives for franchisees to maintain and improve quality, contracts could require the franchisee to post a bond for the duration of the franchise. This bond would be forfeited to the contract enforcers if the franchisee is found to be in violation of the contract; it would serve essentially the same function as a "security deposit" on an apartment.

Once in place, the franchisee will have every incentive to aggressively control costs, adopt new technologies, etc., since every dollar of cost saved is an extra dollar of profit earned. If the firm's managers are not attentive to cost control, the firms' profits will fall, share prices will decline, and the firm will become a ripe target for takeover by owners seeking to reap the gains which would result from turning out (or better motivating) the inefficient management.

9. Concluding Observations and Recommendations

Most municipalities face daunting infrastructure problems. To solve them, well-tested methods of private provision must be embraced. Private infrastructure franchises that are properly designed and strictly policed hold the key to improved infrastructure provision and affordability.

The scheme briefly outlined above, if allowed in Baltimore, would not only eliminate the current maintenance, operational, financial, and other mismanagement problems that plague Baltimore's water and wastewater systems, but would also eliminate Baltimore's current transparency problem. That is because the contracts between Baltimore and the providers of private water and wastewater services would be publicly available, publicly policeable, and publicly auditable.

The current system in Baltimore, with the charter amendment's protection, is dysfunctional. Baltimore's current institutions must be changed. This would benefit the users of the water system because costs would be much lower and more affordable than otherwise would be the case.

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