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**THE BULGARIAN WATER CRISIS
AND PRIVATIZATION**

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Johns Hopkins Institute for Applied Economics,
Global Health, and the Study of Business Enterprise



The Bulgarian Water Crisis and Privatization

By Logan Calichman

About the Series

The *Studies in Applied Economics* series is under the general direction of Professor Steve H. Hanke, the Founder and Co-Director of the Johns Hopkins Institute for Applied Economics, Global Health, and the Study of Business Enterprise (hanke@jhu.edu).

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Abstract

The Bulgarian water sector is plagued with an aging infrastructure and extensive water leakage. When the city of Pernik ran out of water in late 2019, it was due to the complete breakdown of a system built by the communists in the 1960s and 1970s. While crumbling dams and pipe breaks remain the most pressing issue in Bulgaria, self-serving oligarchs operating as heads of public companies create an environment of government corruption that cripples operations. In this paper, the author will explore why the failing water sector in Bulgaria lacks proper financing and an incentive to innovate. Then, the author will conclude with a privatization-based solution that engages the private company already operating in Sofia.

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Introduction

In November 2019, the Bulgarian water crisis began when the city of Pernik simply ran out of water. Pernik, located in Western Bulgaria and carrying the title of the nation's second most populous city, began to face severe water shortages and restrictions. At the peak of the crisis, citizens were only allowed to access water from 2-10pm (Sofia Globe, "Water restrictions in Bulgaria's Pernik", 2019).

These water shortages were due to various flaws in Bulgaria's water distribution system. The main culprit was high levels of non-revenue water (NRW). NRW is defined as volume of lost water as a percentage of net water produced. Usually, this is water lost during the distribution process due to pipe leakages. Levels of NRW reached up to 60% in the city's water distribution system, meaning that more than half of distributed water was being lost before it reached the people of Pernik. The Studena dam, Pernik's main water source, decreased in volume to 16% of its maximum capacity as a result of this. At the root of this problem was rampant corruption that allowed industries to illegally steal water from the residential dam, low tariff pricing, and an over-reliance on subsidies that prevented any meaningful revenue generation for water supply and sanitation companies (WSSCs). Thus, revenue was so low in the years leading up to the crisis that the WSSCs could not embark on any substantial infrastructure projects to improve the water distribution system.

Bulgaria's Water Supply System

Water Distribution Companies

Bulgaria is made up of twenty-eight Provinces, which are the first level of administrative subdivisions within the country. Provinces are further divided into two hundred and sixty-five municipalities. Municipalities are comprised of multiple towns, villages, or settlements and are governed by an elected Mayor.

Water supply companies were 100% state owned up until decentralization efforts in the 1990's. This movement transferred 49% of the ownership responsibilities of the water supply companies to a select number of municipal WSSCs. Some WSSCs remained 100% state owned, some had 51-49% state-municipality shared ownership, and others became 100% municipal owned.

Some of these WSSCs are multicity companies which provide water across many municipalities. 14 of these 29 multicity companies are majority owned by the state and managed by the Ministry of Regional Development and Public Works (MRDPW). 26 WSSCs are municipal companies which serve a single municipality and are owned solely by the municipality it serves. Lastly, Sofiyska Voda is the only privately owned WSSC in the country and serves the Sofia municipality (referenced as Sofia Water in Figure 1). In total, Bulgaria has 64 water and sanitation service providers.

[Figure 1] Water Services Provider Types and Market Shares

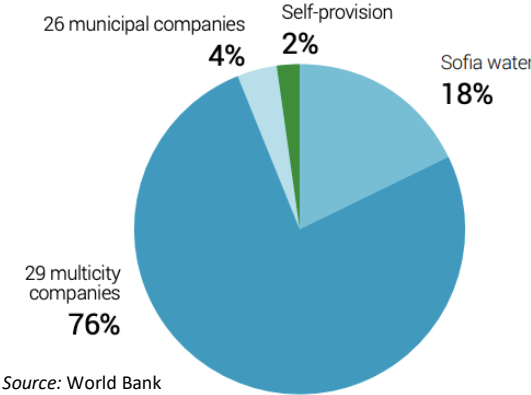


Figure 1 shows the market share of each type of water service provider in Bulgaria. 80% of the water supply is government owned, as opposed to 18% private ownership. Sofia Water operates in the country's largest municipality and services 1.4 million people, close to 20% of Bulgaria's population. Self-provision is the smallest portion of the market share and mostly encompasses small private wells.

Infrastructure

The majority of Bulgaria's current water infrastructure was built during communist rule in the 1960's and 1970's. Known for using poor quality material at cheaper costs, the Bulgarian communist government constructed a water supply system out of steel and fiber cement. Fiber cement pipes, also known as asbestos pipes, are cheap but banned for usage in water distribution in other countries. Asbestos fibers seep into water as the pipes age and create hazards. Drinking water with high asbestos levels has been linked to increased cancer risk and intestinal polyps (Stenstedt, 2019). Bulgaria's outdated system is now thirty-six-years old. Communist rulers prioritized cheaper costs over safety and sacrificed the health of future Bulgarians.

Pipe leakages are the biggest issue limiting the country's ability to supply water. NRW lags far behind EU averages and is around 60%, compared to 49% in Romania, 26% in France, and 7% in Germany (MRDPW, "Strategy for Development and Management of the Water Supply and Sanitation Sector", 2014). High leakage rates imply that water is being wasted because a larger volume of water needs to be distributed to meet consumer needs. Cracks in old pipes and breaks in the distribution system are wasting water that should be going to the consumer.

Moreover, contaminants have entered these leaky pipes and are causing health hazards. Four individuals were taken to the hospital after drinking tap water contaminated with E. Coli during Pernik's crisis. The town blamed the sixty-year old infrastructure for the incident (Sofia Globe, "New Investigation by Police, Prosecutors into Water Crisis", 2019). As a distribution system becomes outdated and leaky, water quality becomes an important issue, posing risks to the consumer.

Bulgaria's entire water supply is hamstrung from the beginning; Bulgaria's major dams are poorly built and in need of renovations. Even the country's chairman of the Bulgarian National Committee of Large Dams, Prof. Dimitar Kislyakov, cited issues with multiple dams. The

Kyustendil dam was only 40% complete when construction permanently halted. This is comparable to when another dam had construction abandoned in 1995 after twenty years of work, seemingly a common practice in the country. The Beli Iskar dam supporting Sofia has aging walls that are over seventy years old and require repairs. It does not meet seismic stability requirements and has drainage galleries at both ends that are unconnected to any terrain. Similar to Pernik's Studena dam, the Beli Iskar has water well below its maximum level. An inspection on January 2, 2020 deemed the Beli Iskar malfunctioning and only partially operational (Nanchev, "A Dozen Unfinished Dams Carry Risk", 2020). Dams with cracks or unfinished areas allow water to seep through, thereby contributing to high levels of NRW.

Bulgaria's own MRDPW understands the dire condition of its water distribution system, writing that "supply systems are obsolete, built of poor-quality material, or incorrectly installed" (MRDPW, "Strategy for Development and Management of the Water Supply and Sanitation Sector", 2014). Ancient infrastructure from the communist era is the main culprit behind the problem, and, as a result, the entire system has high levels of NRW and inefficiently uses natural resources.

Water Sector Organizational Setup

Conducting Legislation

Legislation governing the water sector has prohibited efficiency by creating layer upon layer of bureaucracy. The Water Act (2000) is the main piece of legislation establishing the framework for key players in the system. It defines water as a natural resource, which constitutes public property. The basic principle of the act is that the water supply systems serving the public needs are state, public, and municipal property (Ministry of Regional Development and Public Works [MRDPW], "Act on Waters", 2020). It also defines systems operating and serving in the territory of one municipality as municipal property, while those in more than one municipality are public state property. The roles and responsibilities of key Ministries are laid out as follows:

The Council of Ministers is the main authority in Bulgaria and consists of the Prime Minister and all other specialized Ministers. The Ministers are all chosen by the newly elected government and operate at the national level, while supporting the municipalities.

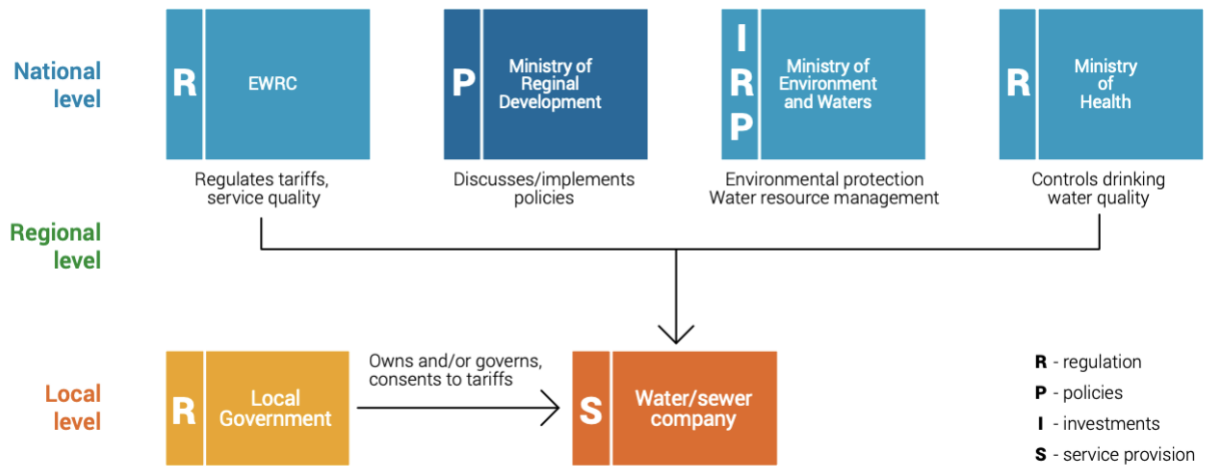
The Ministry of Regional Development and Public Works (MRDPW) is responsible for coordinating the management of the water and sanitation sector at the national level, developing policies, and acting as the manager of state majority owned WSSCs.

The Ministry of Environment and Waters is tasked with environmental protection of the water source.

The Ministry of Health is responsible for ensuring drinking water quality.

The State Energy and Water Regulatory Commission (SEWRC) is an independent regulatory authority that approves business plans and water tariffs, monitors performance of WSSCs, and reviews complaints filed by consumers. It is composed of 9 members who are experienced in the water sector and are appointed by parliament. Legislation defines the SEWRC's role as a body that "carries out price regulation of water supply and sewerage services" by setting a maximum marginal price for water that applies to the entire country. This maximum price is per cubic liter of water consumed (Energy and Water Regulatory Commission, n.d.)

[Figure 2] Structure of Water Sector Management



Source: World Bank
 Note: EWRC is the SEWRC

Figure 2 depicts the various layers of bureaucracy of Bulgaria’s water distribution system. At the national level, the SEWRC, Ministry of Environment and Waters, and Ministry of Health all have regulatory powers. Yet, only the MRDPW and the Ministry of Environment and Waters can implement new policies for the country. The municipalities own the WSSCs or give the state their consent to run a WSSC at the local level. It should be noted that there are no regional bodies that act as middlemen between the state and municipality. Therefore, the national government is interacting directly with municipalities.

The transfer of WSSC ownership in the 1990s from 100% state to a mixture of state and municipality created confusion over capital ownership rights that last until this day. Different municipalities remain unsure of what areas of the distribution system they own and are responsible for, relative to what the state owns. Unresolved uncertainties over property rights directly led to neglect of the system because municipalities are unsure of their exact responsibilities. The multiple layers of bureaucracy and the lack of true hierarchy furthers the inefficiency of the sector.

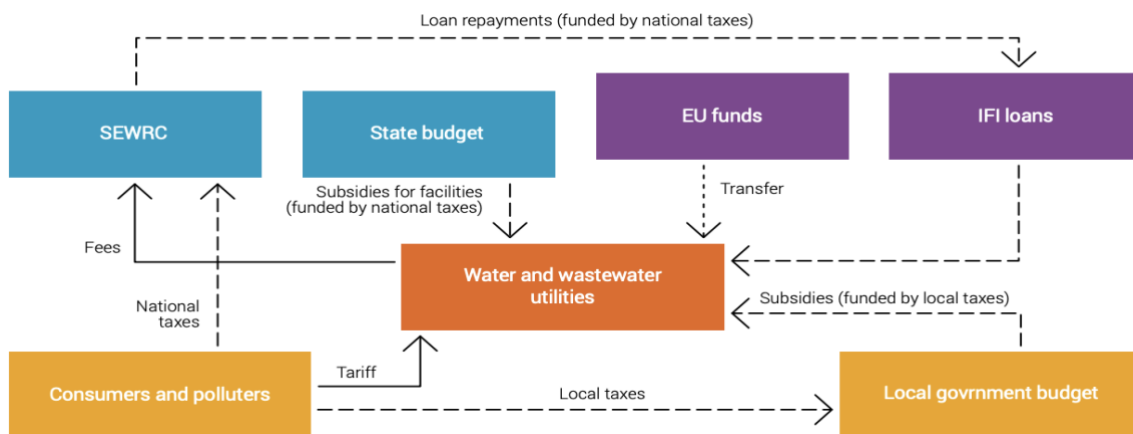
Authoritarian Prime Minister Boyko Borisov has created a system run by himself and a small group of powerful oligarchs. A strong class of around three thousand oligarchs hold the most

powerful positions in Ministries and run the most important businesses (“Bulgaria Exports its Problems”, 2020). The existing legislation helped create these conditions and allows the entire country to run through these oligarchs and their agenda. Tenders and European Union (EU) resources exclusively route through this elite group, giving them a financial chokehold over Bulgaria.

Sector Financing

Bulgarian WSSCs use meters that charge per cubic liter of water consumed, also known as the water tariff. The SEWRC determines this maximum rate and enforces it for every single WSSC across the country. The tariff determines the maximum price, but companies are allowed to charge below it if they choose to. The water tariff comprises the majority of sector financing.

[Figure 3] Main Sources of Funding for Water and Wastewater Services

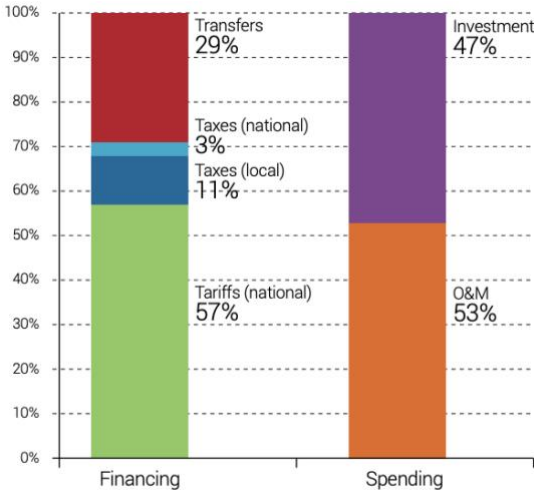


Source: World Bank

Figure 3 shows the different ways that WSSCs are funded. The majority comes from tariffs paid by the final consumer and is the only source of revenue generated through water distribution services. Companies also receive subsidies from the local and national level through respective tax revenue. The EU contributes money to the water sector via transfers from programs that promote higher quality water systems. Not depicted here is the World Bank, also contributing hundreds of millions of dollars to renovate the water distribution systems in Bulgaria.

Low water tariffs have created a situation where most WSSCs are struggling to cover their operating costs. Bulgarian water tariffs are some of the lowest in Europe at 0.94 euro/cubic meter (World Bank, “Water and Wastewater Services in the Danube Region”, 2015). This is below the regional average of 1.32 euro/cubic meter and reveals severe underpricing. From 2010-2015, operating costs to revenue ratios of public WSSCs exceeded 100% for the Northeast, South-Central, and Southwest regions (Raychev, 2018). Thus, when operating costs are more than revenues, water companies cannot set aside money for future investments and renovations. This also creates an overreliance on transfers from organizations like the World Bank and the EU.

[Figure 4] Overall Utility Sector Financing and Service Expenditures in 2011



Source: World Bank

Indicator	Year	Source	Value	EU MS Average	Danube Average
Service Expenditure					
Average annual investment (share of overall sector financing (%))		Author's elab.	47	42	38
Average annual investment (€/capita/year)		Author's elab.	18	42	23
Estimated Investment needed to achieve targets (€/capita/year)	2014-2023	MRRB 2014	86	65	43

Source: World Bank

Figure 4 breaks down how the contributed funds from figure 3 make up overall sector financing. The majority of revenue comes from the national water tariff paid by consumers, but a substantial 29% is sourced from the EU and World Bank. National and local taxes make up the

remaining 14% of financing. The World Bank states that 53% of the sector's revenue is spent on operations and management, while 47% is spent on investment. Both of these numbers are misleading because revenue is typically below or only slightly over operating cost. This 47% spent on investment only equals 18 euros/capita/year, as opposed to the Danube region average of 23 euros/capita/year, and which is far below the EU average of 42 euros/capita/year. While 47% of sector spending goes toward investment, this still lands Bulgaria far below investment averages.

A lack of proper funding has created a large gap between required and actual investment to improve aging infrastructure. The estimated costs of completely rehabilitating the nation's water system and bringing it up to EU standards is \$6.18-6.74 billion (Kristev, 2019). Projected EU funds will only cover around 40% of these costs and Ministries have pledged less than \$337 million combined, leaving a multi-billion-dollar investment gap between what is required to bring the water sector up to EU standards, and what is available (Monitor Team, 2020). The amount of money actually available to fix the broken system is most-likely much less than this projection after oligarchs determine how to allocate EU transfer payments ("Bulgaria Exports its Problems", 2020).

Problems with the Water Sector

Government Waste

Simply put, public companies do not have the same incentives to efficiently allocate all their resources and provide high quality service as private companies do. Public enterprise shares are not bought or sold, so manager compensation is not tied to performance indicators like share price. This difficulty to gauge performance can lead to poor. Additionally, there is no incentive to profit because managers are not awarded for doing so. With no incentives to cut costs or increase profit margins, public companies can suffer from a lack of innovation (Hanke & Walters, "Privatizing Waterworks: Learning from the French Experience", 2011).

Government services also cost more than if provided by the private sector. The Palgrave Dictionary states, “Considerable evidence suggest that the public cost incurred in providing a given quantity and quality of output is about twice as great as private provisions.” This leads to the idea of the bureaucratic rule of two: it is about twice as costly for a WSSC to be publicly run, rather than privately (Hanke, “Privatization”, 1987).

These facts are evident when analyzing select efficiency indicators for Bulgaria’s water sector:

[Figure 5] Selected Indicators of Efficiency for WSSCs in EU Countries

Efficiency of WSSCs	Bulgaria	Romania	Czech Republic	Lithuania	Germany	France
Staff per 1,000 connections	7.7	1.9	0.6	0.8	2.5	2.4
Non-Revenue Water	60%	49%	47%	24%	7%	26%
Pipe breakages (breaks/km/year)	1.5	1.9	0.7	1.1	0.01	0.1
Tariff (€/m ³)	0.94	0.85	1.75	1.40	3.95	3.40

Source: Ministry of Regional Development and Public Works

Figure 5 shows how public WSSCs in Bulgaria are inefficiently allocating and wasting their resources. It has more than triple the number of staff per 1,000 connections than the second highest nation. Their water leakage rate, represented by NRW, is 11% higher than the next closest nation and almost 25% higher than the chart average. Pipe breakages are second highest at 1.5 breaks/km/year. Also, if it weren’t for Bulgaria’s tariff being the second cheapest on the chart, companies could also be charging more for their services. For comparison, the majority of the water distribution system in France, Germany, and the Czech Republic is controlled by private companies.

Bulgaria's high staff per 1,000 connections proves that the bureaucratic rule of two exists in the water sector. On average, labor makes up over 20% of operating costs in water service (Water Sector Regulatory Council, n.d.). So, additional unnecessary labor is costly and shows how public WSSCs are misappropriating funds. Bulgaria's staff is significantly higher than other comparable countries in the region.

Public WSSC managers are not rewarded for making additional profit via increased efficiency, and so, Bulgaria's NRW remains among the highest in the EU. Every time a customer washes a dish or takes a drink of water, the resource is being wasted through numerous pipe breaks and leaks. More than half of all distributed water is lost due to the completely outdated infrastructure. The oligarchs running WSSCs would rather pocket profits than spend it on an expensive infrastructure upgrade, practically ensuring no upgrades to the service.

Public WSSCs continually do not meet consumer expectations while avoiding consequences. More than one third of customers state that they receive low water supply quality very often or constantly. These companies do not change their service because the oligarchs running them are protected by the government and face no additional competition or punishment, a classic example of the Agent-Principal problem common in public industries. Inefficiencies arise when some people ("agents") have a misalignment of interests with those of others ("principals"). (Hanke & Walters, "Reflections on Private Water Supply: Agency and Equity Issues", 2011). In this case, the "agents" are the owners of WSSCs who do not have the same interests as the consumers, the "principals." Customers want higher quality water while the oligarchs know they will remain wealthy whether they provide a quality service or not. Therefore, WSSC service and efficiency remain poor.

This Agent-Principal problem has shown up in the water quality in Bulgaria. These water companies take bribes and allow unregulated dumping into surface water. The towns of Haskovo and Merichlerci have had their water systems contaminated by radioactive material

and arsenic, respectively. To date, citizens in Haskovo cannot use their radioactive water supply for drinking or cooking (Nanchev, “Emil Georgiev: The Drainage of the Studena Dam”, 2020).

[Figure 6] Drinking Water Quality Compliance Results for Selected Indicators in 2010

Indicator	Large Zones (> 1,000 m ³ /day)	Small zones III	Small zones II	Small zones I	Small zones 0
Arsenic	100.00	94.40	100.00	98.93	100.00
Nitrates (source)	98.41	89.95	90.94	90.03	97.05
E. coli	98.01	96.39	95.80	92.41	88.95
Turbidity	95.47	98.87	99.17	98.54	96.81

Source: Ministry of Health 2013

Note: Threshold for microbiological compliance is 5%

Figure 6 shows the drinking water compliance results for selected indicators scored out of 100. Any score under 95 is seen as noncompliant. All large zones are compliant for all indicators, but each category of small zone is uncompliant in at least one indicator. As expected, WSSCs have allowed water quality to fall due to their lack of incentives.

Government Fraud and Corruption

The government can be a detrimental factor in public companies by politicizing purely economic decisions. Greater inefficiency is created when operations of a WSSC are not the main concern of managers. Often in public companies, higher-ups need to put politics into business decision-making when the two should be completely unrelated. Managers in WSSCs are promoted based on political affiliation and not their ability to lead. So, these individuals have to act based on party interests and not what is best for the WSSC and the consumer.

Corruption in the water sector is evident in Bulgaria’s dead last ranking in Transparency International’s 2019 Corruption Perception Index compared to other EU countries. WSSCs, owned mostly by elite oligarchs, often allow industry to steal from the residential water supply. Against Bulgarian law, officials have taken bribes to allow specific companies to take directly from residential water for industrial purposes (Konstantinov, 2020). Water stealing helped contribute to the dramatic fall of the Studena dam’s volume in the Pernik crisis.

Managers have a low degree of autonomy and are forced to play into party politics. These individuals are often fired or replaced without proper cause as ability does not factor into promotion or demotion. Even stakeholders believe that appointments in WSSCs are not based on professional qualities (MRDPW, “Strategy for Development and Management of the Water Supply and Sanitation Sector”, 2014). When one party gains power over another they typically replace managers of WSSCs and other important positions with people who favor the party.

SEWRC Commissioners are supposed to be independent regulators of the water supply, but, in practice, this is far from true. Often commissioners often do not serve their full appointment because of external politics. When one party takes power, these commissioners are replaced by a new group of party loyalists. The SEWRC is also funded through the government budget and not water revenue, making it more of a political position than an independent regulator and ruining its autonomy.

Bulgaria’s failure to implement any improvements from a recent World Bank project highlights the rampant corruption of Borisov’s government. The Municipal Infrastructure Development Program began in 2009 and was closed at the end of 2019. Headed by Toma Alexandrov Yanakiev, it had two main objectives: 1) improve the reliability and quality of water provisions to select communities and 2) assist municipalities to improve investment planning capacity. Simply put, the project’s intention was to restructure the majority of the Bulgarian water system. At an estimated cost of \$148.3 million, the project had three components to help it carry out these objectives (World Bank, “Municipal Infrastructure Development”, n.d.):

1. Implementation support to carry out activities involved with renovating the infrastructure
2. Creation of regional master plans for water supply and sewage systems
3. Implementation of master plans to physically rehabilitate the water infrastructure

Regular implementation checks were conducted to ensure progress. On June 2, 2019, the project scored a rating of “moderately unsatisfactory” in the areas of “progress toward achievement” and “overall implementation progress.” Risk was categorized as “substantial” by the World Bank.

The Bulgarian government received \$115.73 million from the World Bank by the project’s close date on December 31, 2019. Despite receiving 80% of its estimated cost, the project ended with no physical progress on any water infrastructure. Fifty-one regional master plans of satisfactory quality were completed, yet these yielded no physical progress on the country’s aging infrastructure.

A majority of tenders and funding from foreign bodies go through a select few powerful individuals that control the majority of business in the country. There is no evidence that the money sent from the World Bank went towards rebuilding the water supply system. It is far more likely that wealthy oligarchs stole this money and used it to pad their own wealth while allowing the water infrastructure to continue to age and collapse.

Government Incompetence

One of the most glaring features of the Bulgarian government’s incompetence can be seen in the mismanagement of major dams across the country. Four of the largest dams’ (Studena, Asenovets, Yastrebino, and Dyakovo) water levels currently sit at less than 50% of their maximum volume (Kristev, 2019). In many cases, this may occur as the result of a drought, but in Bulgaria’s case, the root cause is each public WSSC’s inability to protect and value the resource they distribute to consumers. WSSCs have shown that they cannot maintain proper water levels for their consumers due to excessive leakage and allowing industry to steal from residential water.

Municipalities, receiving little help from the state, have proved especially incapable of managing their WSSCs. By the end of 2019, 1,347 proposals for the national takeover of municipal WSSCs had been submitted. Municipalities realized that they could no longer run their WSSCs effectively with such minimal revenue, and thus requested state aid. But, the National Association of Municipalities stated that 1,215, or 90%, of these proposals were rejected for lack of proper documentation (Monitor Team, 2020). One of the causes for this stems from the confusion over the complex ownership system. The MRDPW stated that “Delays are further exacerbated by major uncertainties about the ownership and management of water system and sanitation assets and consolidation of operators” (MRDPW, “Strategy for Development and Management of the Water Supply and Sanitation Sector”, 2014).

Tariff Pricing

Effectively pricing water has important impacts on its quantity demanded. The elasticity of demand is defined as the change in quantity demanded in response to a change in price. Water’s elasticity of demand is not zero, meaning that a change in price will have an impact on the amount of water demanded and subsequently consumed. Consumers react to changes in the price of water and adjust their consumption even though water is seen as a necessity. The basic economic principle of marginal cost equaling marginal benefit must be satisfied in the water market to successfully price the good.

Low uniform water tariffs likely indicate that water is being underpriced. The Bulgarian tariff, at 0.94 euros/cubic meter, is significantly below the Danube region average of 1.32 euros/cubic meter (World Bank, “Water and Wastewater Services in the Danube Region”, 2015).

Underpricing water leads to higher consumer demand than would be at the economically efficient price. Because water is not being valued at its true price, water is drained and ecosystems are hurt. Consumers do not take necessary measures to conserve this cheaper water, and the marginal cost of supplying water is greater for each WSSC than the marginal benefit received, their revenue. The Vatican wrote in the World Water Forum that “good

management of natural resources is clearly coupled with requirements that users pay the true cost of services” (Pontifical Council for Justice and Peace, “Water, an Essential Element for Life”, 2006).

Uniform tariffs, determined by the SEWRC, lead to inefficiency and violate marginal cost pricing. Users need to pay rates at which the benefit to the WSSC is equal to the cost of supplying each additional unit of output. A uniform maximum price prohibits companies with higher costs from charging the true amount for supplying each unit of water. The costs of supplying water across all of Bulgaria are unknown, but each vary by terrain and cannot be uniform everywhere. Companies operating in these higher cost areas must be allowed to charge consumers more or else consumers are not paying the full price for their water, leading to a market inefficiency (Hanke & Davis, “Potential for Marginal Cost Pricing in Water Resource Management”, 1973).

Finance

Cost sharing between the national government and municipalities violates the User-Pay Principle’s association rule. The Principle requires that users pay the full economic cost of goods and services they consume. This helps to promote equity, efficiency, and conservation in the case of water services. Specifically, the association rule states that residents of various political jurisdictions must share project costs in proportion to the direct benefits received within the respective jurisdiction (Hanke, “The Economics of Canadian Municipal Water Supply: Applying the User-Pay Principle”, 1987). The practice of WSSCs receiving state tax money to help fund its endeavors violates this principle. Municipalities are not bearing the full cost of a project or operation of the WSSC, for which they are the sole beneficiary. Subsidies from the state artificially increase the demand for new projects because they are relatively cheaper to the municipalities. To achieve maximum efficiency in the sector, each WSSC must be self-financed.

WSSCs must charge prices at their long run marginal cost, also called marginal capital cost, to plan for increased demand and finance capital improvements. This cost measures the effect of

use upon the total system costs. Relevant total system costs include those planned to satisfy increases in use or demand in future years. The opportunity cost is measured in terms of slowing down or speeding up the growth in use and associated investments (Hanke & Wentworth, "On the Marginal Cost of Wastewater Services", 1981). Planned investments in the system can be incorporated into current costs, leaving water companies with enough capital to replace depreciating equipment and supply more customers.

Public WSSCs are charging well below their long run marginal costs. In fact, many companies experience operating costs that are above revenue generated, leaving no additional funding for future capital improvement. Overall sector investment is well below average, and a large gap remains between what companies have and what companies need to rehabilitate water infrastructure. A major part of the current crisis is due to WSSCs charging consumers well below their long run marginal cost. Bulgaria will continue to have to deal with the problems associated with a depleting capital stock if the current course is maintained.

Privatizing the Water Sector

By eliminating politics from decision making, privatization will make the water sector more efficient. WSSC managers will be able to act completely autonomously and make decisions for the good of the company. They will also be promoted based on ability and their performance can easily be measured by company profits and share price. This gives an incentive to innovate and reduce costs, while providing the highest quality service. Removing government influence will also fix the Agent-Principal problem seen when WSSCs do not care about customer ratings. Lastly, privatization helps to stop corruption because private WSSCs have no incentive to allow industry to steal from their water supply; a private company will fully value the resource it provides.

A system of private WSSCs across Bulgaria will fix funding and revenue problems seen by public companies. The User-Pay Principle problem will be completely fixed by having water

distributors fund their own endeavors and infrastructure improvements. Also, private WSSCs will use marginal cost pricing, leading to more appropriately funded companies. Increasing revenue streams from effectively pricing water will allow companies to plan for future infrastructure improvements and fix the extreme leak problems facing the country. Over time, a private system will update its distribution network and effectively lower NRW water. A system of private WSSCs should also remove the burden of water subsidization on the government's budget.

Types of Ownership

The concession of public WSSCs is the most plausible type of ownership transfer in Bulgaria, where a successful example already exists: Sofiyska Voda. Under this structure, a private company is granted permission to monitor, manage, and maintain all facilities involved in the distribution of water. It can collect fees directly from consumers over the course of its contract, which is usually around thirty years in length. The private WSSC is in charge of the modernization of facilities, infrastructure, and operations. These contracts also set water prices with a fixed variable of a set fee per month or year and a changing variable based on consumption (Hanke & Walters, "Privatizing Waterworks: Learning from the French Experience", 2011). Sofiyska Voda's management of the Sofia water distribution system shows how concessions can work to create a more efficient WSSC in Bulgaria.

Sofiyska Voda

Sofiyska Voda was established in October 2000 as the first private company operating a water utility in Bulgaria. It was awarded a twenty-five-year Concession Agreement to be the sole supplier of the Sofia municipality. Sofiyska Voda is the concessionaire of water supply and sanitation (WSS) assets, which remain state property. This condition makes the contract compliant with the Water Act because all water distribution infrastructure must remain property of the municipality or state. Shareholding capital is split between the Sofia

municipality (22.9%) and the French company Veolia (77.1%) (Sofiyska Voda, n.d). It is one of the largest utilities in the country, serving around 1.4 million people.

The contract between Sofiyska Voda and the Sofia municipality contains many important provisions that are essential for a successful concession contract. First, the Grantor (Sofia municipality) is contractually bound to provide all necessary information and data for management purposes. This eliminates information asymmetry that could lead to a failed contract. Second, the Concessionaire (Sofiyska Voda) was given permission to collect money from consumers and operate public assets, but these and new public assets constructed by the Concessionaire are all owned by the Grantor. Third, Sofiyska Voda is allowed to propose amendments to price agreements if the cost of supplying water changes, and the contract can be void if new prices are not agreed upon. Lastly, Sofiyska Voda is in violation of the contract if they do not achieve certain performance standards, such as water quality and quantity levels, or, if they do not provide an annual status report on assets (Sofia Municipality & Sofia Water AD). In sum, the municipality can be sure that the Concessionaire is performing its duties as contractually obligated.

Since its inception, Sofiyska Voda has performed significantly better than all Bulgarian public WSSCs in every major category and outperformed many public WSSCs in a survey conducted by the MRDPW. Sofiyska Voda scored 4.67/5 in “Accountability towards customers” and “Financial” while achieving a 4/5 in “Corporate Governance.” All public WSSCs scored more than a full point less in these areas. Public water suppliers received an average score of 2.88 for District operators, and 2.62 for municipal, as opposed to Sofiyska Voda’s 3.69 (MRDPW, “Strategy for Development and Management of the Water Supply and Sanitation Sector”, 2014).

[Figure 7] Sofiyska Voda Non-Revenue Water from 2005-2016

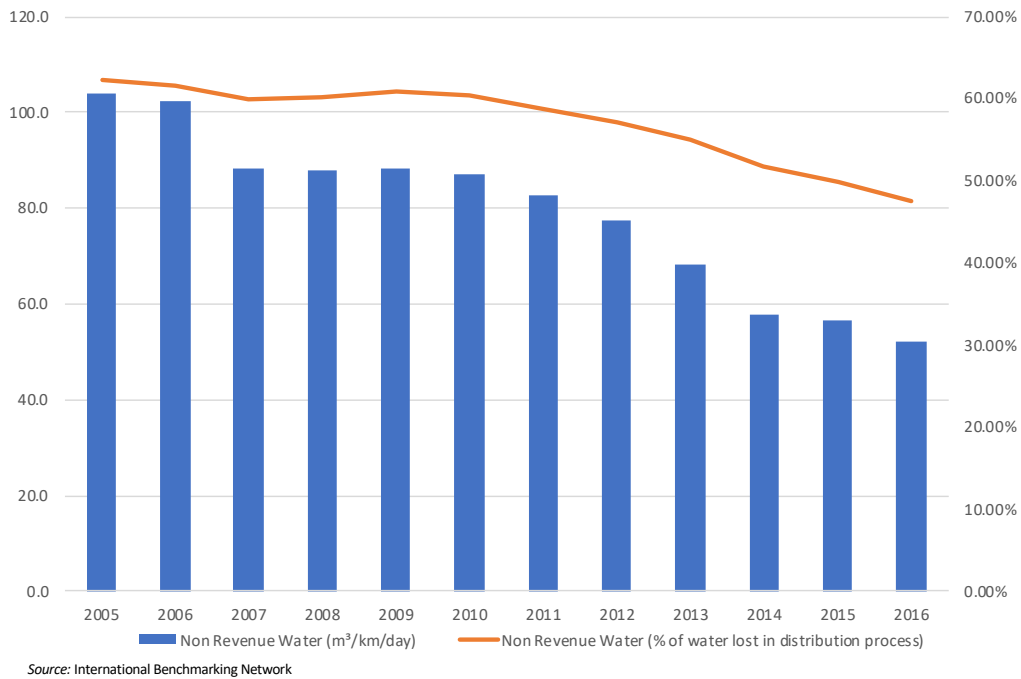


Figure 7 shows the decrease in NRW from 2005-2016 in Sofia. Privatization of the water sector has led to a substantial decrease in leakage in Bulgaria’s capital, evidenced by Sofiyska Voda decreasing its NRW by around 15% over this time period. Conversely, most public WSSCs have seen increases in NRW due to the aging infrastructure of the country. In order to reduce waste and help save money, Sofiyska Voda has invested significant funds to plug leaks and prevent excessive water waste caused by the outdated infrastructure it overtook.

Sofiyska Voda has committed more revenue to financing than any other public WSSC in Bulgaria, pledging to spend \$117.23 million from 2017-2021 on water system improvements. One project already underway involves the implementation of pressure reducing valves that has allowed the WSSC to decrease their water supply volume by 10% thus far. Phase two of the ongoing project expects to see up to a 17% decrease in volume and includes the installation of efficiency improving dynamic pressure reducing valves (Cohen, 2017). The valves will help Sofiyska Voda reduce the water supply it sends out to final consumers, conserving water. A project like this is one example of private company innovation to reduce overall costs.

Managers are incentivized to reduce costs and increase profits as raises for themselves will soon follow.

Elimination of the Agent-Principal problem in Sofia is evident in Sofiyska Voda's customer satisfaction ratings, increasing from 23% in its first year of operation to 78% by 2007. Customer satisfaction is still rising to this day, evidence of a private company valuing consumer input and attempting to provide the highest quality of service possible. Sofiyska Voda values generating a profit, so it wants to provide the highest quality water service to consumers in order to maintain its customer base.

Sofia's water distributor won the Bulgarian Water Association's award for "Best Drinking Water Treatment Plant" on October 1, 2020. The goal of the competition was to highlight the most effective technologies used in treating drinking water ("Another recognition for 'Sofia Water' from the water supply community", 2020). This award serves as yet another example of the private WSSC continuing to separate itself from its public peers.

Success stories like the concession of Sofia's water supply are not unique. Results such as this are consistent with the French experience, documented by Hanke and Walters. France first introduced privatization into the water sector in 1782 with the Perrier brothers. After this exposure, the practice took off, and today, 55% of drinking water in France is supplied by private companies (Hanke & Walters, "Privatizing Waterworks: Learning from the French Experience", 2011). Privatization in France has expanded high-quality and efficient service, making them world leaders in technological and management innovations in the water sector (Hanke, "Crisis-Ridden Water Systems Should Go Private", 1981). The popularity and success of the French concession is evident in the fact that the model has been introduced to many countries such as Italy, Brazil, Peru, and others.

Conclusion

Bulgaria is faced with a water crisis stemming from aging infrastructure. The communist leaders of the 1960's and 1970's built the current distribution system out of cheap asbestos pipes that now average almost forty years old. Today, the system is plagued by high NRW that comes as the result of pipe breakages and leaks. More than half of water distributed is lost in the system and does not make it to the final consumer. Dams are filled to less than half their maximum capacity and are breaking down with no repairs in sight.

Government corruption and underfinanced WSSCs are the main features of the struggling system. A group of elite oligarchs and party members favoring Prime Minister Borisov run the majority of the water distribution system. These individuals allow industry theft of residential water and pocket transfer payments from foreign bodies intended to be used to better the system. Many regions saw operational costs greater than their revenue generated, and the system inefficiently subsidizes these unprofitable companies. Tariffs remain at some of the lowest levels in all of Europe and contribute to the lack of money available to fund infrastructure improvements. Issues like the ones presented are common for public companies with no incentive to generate profit. Being tied to the government creates a lack of autonomy, ruining the efficiency of the sector.

Privatization of each WSSC would help make the system more efficient. The example of Sofiyska Voda in the Sofia municipality showed that the Agent-Principal problem was eliminated; customer satisfaction increased tremendously once the private industry was introduced. NRW and leaks decreased as a result of increased investment in improving water infrastructure. The municipality has seen technological innovations that are characteristic of private industry, such as pressure reducing valves that have decreased necessary water volume. Eliminating the government from the decision making process also eliminates industry theft and makes business decisions purely economic. Privatization remains the best path forward for the Bulgarian water sector as shown by Sofiyska Voda's decades long success.

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