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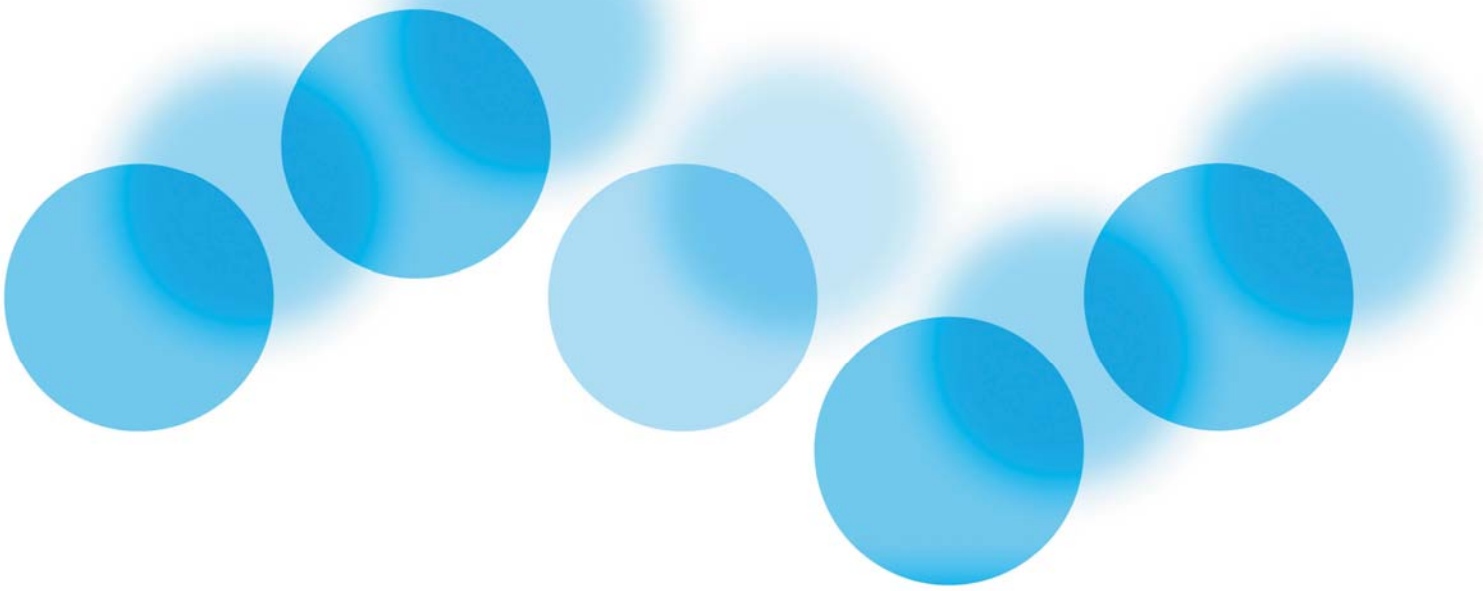
Water Tariffs and Related Management Reforms in the Pitesti, Romania Water Utility: Recent History and Future Prospects

Final Report



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AUTHORS

PREPARED BY:

MAKK; ACP

AUTHORS:

Glenn Morris[1]

András Kis

Magdalena Dumitru

www.makk.zpok.hu
glennmorris@bellsouth.net
kis.andras@makk.zpok.hu

[1] The authors are, respectively, Lead Economist and Regional Coordinating Economist of the DRP Tariffs and Charges Project and Economist with the ACP Project Implementation Unit.

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PREFACE

This report builds on the insights and recommendations developed in Phase I of the Tariffs and Charges Project (Morris and Kis, 2004). It examines in detail the recent and projected experience of S.C. Apa Canal 2000 SA, the water and sewerage company wholly owned by the City of Pitesti. S.C. Apa Canal 2000 SA, referred to here as Apa Canal Pitesti (ACP), provides water and wastewater service in and around Pitesti under a long term concession agreement with the City.

While no water system is absolutely typical, ACP faces many of the problems encountered by larger, municipal and regional water systems in the Danube region. The management and staff of ACP have been working hard to raise efficiency and to develop and implement plans to replace and upgrade crumbling facilities and improve services, including health and environmental protection services. As part of these efforts, the water system has adopted a variety of tariff and related policies to make better use of its own, limited internal resources; to increase internal resources; and to obtain assistance from local and national governments and other external sources. Thus, the ACP experience offers a window into both the possibilities for, and challenges to, providing higher levels of service, in a sustainable fashion.

This report documents the problems faced, the changes made, and the tests ahead for ACP, its owner, and its customers. To highlight and quantify this experience, we have used ASTEC, a spreadsheet model whose accounts were calibrated to the physical and financial conditions of the ACP system. This version of ASTEC was then used to explore what might have been, or what could be, through a series of hypothetical but plausible scenarios. The results of these scenarios, as well as the analyses of ACP's situation that these inquiries stimulate, are then used to show how far ACP has already come toward meeting its goals and describes the advantages and disadvantages of alternate futures.

ACKNOWLEDGEMENTS

A demonstration project such as this one depends critically on the good will, energy, and material support provided by the management and staff of the organization studied. In both demonstrations examined as part of Phase II of our study, we were extremely fortunate to have found exceptionally talented and compatible partners.

ACP, and this report, have benefited from the exceptional leadership and personal commitment of Mr. Gelu Mujea, Director General of ACP and Mr. Ion Decher, Head of the Project Implementation Unit (PIU) and Deputy General Manager. This report was also made possible by the outstanding assistance provided by numerous ACP technical and administrative staff and the staff of the Project Implementation Unit. We owe a special debt to Ms. Monica Glodeanu, Head of the Accounting Department, for her many contributions and clarifications. We wish to gratefully thank Mr. Mujea, Mr. Decher, Ms. Glodeanu, and all those members of the ACP staff involved in supporting and assisting this work over the past two years and to Dr. Krzysztof Berbeka and Mr. Spartak Keremidchiev, who reviewed a draft of this report. Any remaining errors are, of course, the responsibility of the authors.

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ABBREVIATIONS AND GLOSSARY

ACP	Formally, S.C. APA CANAL 2000 SA. The acronym stands for "Apa Canal Pitesti". It is the joint stock company owned by the City of Pitesti that runs the water system of Pitesti and surrounding communities under a concession contract with the City.
ASTEC	Account Simulation for Tariffs and Effluent Charges, a computer model implemented in Microsoft Excel.
DWTP	Drinking Water Treatment Plant. The main DWTP of Pitesti is located in the Budeasa district, upstream and on the opposite side of the Arges River from the City of Pitesti.
CFCU	Central Finance and Contracting Unit. This unit of the Ministry of Finance is the formal contracting authority for work and service contracts to rehabilitation of Pitesti's water system under ISPA measure no. 2003/RO/16/P/PE/026.
EIB	European Investment Bank
ETS	Effluent Treatment Surcharge
FM	Financing Memorandum
ISPA	Instrument for Structural Policies for Pre-Accession.
ISPA-FM	The ISPA Financing Memorandum signed by the Romanian Government and European Union for non reimbursable financial assistance granted through the ISPA for Rehabilitation of Pitesti's water and wastewater system.
MRD Fund	Maintenance, Replacement, and Development Fund. An ACP fund, supported by a fee added to water and wastewater tariffs, under terms of the ISPA-FM, earmarked for supporting maintenance, repair, and development activities
MWWU	Municipal Water and Wastewater Utility
PIU	Project Implementation Unit. The unit within ACP responsible for administering and implementing the investment program supported in part by ISPA grants and described in the FM
RON	New Romanian Lei, the currency in Romania. 10,000 old Romanian Lei (ROL) was converted into 1 RON as of July 1, 2005. In 2005, one Euro was worth 3.62 RON. Virtually all monetized data contained in this report are in RON. For those most used to working in Euro, a rough but slightly over-stated conversion to Euro can therefore be obtained by taking one third of the RON value
SU	service user
VAT	Value Added Tax
WWTP	Wastewater Treatment Plant. The main WWTP for Pitesti is on a small bluff overlooking the Arges River on the downstream side of the City

EXECUTIVE SUMMARY

THE MANAGEMENT CHALLENGE

This report examines the experience with, and potential for, introduction of tariff and related reforms in the context of the large water and wastewater system serving Pitesti, Romania. Serving a population of over 225,000, the system, S.C. APA CANAL 2000 SA, is a public enterprise owned by the City of Pitesti. It operates the water treatment plant, the water and wastewater networks, and the wastewater treatment plant under a long term concession agreement with the City. Included among the problems ACP confronted when established in 2000 were:

- High turbidity in its surface water supply;
- A decaying, oversized, and inefficient drinking water treatment plant;
- A decaying, oversized, and inefficient wastewater treatment plant;
- Weaknesses in the metering of water use and consumption;
- Rupture or collapse of older water and wastewater lines;
- Delays in obtaining approval for tariff increases to cover cost inflation in an environment with high inflation;
- Mediocre efficiency in using internal resources, especially labor; and
- Serious weaknesses in the physical and financial information systems.

These features, along with other institutional and historic conditions, often interacted to make it difficult to obtain support for tariff and other reforms that would help raise the resources necessary to address many of these problems. They also made it difficult to put reducing nutrient and toxic effluents produced by ACP high on the utility or city agenda.

PITESTI'S PROGRAM OF TARIFF AND RELATED REFORMS

Current ACP management was appointed in 2000 and has, since 2002, vigorously pursued a number of tariff and related policy changes aimed at raising service levels and improving the financial condition of the ACP. This initiative was the product of both the serious deterioration in the system physical and financial conditions and the appointment of new management at ACP. Among the reform initiatives that have been vigorously pursued are:

- Restructuring of the labour force - it is now just a little over half the size it was in 2002 and the skill set of the remaining employees is considerably higher on average;
- Investing in cost-saving technologies, especially automation technologies for treatment of water and handling of wastewater sludge; and
- Enhancing revenues by raising tariffs, improving collection of debts, and establishing an Effluent Treatment Surcharge.

ACP's biggest initiative, however, was to engage a consulting firm to help it develop an application to apply for financial assistance from the EU ISPA program. This initiative was successful and, with additional financing from EIB, ACP is now processing bids for implementing a 148 million RON (€41 million) investment and renovation program.

IMPACTS OF RECENT TARIFF AND RELATED POLICY REFORMS

We used the ASTEC computer model to examine in a quantitative way both the impact of past tariff and related policy reforms at ACP and future prospects after the ISPA-sponsored investment program. While our results are necessarily qualified by both limitations of data and necessary assumptions, the results suggest that:

- Without the revenue enhancements and costs-savings of the reform program, ACP would have been in dire financial condition by 2005. In the worst case, revenues would have covered only 40% of costs.
- Without cost-savings investments and related policy reforms, tariffs necessary to cover system costs would have increased water service expenses for typical Pitesti households from 17 to 18 percent above 2005 levels.

We conclude that, on the whole, the reforms instituted from 2002-2005 appear to have been very successful in leveraging local resources for use in replacing and up-grading the water system infrastructure.

Many of the reforms adopted by ACP were, without doubt, inspired by the opportunity to attract and keep ISPA grants. Indeed, several key reforms are spelled out in the "Financing Memorandum" (FM), ISPA Measure No: 2003 RO 16 P PE 026, executed between EU and the Government of Romania. These include a schedule of real tariff increases and the requirement that ACP establish an Effluent Treatment Surcharge for industrial customers.

FUTURE PROSPECTS

If all goes well, ACP will have upgraded and partly replaced water and wastewater treatment facilities as well as extensive improvements to its water and wastewater networks by 2012. And, with ISPA grants and European Investment Bank (EIB) loans, ACP should be in fairly good financial condition assuming that possible but not highly likely adverse outcomes related to the financial and other risks it has undertaken

While the ISPA process may legitimately take major credit for the current reform program, the conditions attached to the FM were not without their downside for reform principles and ACP customers. The FM required that ACP accept a loan from EIB. As part of that loan agreement, ACP will be carrying exchange rate risks associated with the loan. Additionally, the schedule of tariff increases required by the FM appears to be potentially excessive. For example, one of the ASTEC scenarios that we ran suggests that tariffs in 2012 may be ten to twenty percent higher than necessary to fully pay for expenditures. Our use of ASTEC to estimate future ACP conditions showed that while ACP will likely be financially sound, the tariff levels involved are high enough to raise some concern about the burdens placed on ACP customers. Some of the burden estimates we compiled are shown in Table 1. While we hasten to again note that these results are qualified by the data and methods used to calculate them, they suggest that paying for the ISPA-sponsored investment program may weigh more heavily on Pitesti customers than earlier studies have represented.

Table 1 Burden Estimates for Typical Pitesti Households

Customer Characterization	Burden Estimates for Baseline and Future Years (Percent)		
	Baseline - 2005	2009	2012
Households with Separate Residences	3.16%	4.27%	4.26%
Households in Apartment Blocks with Central Meters	4.03%	5.44%	5.44%
Households in Apartment Blocks with Apartment Meters	2.81%	3.79%	3.79%
Pensioners	4.94%	6.68%	6.67%

CONCLUSIONS AND RECOMMENDATIONS

All that ACP has accomplished encourages our contention that an integrated and well-implemented program of tariff and related policy reforms can improve local resource use and free local resources for provision of service upgrades and enhanced environmental protection. External financial assistance, however, provides vital support for such a reform program as well as essential financial assistance for upgrades in water service and wastewater treatment.

We urge ACP to continue its tariff and related reforms including:

- Initiatives to reduce operating costs;
- Efforts to identify and undertake cost-saving investments;
- Encouragement of individual apartment metering and accounts;
- Continuing review and refinement of the Effluent Treatment Surcharge and the annual storm water handling charge; and
- Development of its Management Information System to support innovative tariff design and long term planning.

At the same time, ACP faces substantial challenges as it begins construction and operation of new drinking water and wastewater treatment facilities, is pressured to "regionalize" its operations, and faces more stringent effluent monitoring and sludge disposal requirements. As ACP considers how it will address these challenges, we encourage ACP to further extend its tariff and policy reforms to include:

- More detailed examination of the structure of costs among different customers and services in order to develop tariffs that further reflect costs of service, especially for customers outside of Pitesti,
- Consideration of a fixed component of the tariff to help cover the high fixed costs of providing service and stabilize revenue streams, and
- A more active public information program to alert customers to the continuing challenges faced by ACP and the way resolution of these challenges will affect the customer's service and costs.

Furthermore, based on the Pitesti experience, as well as our other research, we recommend broader changes in the design of the investment, tariff, and institutional reform process for municipal water systems including:

- Establishment of independent data base and analytical capabilities that allow municipal water utilities to more fully evaluate investment options in advance and then during pre-feasibility and feasibility assessments.
- Support for a program of national and international cooperation among water utility managers and owners so that the experience of communities like Pitesti can be preserved and effectively transferred to those just beginning to confront the challenges posed by the introduction of major investments and tariff and related reforms.

1. BACKGROUND OF REFORMS

The Romanian central government assigned ownership and operating responsibility for many local public services to municipalities and regional governments during the 1990s. The process, called "devolution", resulted in the City of Pitesti's ownership and operation of a wide variety of municipal services, including the local water and sewage infrastructure. In 2000, the City of Pitesti reorganized these services and established S.C. APA CANAL 2000 SA (ACP), a joint stock company wholly owned by the City of Pitesti, to operate the water network on behalf of the City. The legal foundation of this arrangement is a long term concession agreement between the City and ACP.

The City continues to own the core physical infrastructure of the system: the water treatment facilities and networks. The principal elements of this system include: a main drinking water treatment plant (DWTP); a drinking water distribution network, including storage and pumping stations; a sewage collection network that in the old town section of Pitesti is combined with the storm water system; and a main wastewater treatment plant (WWTP) that includes facilities for both primary and secondary (biological) treatment of wastewater and processing sludge. The process of setting up ACP, including identifying, classifying and re-classifying ownership and valuation of assets took a great deal of time and legal action (Caian and Boer, 2003).

ACP owns certain buildings and equipment needed to operate, inspect, maintain, and repair the system infrastructure. It operates the core infrastructure under a concession contract with the City. The City oversees ACP through the ACP Board of Directors comprised of members of the Pitesti City Council. This Board appoints the Managing Board of ACP and the Managing Board in turn appoints the General Manager.

Since 2001 the General Manager of ACP has been Mr. Gelu Mujea. Mr. Mujea was trained as an engineer and was previously a manager at the nearby Dacia automotive company. He had been complaining to the City Council that water service was poor and making suggestions for improving operations and efficiency. The City Council responded by appointing Mr. Mujea to run the company and, in effect, challenging him to prove that he could do a better job. This report documents Mr. Mujea's efforts, as well as those of the ACP professional and operating staff, to respond to the challenge: to stop the system from sliding further into disrepair, to stabilize its finances, to modernize operations, and establish the foundation for better, reliable service over the long run. As discussed below, tariff and related reforms have been key supporting elements of this effort.

2. INVESTMENT AND OPERATING CHALLENGES FACING APA CANAL PITESTI

The water system provides water and sewerage service to over 225,000 citizens and thousands of commercial and industrial customers. The vast majority of its customers are residents of, or are located in, the City of Pitesti. Some residential customers and important industrial customers are located in communities or districts outside the City.

The system, however, was showing signs of both age and disrepair by 2000. These conditions, in combination with the natural challenges of operating a water system in Pitesti's physical and geographic setting, posed severe challenges to the newly formed ACP. In the following section, we describe some of the more dramatic problems that ACP faced as it undertook the operation of Pitesti's water system. In later sections we examine ACP's responses to these challenges, both those undertaken so far as well as plans for the immediate future.

2.1. Turbid Water Supply

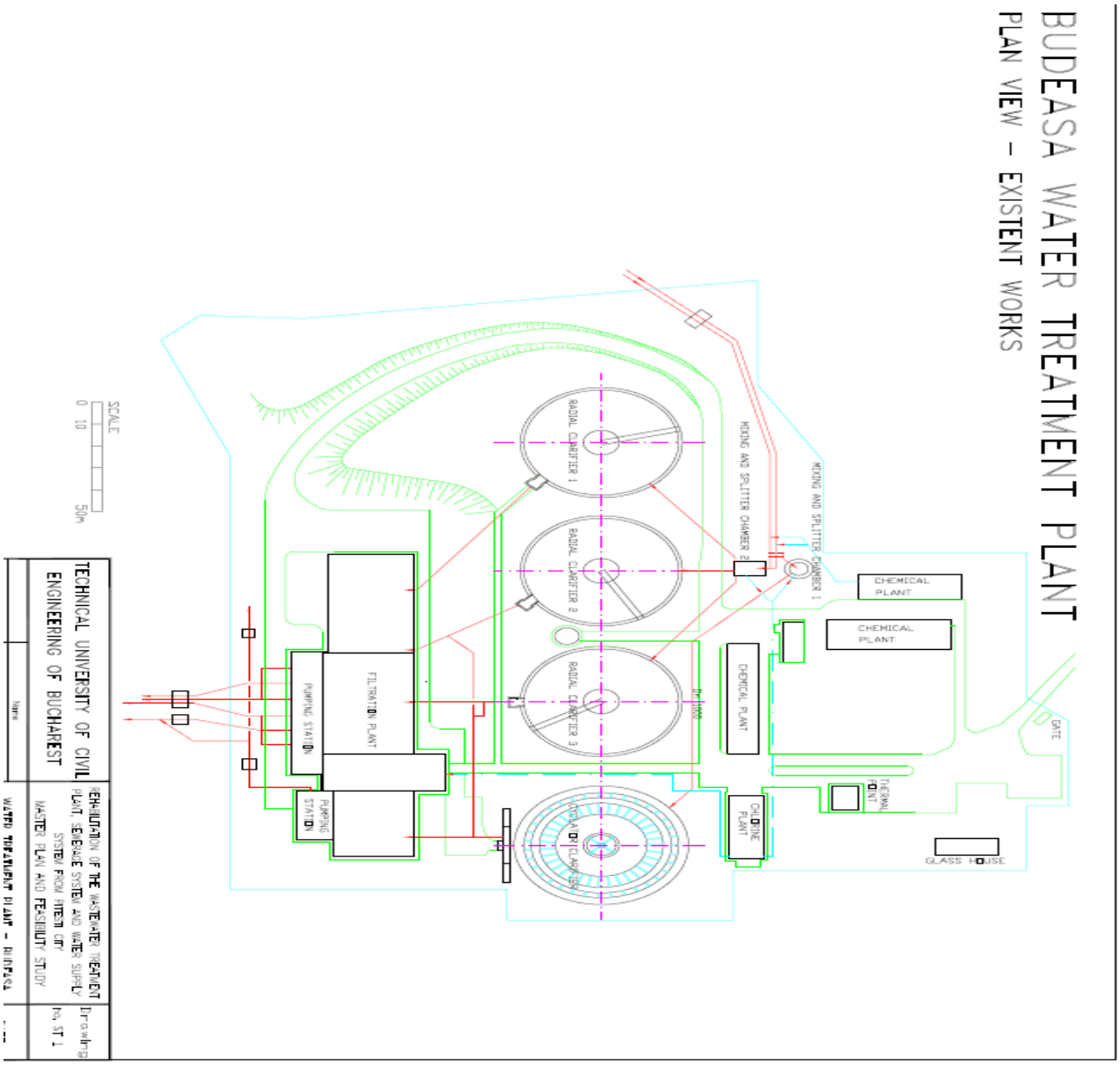
The primary water supply for Pitesti is the Arges River. This river has naturally high levels of suspended particles, so input water has high turbidity. When it rains, the turbidity of intake water can be especially high. Over the period 2001-2004 the average turbidity was 10-15 Degrees but in some periods during the summer turbidity was substantially higher. In 2005, a particularly bad year because of periodic, heavy summer rains, the turbidity of DWTP input waters greatly exceeded normal water standards for two to three days at a time (Dumitru, September, 24, 2006)).

Reducing turbidity to national norms is challenging both technically and financially. For example, in the summer of 2005 some of the water systems on the Arges River had to shut down because they could not reduce turbidity to acceptable levels and in Pitesti some 36 tons of aluminum sulfate per day had to be added to the input water on several occasions to reduce turbidity. The Pitesti water system continued to operate but the cost of chemicals for water treatment over the summer was three times higher than usual (Dumitru, September, 24, 2006).

2.2. Decaying and Inefficient Drinking Water Plant

The Budeasa Drinking Water Treatment Plant (DWTP) of the Pitesti water system includes mixing tanks, clarifiers (settling tanks), and filters (See Figure 1 below)). In the mixing tanks, aluminum sulfate (for coagulation), lime (to reduce acidity), and per-chlorination (to kill bacteria) are added to the incoming raw water. In the clarifiers the clumped particles drop to the bottom of the tank and the clearer water is sent to the gravel and sand filter tanks. The raw water is pushed through the filters and particulates are further filtered out. The raw water is dosed again with chlorine to kill bacteria and other organisms and sent to the treated water reservoir. From there it is pumped via the main water mains to the water network and distribution reservoirs.

Figure 1 Schematic Diagram of Drinking Water Treatment Plant and Network Pumps



While some of the current DWTP has been upgraded since 2000, the facility is still over-capacity, deteriorating, and equipped with some low efficiency machinery. This means that current maintenance and operating costs are very high and likely to increase even more in the future unless decisive steps are taken. These conditions impair both the reliability and the quality of the drinking water supply.

2.3. Leakage from the Water Network

The drinking water distribution network includes some very old segments and a large proportion of the drinking water produced is not "billed" to customers. In its early days, ACP was able to bill customers for only about 50% of the water it produced. This situation was the result of many factors, but the major factor was the loss of water due to leaks or breaks in the distribution system. Such leaks are expensive in at least two respects: more water must be treated for every

unit of water billed and more energy and pumping is required to keep the system properly pressurized.

A number of estimates for unbilled water quantities are around. Some of them were computed within ACP, others were estimated by external consultants. The management of ACP currently believes that around 7.5 million m3 of water was produced, but not billed in 2002, while the same figure for 2005 is estimated to be about 6.5 million m3.

The condition of the water network may also contribute to problems in drinking water quality. At the ends of the network the chlorine levels of the water is sometimes slightly below standard and this increases the risk that customers may not be protected from bacterial contamination.

Furthermore, the drinking water system is not complete. In 2002 ninety-seven percent of Pitesti residents were served by the system; the rest of the residents either used private wells or bulk water. By 2005 this ratio increased to ninety-eight percent. The extension of the network took place in areas with individual homes. Virtually all apartment buildings had already been connected to the water network even before 2002. There is pressure from prospective customers and their political representatives to extend the current system still further to all residents of Pitesti and, perhaps more significantly, to surrounding communities.

2.4. Age and Design of the Sewerage System

The sewerage system is extensive but serves fewer customers than the water system. In 2005 only about ninety-five percent of Pitesti residents had sewer service, which is still a substantial increase from the 93% figure of 2002 (Financing Memorandum, 2003), especially when one considers that this increase took place in parts of the city where there are mainly individual homes, which are not as densely populated as the areas with big apartment blocks**.** There is a strong interest on the part of the City in extending the system within Pitesti, as well as a broader interest on the part of other communities to extend the system to their residents and businesses.

Parts of the sewer network are also quite old and there is infiltration of groundwater into the system, though the amount of such infiltration is speculative. Furthermore, the wastewater sewers in the old section of the City are combined with the storm water system. The annual volume of storm water and infiltration collected by the sewer together is estimated to be between 5 and 10 million m^3 by various professionals within ACP. This figure partly depends on annual precipitation. For the purpose of our analysis a mid-range figure of 7 million m^3/year of infiltration and storm water was used for both 2002 and 2005.

Such combined systems run contrary to modern water management policy. Among other things, a combined system has more variation in water flow and water quality over time and this creates both design and operating problems which can, in their turn, produce further management and financial challenges. Finally, the combined network ends at a point that has a lower elevation than the WWTP. The final leg to this part of the wastewater network requires pumping the combined storm water and wastewater up to the elevation of the WWTP.

2.5. Aging and Oversized Wastewater Treatment Plant

The wastewater collected by Pitesti is treated at a large wastewater treatment plant. A diagram of the current WWTP is provided in Figure 2 below. Processing begins with standard primary treatment involving screening, skimming, and settling of wastewater. The settling process allows the heavier components of the effluent to settle and produces a sludge that is collected from the bottom of the primary clarifier tanks and pumped to fermentation tanks. The secondary or biological removal of organic material from the remaining effluent occurs when activated sludge is

injected into the effluent coming from primary clarification. The organisms in the activated sludge "digest" the organic material in the water, producing water and CO_2. Oxygenation of the water to sustain this process is accomplished by mechanical agitation and injecting big bubbles of air. After the work of the organisms is done, the effluent is sent to a secondary clarifier where most of the organisms settle out of the effluent and the clarified effluent is discharged into the Arges River. Some of the activated sludge is then recycled for use in the secondary treatment stage. The process currently proceeds without use of any chemical additives.

While the WWTP does treat all the sewerage system effluent, the plant itself is very expensive to operate. Its equipment is inefficient and requires large amounts of energy to operate. This problem is exacerbated by the fact that the plant was designed to handle nearly three times the effluent currently processed. The operation is controlled almost entirely by hand, making it very labor intensive. Finally, the various basins and plant plumbing are nearly forty years old and beginning to fail.

The biological treatment often increases the nutrient loading of the effluent as a result of by-product production of nitrates. This could be a serious problem in the near future as nutrient standards and removal requirements are being tightened to conform to EU directives.

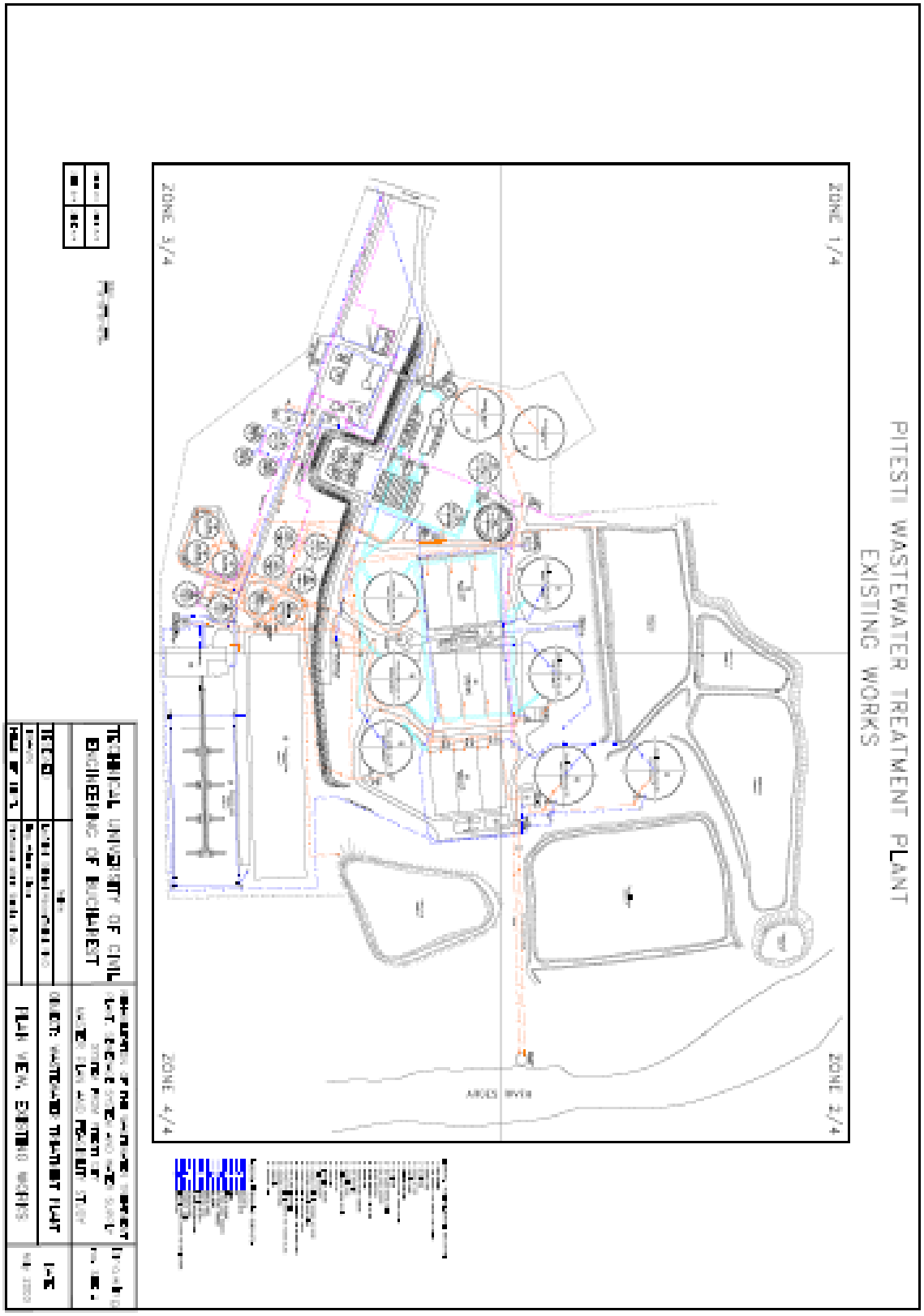
Processing and disposal of WWTP sludge is another problem likely to become more serious in the near future.[2] The current plant has a facility that dewaters the sludge produced by the fermentation tanks. This facility was modernized in 2000. Even processed, the WWTP produces roughly 1700 metric tons of sludge a year**.** This sludge is currently disposed of by applying it as a conditioner to agricultural soil. In the future the sludge will probably have to be sent to a either a landfill or an incinerator that qualifies to handle the sludge under more stringent disposal regulations.[3] In either case, this transition is expected to add substantially to the cost of disposal.

The composition of the sludge, as well as the treatment of the effluent, is affected by the quality of the wastewater. Pitesti is home to numerous petrochemical, metallurgical, and other industrial facilities whose effluent often includes unusual inorganic compounds or toxic substances. While the industrial facilities are required to install pre-treatment facilities for their wastewater, the installation and operation of these facilities often does not completely remove the problem chemicals and compounds from their wastewater stream. Today this creates a water pollution problem on the Arges downstream of Pitesti. It may also cause technical problems in a WWTP with advanced treatment.

[2] The sludge fermentation and dewatering facilities also handle sludge hauled in from septic systems around the region. One associated line of business of ACP is cleaning septic systems and processing septic sludge gathered by its employees and by other septic system cleaning contactors.

[3] ACP believes that its sludge is free of any heavy metal contamination and that disposal of this sludge as a soil conditioner would not present a health threat.

Figure 2 Pitesti Wastewater Treatment Plant: Current Works



2.6. Shortcomings in Metering and Measurement of Water Use and Wastewater Discharge

Metering of water use by customers is widespread in Pitesti. It is often the case, however, that 1) the meters at apartment blocks measure use by the whole block, not by individual apartment, 2) the meters that are installed are believed to systematically under-report usage (Mujea, October 2006), and 3) some users have tapped into the water and/or wastewater system and are not even billed, much less have their water use metered. These conditions increase system production and costs and reduce system revenues and thus reduce both the efficiency of tariffs and the resources available to ACP.

2.7. Tariffs and Related Information Systems

The process of setting water and wastewater tariffs – including design, review, and approval of tariffs – has been undergoing a variety of transitions as ownership, operation, financing and regulation of the water and wastewater systems have been changing. ACP's cost accounts and billing system, as well as the supporting physical measurement systems, were not designed to deal with the new conditions. The demands for more extensive and reliable data necessary to develop and justify new investment programs and associated tariff requests have highlighted the shortcomings of the inherited information systems.

While the information system needs to be upgraded, the transition in the legal and institutional framework for setting tariffs is not altogether coherent or smooth. Various price restrictions or permitted cost entries don't necessarily provide incentives for better management, efficient resource allocation, or economic sustainability. Of course, design of regulatory and institutional conditions so as to preserve incentives for good management and the long term benefit of customers is challenging under the best of conditions. The changing, and sometimes conflicting, regulatory and institutional environment adds additional barriers to realization of better management of ACP.

3. CURRENT TARIFF AND RELATED REFORM INITIATIVES

Prior to the founding of ACP, its predecessor organization had already begun addressing some of these issues. It had succeeded in instituting some significant automation and processing changes e.g., automation of chemical dosing in the DWTP and dewatering of sludge in the WWTP. With the creation of ACP and the appointment of a new management team in 2000, these efforts accelerated, broadened, and became more ambitious. The aims were:

- first, to reverse deterioration in the physical infrastructure and maintain current levels of service and reliability long term,
- second, to extend service to new and existing customers and,
- third, to up-grade the system to meet new national and international health and environmental standards.

The initiatives, broadly speaking, were designed to support an investment program through 1) better use of local resources through pursuit of cost-saving reorganization and investments, 2) more extensive or sustained use of local resources through revenue-enhancement, and 3) use of external grants and loans to provide immediate supplements to local resources. In all of this, tariffs and tariff-related reforms played an important role, both directly and indirectly. Like tariff reforms generally, the design and success of each reform depended on its relationship to, and interaction with, other aspects of system operations, including other policy and operating reforms.

Here we review Pitesti's recent reform program, with special emphasis on the role of tariff and tariff-related reforms that are our particular interest. In the following sections we describe some of the reform initiatives already undertaken and some of the immediate results.

3.1. Cost Reduction

One way to free resources for needed investment is to find ways to save costs. It is useful to distinguish among the variety of ways of saving costs. In one case, ACP can reduce costs by cutting current inputs of labor, energy, and materials in combination with the existing level of equipment and infrastructure investment.[4] The most effective way to do this may sometimes mean adding more of some inputs while reducing others, so long as total operating costs are reduced. We call this type of change "short run" cost savings. Alternately, one can introduce changes in equipment or infrastructure that, while costly at the outset, reduce the total costs of service provision in the longer term. Such cost savings usually take some time to introduce and the savings themselves may only show up a year or two later in the operating accounts. The lag time and the size of cost savings often depend on the nature and size of the investment. In the discussion below, we refer to "near term" cost savings when the investments involved are not massive and don't replace or alter fundamental infrastructure.

3.1.1. Short Run Cost Savings

Since 2001, ACP has substantially reduced and reconfigured the labor force. In 2001 ACP used to employ 1,046 individuals; in 2005 it employed 560**.** The type of labor employed shifted as well. In general, the work force of ACP became more skilled and had training in a wider variety of specialties such as laboratory methods, information systems, and financial administration. Scaling

[4] Of course, one can often reduce costs by reducing the level of service provided to customers e.g., allow water quality standards to slip. ACP has tried to find cost savings while maintaining or improving service levels. The reader should assume this to be the case unless we expressly discuss losses in service quality as part of this analysis.

back of the workforce was accompanied by a real increase in salaries for the remaining work force. This was necessitated by labor market conditions. Both locally and nationally, wages for technical skills like those of the workers retained or hired by ACP in the last few years have been rising rapidly. These changes meant that the total labor costs for ACP went from 6.85 million RON in 2002 to 8.79 million RON/year in 2005 (all in 2005 RON).[5]

At the DWTP three large filter beds, roughly 30% of its filter capacity and a clarifier have been sidelined. As a result of past overestimation of long term capacity requirements and the absolute declines in water demand in recent years, these filters were no longer needed. ACP saved on maintenance and operating costs by sidelining them.[6] While the filter beds and clarifier are maintained, not operating them saves on operating costs.

3.1.2. Near Term Cost Savings

ACP made a number of changes in its operations that involved purchase of equipment and changes in operations that are believed to have resulted in near term cost savings. These changes for the DWTP include:

1. Further automation of the process of adding chemicals to the mixing tanks of the DWTP. The process made dosing raw water with aluminum sulfate, lime, and chlorine both less labor and chemical intensive.
2. Automation of the process of regulating water passing through a pair of the sand treatment filters in the DWTP.
3. Automation of the process of dosing filtered water with chlorine at the DWTP.
4. Replacing the boiler used to heat water at the DWTP.

ACP also made some modifications to improve operations and reduce costs of the water distribution system and the sewerage network.

3.2. Revenue Enhancement

Some of the changes introduced or elaborated by ACP were designed to enhance the revenues collected for provision of water and wastewater services. Such enhancements generally fall into four categories 1) increase tariffs, 2) special fees 3) improved billing and collection, and 4) improved metering and measurement. While revenue enhancement policies are likely to result in increased revenues, the fact that these policies can also stimulate changes in customer behavior means that the actual results may differ from initial expectations.

3.2.1. Increased Tariffs

Since 2000, ACP and its predecessor have requested and received increases in the variable tariff on water and wastewater for Pitesti fourteen times (see Table **2**). Over the five year period, tariffs increased over 500%. Most of the increase was a response to the rapid increase in operating costs occasioned by a nationwide period of high inflation. Some of the tariff increases, however, supported new investments and operating costs needed for continued provision of existing service long term, to expand service, and to improve the quality of service e.g., reliability, drinking water quality, effluent quality, and sludge disposal.

[5] In 2005, one RON was worth €3.62. For those most used to working in Euro, a rough but slightly over-stated conversion to Euro can therefore be obtained by taking one third of the RON value.

[6] As a further consideration, these filters had a floor whose mesh size was relatively large. The water going through these filters was not cleaned as thoroughly as the water going through the other filters of the system. A costly retrofit would be required to bring them up to the standard of the other filters (Tudose , 2006.).

Table 2 Tariff History for ACP Customers in Pitesti

Date Established (day. month. year)	Water Tariff	Wastewater Tariff	Competition Council Decision Number
	Nominal RON/m^3	Nominal RON/m^3	
03.03.2000	0.1990	0.1110	No. 5536/03.03.2000
20.07.2000	0.2303	0.1283	No. 1851
20.12.2000	0.2583	0.1440	No. 3185
05.04.2001	0.2583	0.1630	No. 1172
10.08.2001	0.2966	0.1872	No. 2831
09.01.2002	0.3150	0.1988	No. 4699
13.03.2002	0.3531	0.2229	No. 877
27.06.2002	0.4840	0.3090	No. 2230
01.04.2003	0.5945	0.4720	No. 71/2003
01.07.2003	0.7020	0.5752	No. 193/2003
01.11.2003	0.7730	0.6764	No.339/2003
01.05.2004	0.8581	0.7893	No. 128/2004
01.11.2004	0.9587	0.8445	No. 151/2004
15.09.2005	1.19	1.05	No. 298/31.08.2005
22.12.2005	1.25	1.11	No. 455/21.12.2005

Note: Tariffs are for Pitesti customers only and do not include the Value Added Tax. Tariffs before 2005 were converted from Romanian Lei to RON at the rate of 1 RON = 10000 Lei.

ACP has distinct water and wastewater tariffs. ACP is unusual in that variable tariffs per m^3 for water and wastewater services are the same for industry and commercial customers as they are for households. This has been the case since at least 2000. This is fairly innovative and roughly in keeping with the principle of efficient tariff setting.[7]

Different tariffs are set for the service areas outside the City of Pitesti. The reasons for these differences derive primarily from differences in the cost to ACP of providing service to the adjacent communities. For example, some of the surrounding communities financed their own infrastructure but they don't require ACP to make royalty payments to the local government. Thus, royalty payments are not a cost of providing service to these customers and ACP does not include such costs when it computes tariffs for customers in these communities. Tariffs for ACP service areas and customers outside of Pitesti are discussed in more detail in Section 5.1.3 below.

Tariff proposals are subject to review by ACP's Managing Board, the City Council of Pitesti and, at the national level, the National Regulatory Authority**.** The tariffs proposed to the National Regulatory Council must be justified by current operating costs or investment needs. The tariffs proposals are, therefore, sub-divided into tariff components based on cost or investment categories established by ACP with guidance from the National Regulatory Authority. All these components are presented as "cost shares" of the tariff i.e., denominated as RON per unit of water billed. All these tariff cost or investment components are listed in Sections 1 and 2, along with a discussion of the purpose and economic foundation of several of the entries.

In discussing revenue enhancement through tariffs, we focus on the following selected component entries of Pitesti's tariff accounts. These entries are, in principle, related to 1) replacement of

[7] Tariffs have a variety of purposes that are not always compatible. Principal among the purposes are to cover the cost of providing services, and to efficiently allocate resources, including water resources. The efficiency principle can be summarized as requiring that each customer pays a tariff that is commensurate with the marginal cost of providing that customer with service. In many cases the costs of service are roughly the same among many groups of households and commercial customers and efficient resource allocation directs that their tariffs should be the same. Of course, if the costs of serving customers differs, efficiency requires that the tariffs should differ among these groups of customers so long as transactions costs – the cost of implementing such distinctions – are less than the differences in the cost of service across the customer groups.

existing equipment and infrastructure or 2) support of new investment.[8] The relevant entries are shown in Table 3. What they have in common is the fact that their principal function is to support the replacement and development of the physical infrastructure used to provide water and wastewater service.

Table 3 Investment-Related Tariff Components As a Portion of the Combined Water and Wastewater Tariff in Pitesti, 2004-2005*

Fees	Amount (RON/m^3)	Percentage of Tariff
Depreciation	0.054	2.99%
Royalties paid to the City of Pitesti	0.0131	0.73%
Profit	0.0738	4.09%
Development Quota	0.191	10.59%
Maintenance, Repair, and Development Fund	0.02	1.11%
Total Fees	0.3519	19.52%

* For much of 2005 the water tariff was 0.9587 RON/m^3 and the wastewater tariff was 0.8445 RON/m^3; the composite tariff was the sum or 1.8032 RON/m^3. The water and wastewater tariffs were raised twice later in 2005 (see Table **2**). The investment components also changed at the end of 2005.

The entries related to depreciation – the implicit cost of using existing equipment and infrastructure – are:

- Depreciation – covering the allowable depreciation of buildings and equipment *owned by ACP* and used to support provision of water and wastewater services.
- Royalty Fee – covering a payment to the City of Pitesti and justified as covering depreciation of basic network and facilities infrastructure owned by the City.

The entries related to net revenues – entries in excess of current implicit and explicit costs – are:

- Profit – calculated as a percentage of operating and other base costs.
- Development Quota – calculated as a percentage of operating and other base costs.
- Maintenance, Replacement, and Development (MRD) Fee – an amount in RON/m3 of water and wastewater service billed.

As shown in Table 3, the 2005 tariff plan made allowances to use nearly twenty percent of the tariff revenue for investment in system infrastructure. A small portion, roughly 3.7 percent of the tariff, was designated for replacement of existing infrastructure. Nearly 15.8 percent of the tariff was either designated to support investment programs or available for such designation. In principle, these investment-related components set tariff levels over direct operating costs and could be used by ACP to a) replace depreciating infrastructure and b) make new investments that improve or extend service or reduce direct operating costs of current service levels.

In September, 2005 the tariffs were revised again. The MRD fee was raised to 0.02 RON/m^3 for both water and wastewater. The Development quotas for both water and wastewater were cut from roughly 12% to 9% of other costs. Profit continued to be included in tariffs at five percent of other costs.

There is no provision of automatic escalation of tariffs due to price inflation. In the early years of ACP, the revenues generated by these investment-related tariff components were often swamped

[8] There are several other entries that may also be related to system investment. One is a component entry entitled "financial expenditures". It includes some fees and interest related to short term debt. To the extent that this debt also finances certain investments, rather that covering simply buffering payment of operating and management expenses, then this item may include the cost of some investment. Similarly, the "repair and maintenance" entries may include some small scale replacement of infrastructure.

by inflation-related increases in operating costs. Revenues that, under the tariff calculations offered by ACP, were originally designated to be used for replacement or new investments in the system were sometimes used to pay operating costs. As a result, in the early part of the decade ACP regularly fell behind its investment aspirations. The investment program was therefore limited to the cost-saving, network expansion, and external support initiatives described elsewhere. In fact, some of the repair and maintenance of the system had to be funded by the City of Pitesti out of royalty remittances. Sections 1 and 2 further discuss the link between fixed and variable costs and the cost components of tariffs.

3.2.2. Special Fees

ACP has a number of activities that generate income through special fees. Several of these were established before the creation of ACP but have been adjusted by ACP and now provide additional income. Other fees were initiated by ACP to recover some specific costs of service.

3.2.2.1. Storm Water Fee

ACP is responsible for storm water collected from the old, central part of the city in its sewerage system. ACP sets an annual fee for this service based on an estimate of the amount of storm water that originates with a particular property and then bills the property owner. The estimate of storm water runoff is based on the area of that parcel covered with either structures or pavement.

ACP billed property owners for a total 1.7 million m^3 of storm water collection and disposal service in 2005 with a tariff rate of 0.05 RON per m^3. The storm water fee is added to each customer's bill once a year. The total revenue from storm water fees collected in 2005 was 85,100 RON. The storm water fee has not changed for many years and is only a small fraction of the 1.06 RON/m^3 currently billed for wastewater service in the City.

3.2.2.2. Effluent Treatment Surcharge

An "effluent treatment surcharge" (ETS) was added to the usual wastewater tariff for large commercial and industrial customers beginning in August, 2004 (Apa Canal 2000 Pitesti. 2004). The Monitoring Department of ACP takes samples of the wastewater of monitored industries. When the samples exceed the specified effluent standards, a surcharge is added to the usual wastewater tariff of 1.1 RON/m^3. The amount of the surcharge is determined by a multiplier that increases with an index that varies directly with the amount by which the effluent standards are exceeded. Part of the ETS regulation includes opportunities to negotiate a compliance program. In 2005, the ETS yielded an amount equal to 4.45 percent of the amount of the wastewater bill for industrial customers as a whole.

ACP considers the ETS to be an application of the "polluter pays principle". A surcharge of this type was also a condition in the ISPA Financing Memorandum (2003) that had to be met before further grants beyond the initial commitment could be made (see Section 3.3.1 below). In practice the ETS only applies to large wastewater sources.

The terms of the ISPA-FM also require that ACP assure that industrial and commercial customers meet EU pretreatment requirements. There is an action plan for assuring this but it had not yet been approved as of 2006.

3.2.3. Extension of Service

Like many reforms, the effort to enhance revenues by extending service to new customers is offset in the short run by the increased costs of providing the service. If ACP is to help meet the service goals established by the EU Water and Wastewater Directive and Romanian national policy,

however, then extension of water and wastewater service to more customers throughout ACP's service area will continue to be an objective.[9]

3.2.3.1. Extension of Water Service

In the period 2001-2005, ACP extended water service to new water customers who previously had no central water service. Most were household accounts. To do this, the water system built new water mains and secondary networks. The cost of this construction was RON 400,000. These extensions were financed internally. The cost of connecting the customer to the network – of installing pipes and a meter on the customer's property and connecting and testing the installation – was born by the customer. If ACP provided these services, it billed the customer. The estimated number of households and accounts receiving water service in 2002 and 2005 are described in Table 4 below.

Table 4 Estimated Number of Apartments Receiving Water Service, 2002 and 2005

Household Category	Total Number of Apartments[10]	Apartments Connected to the Water Network		Connection Rate to the Water Network		Number of Accounts with Water Service	
		2002	2005	2002	2005	2002	2005
Household A*	6 951	5 104	5 724	73.4%	82.4%	5 104	5 724
Household B*	52 378	52 378	52 378	100.0%	100.0%	1 063	1 063
Household C*	2 207	2 207	2 207	100.0%	100.0%	2 207	2 207
Total	61 536	59 690	60 309	97.0%	98.0%	8 374	8 994

* Household A: Individual houses with independent metering. Household B: Block of apartments. ACP is in contract with the block, and not with the individual apartments. Consumption is metered centrally for all apartments together. Household C: Apartments in blocks, but ACP is in direct contract with the apartments and water consumption is metered individually for each apartment.

3.2.3.2. Extension of Wastewater Service

In the period 2001-2005, ACP extended wastewater service to new wastewater customers who previously had no central sewerage service. Most were household accounts. To do this, the water system built new sewer connectors. The cost of this construction was RON 363,000. This was financed internally by ACP. As in the case of water service, the cost of work and materials performed on the customers private property was paid for by the customer.

[9] One consideration that perhaps helps drive this policy is the prospect for economies of scale that commonly result from larger capacity treatment facilities and more efficient central administration. Larger capacity facilities and full utilization of existing capacity will, up to a point, often mean lower average costs of service and, from there, lower tariffs. Another consideration, however, is the cost – both initial and operating cost - of extending service. If the prospective customers are thinly spread and/or live on higher, hilly terrain, these costs may swamp any economies of scale.

[10] Lacking actual data, it was assumed that the number of apartments is constant over this period. These data are of interest because they show the relationship between apartments (which are, roughly speaking, household units, and ACP household accounts, which in many instances are based on a single, central meter). As the city spreads, as the economy develops, and as the number of individually metered apartments increases, the number and classification of accounts will change e.g., more household accounts will be in individually metered apartments, and, the relationship between the number of accounts and apartments per account for centrally metered apartment blocks may also change, probably very gradually change, year by year.

Table 5 Estimated Number of Apartments Receiving Wastewater Service, 2002 and 2005

Household Category	Total Number of Apartments[11]	Apartments Connected to the Wastewater Network		Connection Rate to the Wastewater Network		Number of Accounts with Wastewater service	
		2002	2005	2002	2005	2002	2005
Household A*	6 951	2 643	3 874	38.0%	55.7%	2 643	3 874
Household B*	52 378	52 378	52 378	100.0%	100.0%	1 063	1 063
Household C*	2 207	2 207	2 207	100.0%	100.0%	2 207	2 207
Total	61 536	57 228	58 459	93.0%	95.0%	5 913	7 144

* Household A: Individual houses with independent metering. Household B: Block of apartments. ACP is in contract with the block, and not with the individual apartments. Consumption is metered centrally for all apartments together. Household C: Apartments in blocks, but ACP is in direct contract with the apartments and water consumption is metered individually for each apartment.

3.2.3.3. Improved Billing and Collection

ACP introduced some new, more aggressive policies for collecting overdue bills from customers. If payment is not made within 30 days then there is an interest penalty. After another 30 days ACP can legally disconnect the service. Based on conversations with ACP Commercial Department, we estimate that uncollected bills for water service decreased from 4.9% to 2% from 2001 to 2005. Wastewater Service uncollected bills decreased from 5.3% to 2.2%. Improved economic conditions in Pitesti and surrounding communities, as well as the new overdue bill recovery policies, were responsible for the improved collection rates.

3.2.4. Improved Metering

3.2.4.1. Metering Individual Household Apartments

A major problem for many lower and middle Danube countries has been centrally metered apartment blocks. These apartment blocks provide service to many separate households that make water consumptions decisions. Until each apartment is metered, however, the bill for this use is based on the central meter and divided among households on some basis that may not very well reflect the water use of that particular household. Such "joint" metering usually reduces the incentive for any individual household to conserve water and results in both large amounts of water consumption per capita and higher water bills.[12]

Recently, new apartment buildings and major apartment renovations have included technical changes that allow metering the water service of each individual apartment. These changes have been adopted voluntarily by real estate developers and individual renovators because occupants believe they will save money since they will not have to pay for the water used by high water-use, centrally metered users.

[11] Lacking actual data, it was assumed that the number of apartments is constant. Nevertheless, as the city spreads and as the economy develops, the number of apartments is likely to increase to some extent year after year.

[12] This practice can make differentiation between accounts, water users and, meters a little more difficult. In some instances the committee that runs the apartment block has the account with the water system. In other cases, the water system may have an account with each apartment even though the apartment block is served by only one meter. Then there are hybrid situations: some apartments have individual meters and accounts and the balance of the apartments have an account covered by a single meter.

In addition, ACP began a program that encouraged households in Pitesti to install the meters in existing individual apartments by financing fifty percent of the cost of meters, installation, and, in some instances, telecommunication of water use information.[13] The rest of financing came from households by way of purchasing parts, renovating affected parts of the apartments etc. Households that participate in this program can realize lower water bills if they restrain water use and achieve below-average consumption. They can thereby reduce both their water and wastewater bill. Approximately 800 apartment owners have chosen to participate in this program as of 2004-5. It has cost ACP 0.233 million RON to finance and operate the program.

In 2001, less than 2,000 of the approximately 55,000 households living in apartment blocks in Pitesti were individually metered. By 2005, close to 3,000 of them were being metered individually, some of them due to the apartment metering program described above, while others were newly built or renovated apartments which had individual meters installed from the outset or as part of renovation. The average water use per household at centrally metered apartment buildings is around 130 m^3/year. Average water use drops below 100 m^3/year for individually metered apartments.

3.3. External Assistance

One of the initial objectives of ACP was to apply for grants or loans to help finance the longer term investment needed to both maintain current service levels and expand and improve service in the future to meet more stringent service area coverage, water quality, and effluent quality requirements. Predecessor operators of the Pitesti water system had a variety of external support initiatives in the past, but ACP was interested in obtaining the resources to make really major investments in the system.[14] Such initiative had some prospect of success because the EU had established the ISPA grant program for prospective EU member states and international financial institutions had a strong interest in lending to developing countries where the prospects for political stability and economic growth were good.

ACP began this process by commissioning a team of consultants to execute a set of studies that examined water system conditions in the early years of ACP (Sandu**,** Marin et. al., 2003; Caian, Sorin and Augustin Boer, 2003). These studies were internally financed by ACP and gathered data and examined physical, technical, financial, and legal conditions of the water system. These studies formed the foundation upon which ACP built when it applied for ISPA grants and loans to cover costs of proposed rehabilitation and up-grade of the DWTP, the water network, the sewer network, and the WWTP.

3.3.1. ISPA Grant

Beginning in 2002 the City of Pitesti and ACP, with the support of the government of Romania, applied for and then negotiated with the EU ISPA program for a grant to finance major rehabilitation of the system infrastructure (Apa Canal 2000 Pitesti, undated**)**. An agreement, in the form of the ISPA Financing Memorandum was reached in 2003. The ISPA-FM offered to grant up to €31.3125 million (113.4 million RON): seventy five percent of the estimated cost of €41.75 million (151.1 million RON) for rehabilitation and upgrade investment deemed "eligible" for assistance by

[13] ACP has experimented with collection of water use data from apartments and other customers by use of a radio-telephone system beginning in 2005. The initial experience with this system was that it was not very reliable or accurate. ACP, however, contends that some technical modifications and experience using the system since then have greatly improved it**.** For the time being, it must be considered an experimental system.

[14] For example, ACP received an in-kind grant of trucks from US AID. These trucks were mothballed after a few years due to the high cost of purchasing replacement parts.

ISPA.. The Financing Memorandum calls for an extensive program of support and investment as itemized in Table 6.

Table 6 Investment Program for Water and Wastewater System Rehabilitation by Contract and Technical Support

Contracts	Total value of the contract (€)	Total value of the contract (RON)	ISPA grant (RON)	EIB loan (RON)	Percent of total of EIB loan supporting each contract
Technical assistance and supervision (contract D)	3,431,352	12,352,867	12,352,867	0	
Rehabilitation of DWTP (contract A)	7,187,930	25,876,548	19,148,646	6,727,902	18%
Rehabilitation and extension of water and wastewater networks (contract B)	14,910,770	53,678,772	38,756,073	14,922,699	40%
Rehabilitation of WWTP (contract C)	15,901,300	57,244,680	41,330,659	15,914,021	42%
Total[15]	41,750,000	150,300,000	112,735,378	37,564,622	

Of these four contracts, only the Technical Assistance Contract had been signed as of Summer, 2005. This contract is with a consortium of European and Romanian consulting firms and is funded entirely by the ISPA grant. The Technical Assistance contract assists ACP in the development, tendering, contractor selection, and monitoring of the other three infrastructure rehabilitation contracts.

There are many stipulations in the ISPA-FM and its Annexes, including the following items that relate directly to tariff and related reforms. Under the ISPA-FM, ACP must:

- In cooperation with the Government of Romania, negotiate a loan with the European Investment Bank (EIB) to finance the balance of the investment program (see 3.3.2),
- Establishment of a Project Implementation Unit (PIU) to support and oversee the contracts,
- Set up a Maintenance, Replacement, and Development (MRD) Fund acceptable to the EC and EIB (see Section 3.2.1). The revenues accruing to this fund were to be used exclusively to support MRD activities.
- Increase tariffs in real terms in three phases:
  - by 20% for water and by 25 % for wastewater in real terms relative the tariff at July 1, 2003;
  - for both water and wastewater by 15% in 2005 relative to the tariff on January 1, 2005;
  - and for both water and wastewater by 10% in 2006 relative to the tariff on January, 1 2006.[16]

[15] The parts do not add to the total because the Technical Assistance Contract was awarded for €3,431,352, roughly ten percent less than the original cost estimate upon which the total is based.

[16] This last item, which became effective on January 1, 2007, involved much larger increases than the prescribed 10%. Water tariffs increased 28.8%, while wastewater tariffs went up 19.8%.

> Introduce appropriate wastewater charges for industries, based on the quantity and quality of effluent produced and on the cost of treatment.

The other stipulations of the Financial Memorandum include technical conditions related to the successful completion of the reconstruction and rehabilitation projects, performance of the system after the completion of projects, and special provisions in keeping with the intention of the grant e.g., no near term privatization of assets that have been rehabilitated and upgraded.

An Implementing Agreement was signed in 2005. The Implementing Agreement and contains the rights and obligations of the beneficiaries of the grant: ACP (the Final Beneficiary), the Pitesti City Council (the Local Beneficiary) and the Central Finance and Contracting Unit (CFCU) or Contracting Authority of the Government of Romania. Also signed after the Financing Memorandum was a "Framework Agreement" with instructions on procedures for ACP and the Local Council.

3.3.2. European Investment Bank Loan

As just noted, continued ISPA grants are conditioned on successful completion of negotiations between EIB and the CFCU branch of the Romanian Ministry of Public Finance. The plan is for EIB to make a sovereign loan through the CFCU to ACP and five other localities. All these localities are also using ISPA grants to upgrade water and transportation infrastructure and to supplement the grants with EIB financing that will be repaid using local resources.

Completion of the loan agreement had were delayed by the difficulty the Ministry had completing the subsidiary contracts with several of the localities (not Pitesti). The Romanian Competition Council must approve these contracts and this body has some concerns that required some special clarification or modification in the local contracts. As a result, the entire EIB loan has been delayed until early 2007. Thus, while the EIB loan is a condition of the ISPA-FM, the loan itself is discussed below as part of future external assistance to support investments.

4. NEW OR FUTURE REFORMS

4.1. External Assistance

4.1.1. ISPA Contribution to ACP Investment Program

The construction portion of the ISPA-supported investment program described in Table 6 has yet to begin. Also as noted in Table 6, a substantial portion of the investment cost of these future projects will be covered by ISPA grants. ISPA grants will provide the bulk of the financing of:

- Reconstruction and refurbishment of the DWTP,
- Extension and Replacement of Water and Sewerage system, and
- Reconstruction and refurbishment of the WWTP.

More detail on the work to be performed under each of these projects is contained in Annex I of the ISPA Financing Memorandum (2003). These projects are expected to bring ACP into compliance with the various EU Directives that cover operation of municipal water systems and drinking water and effluent discharge standards.

The grants, totaling an estimated 110 million RON, will be made after the tenders for these three projects have been issued, bids reviewed, and contracts awarded. Grant assets will not be added to the investment basis for purpose of computing depreciation for purpose of tariff setting. This is important because it says, in effect, that current beneficiaries need make no provision for replacement in the future – that's up to future customers. Even so, the Accounting Department of ACP will still keep track of these investments and depreciate them when calculating the net worth of the infrastructure.

4.1.2. European Investment Bank Loan to Support ACP Investment Program

The ISPA construction grants are, as noted above, conditioned on Pitesti's receipt of a loan from the EIB to cover the remaining cost of the three projects. This assistance is "external" in the sense that it allows ACP to move these investments up in time. Ultimately, this is all financed internally, since the loan is secured by the assets of ACP and repaid, principal and interest, from the revenues of customers.

The 37.5 million RON loan is still being negotiated and ACP is committed to taking the loan and its obligations as soon as possible. While the final terms are not known precisely, they are know well enough to make educated guess for purposes of scenario specification (see Section 5.3).

4.2. Cost Reductions

Many of the investments envisioned for the ACP's investment program are expected to yield reductions in operating costs due, especially, to energy savings and better matching of capacity to existing and projected demand. At the same time, the investments are also expected to increase the customer base for water and wastewater services and add new, extended, and costly treatment activities at the water and wastewater plants. Assessing the ultimate impact of these contrary and interconnecting influences on future ACP costs and, ultimately, service and tariffs is one of the purposes of this study.

4.2.1. Cost Reductions Due to Streamlined Operations

ACP continues to expect that it can reduce costs by improving the efficiency through re-organization of its use of staff and other existing resources. Of course, it is very difficult to untangle such cost savings from those due to various aspects of the investment program per se or due to the interactions between the two types of cost reducing changes occurring simultaneously.

As part of the Technical Assistance Program, a consultant recently completed a tariff study. This study noted a weakness in ACP's incentive to reduce costs: the "profit" allowance is fixed as a proportion of costs. This possibly discourages aggressive cost saving improvements in operations. In this spirit, the consultant suggested consideration of a new contract between Pitesti and ACP that is structured to support a performance-based incentive system. In such a system, genuine cost savings are retained by the Company in the short run but then lower reference costs based on these savings are used in computing future tariffs and setting the benchmark for any future retention of savings by ACP. At present, however, such a change in the contractual relationship between Pitesti and ACP is not under active consideration.

4.2.2. Cost Changes for Water Plant Investment Activities

4.2.2.1. Capacity Optimization for the Drinking Water Plant

The capacity of the drinking water plant will be further reduced from roughly 78,000 m^3 per day (29 million m^3/year) to 65,000 m^3 per day (23 million m^3/year). This optimization potentially saves on investment costs AND operating costs since the plant design more optimally matches lower water use projections. These lower water use projections are the result of assuming continued economic restructuring of the economy, lower demand for water resulting from recent and projected future increases in tariff levels, and more individualized metering, and improvements in the integrity of the distribution system.

4.2.2.2. Reductions in Energy Costs

We expect that the renovated DWTP will yield substantial reductions in electricity consumption relative to the present plant. At current prices, ACP expects to reduce operating costs for electricity by 180,000 RON/year.

4.2.2.3. Upgrades in Treatment

A main objective of the ISPA measure is to provide for the rehabilitation and construction of infrastructure related with drinking water treatment. This will enable compliance with provisions of the Drinking Water Directive 98/83/EC.

4.2.3. Cost Changes for Water Network Investments

The water network goes under partial rehabilitation and it will also be extended. Rehabilitation of network parts will reduce leakage from the networks, with an estimated reduction of about 1 million m^3/year. This in turn, will drive some of the operating costs of ACP lower, since less water will need to be treated and pumped. The maintenance costs associated with the replaced network sections should also be lower.

Network extension will result in household connection rates of 99%, as opposed to 98% in 2005. As a result, ACP will face higher operating costs, since more water will need to be treated and pumped, and the new network sections will also have to be maintained. Moreover, according to experience at other water systems, the lower the number of connections per km of network, the

higher the unit cost of serving those connections will be, and the new water network sections will reach areas which are less densely populated than the central parts of Pitesti. On the other hand, extension of the network will also generate revenues, which will partly or fully compensate ACP for the increased costs.

4.2.4. Cost Changes for Wastewater Networks

About 35 km of new sewer will be built, while 5 km is planned to be rehabilitated as part of the ISPA funded program of investments. Moreover, some of the storm water collected in the old part of the city will be separately collected in a gravitational network and then pumped into the river. As a result less wastewater will get treated, thereby some chemicals and electricity can be saved – at least when compared to a situation with higher treatment volumes. Network repair and maintenance costs will be lower on the rehabilitated sections, but overall maintenance costs will still increase due to the increased length of network.

4.2.5. Cost Changes for Wastewater Treatment Plant Investment

The reconstruction of the WWTP will allow compliance with the treatment standards of the Urban Wastewater Treatment Directive 91/271/EEC as implemented in Romania. This investment will also result in a variety of changes in the cost, as well as the effectiveness, of wastewater treatment.

4.2.5.1. Capacity Optimization

The WWTP has been operating with an average flow of 42,000 m^3 per day (15.2 million m^3 per year). This is substantially in excess of current WWTP capacity. The ISPA-FM suggests a design for the reconstructed WWTP of dry weather flow of 56 160 m^3/day (20.5 million m^3 annual flow). This optimization potentially saves on investment costs and operating costs since the plant design more optimally matches lower WWTP inflows.

The lower wastewater inflow projections are in large measure the result of lower estimates of water use. They are also the result of the investment affecting the handling of storm water. Partially offsetting increases are due to the extension of the wastewater collection network.

4.2.5.2. Energy Savings

As a result of technological changes at the WWTP (some parts taken off-line and improvements in sludge dewatering) the unit electricity cost decreased by about 0.13 RON/m^3 to 0.11 RON/m^3. Part of this saving may be attributable to a change in the extent of treatment, about which we have no information.

4.3. Revenue Enhancements

Revenue enhancement is also an important part of ACP's future program. Local resources will be needed to cover 1) the "non-eligible" costs of the investment program, 2) the repayment of the principle and interest on the EIB loan, and 3) any new operating costs these investments require. These local resources will be gathered almost exclusively from customer tariffs and fees.

4.3.1. Future Tariff Increases

The sharp increases in real tariff levels identified by the ISPA-FM and designed to meet these three new categories of expenses connected with ACP's investment program have already been

introduced by ACP. As a result, the real, compound effect of tariff increases from 2004-2006 was a roughly eighty-two percent increase in water tariffs and a roughly seventy-two percent increase in wastewater tariffs. Further tariff increases in the future depend on the actual operating costs associated with the new investments and the realization of variable components of the loan agreement.

4.3.2. Improved Water Meter Technology

ACP has been using meters with a technology that are suspected of systematically underestimating water use by some customers by about fifteen percent on average (Mujea, personal communication). In 2006 ACP began a program of replacing them with more expensive but more technically advanced and accurate meters.

Rough calculations show that it makes sense for ACP to replace large water meters and medium size meters, as the cost of replacement would be more than compensated for by additional revenues. Small meters, however, are not worth replacing before the end of their economic life, as the revenue shortfall from systematic under metering does not reach the cost of replacing the old style meters. Had ACP decided to replace medium and large diameter meters, it would be able to generate over 2.5 million RON of net revenues annually. Details of the calculations are in Table 7 below. If we assume that water and wastewater tariffs increase beyond the price change of water meters, the program will become even more attractive.

Table 7 Impacts of a Hypothetical Water Meter Replacement Program

	Medium size meters	Large consumption meters	Low consumption meters
Total cost, EUR	1 000 000	222 222	592 593
Total cost, RON	3 500 000	777 778	2 074 074
Assumed lifetime of meters (years)	5	5	5
Cost of capital (%)	5,00%	5,00%	5,00%
Annual cost	769 916	171 092	456 247
Meters replaced	13 500	1 000	8 000
Average metered consumption per meter per year	894	6600	90
Increased in metered amounts (without any incentive effect)	10%	10%	10%
Additional water consumption captured per water meter (m^3/year)	89	660	9
Additional wastewater discharge captured per water meter (m^3/year)	85	627	8.5
Tariff of water (RON/m^3)	1.03	1.03	1.03
Tariff of wastewater (RON/m^3)	0.90	0.90	0.90
Additional revenue per year (RON/m^3)	2 276 856	1 244 351	135 747
Net revenue per year (RON/m^3)	1 506 940	1 073 258	-320 499

4.3.3. Billing System

As part of a new Financial Information Technology system, a new billing program that controls the issue water and wastewater service invoices, keeps track payments, computed penalties, and generally automates and improves the billing system of ACP is being purchased and implemented. We don't have any information, at this point, on how much the system cost to purchase, how much it will cost to operate, or how much it will save due to automation. Similarly, we don't know how much it will improve bill collection.

4.3.4. Changes in Customer Base

ACP plans to add customers and expand services as its networks are modified and expanded under the proposed ISPA investment program. The water service connection rate of citizens in Pitesti is forecast to be 99% in 2012 as opposed to 98% in 2005. Most of the new connections will be to individual households. The connection rate for wastewater service will grow at higher rate to 97% in 2012, from an estimated rate of 95% in 2005.

Table 8 Estimated Number of Apartments Receiving Water Service, 2005 and 2012

Household Category	Total Number of Apartments[17]	Apartments Connected to the Water Network		Connection Rate to the Water Network		Number of Accounts with Water Service	
		2005	2012	2005	2012	2005	2012
Household A*	6 951	5 724	6 335	82.4%	91.1%	5 724	6 335
Household B*	52 378	52 378	52 378	100.0%	100.0%	1 063	1 063
Household C*	2 207	2 207	2 207	100.0%	100.0%	2 207	2 207
Total	61 536	60 309	60 920	98.0%	99.0%	8 994	9 605

* Household A: Individual houses with independent metering. Household B: Block of apartments. ACP is in contract with the block, and not with the individual apartments. Consumption is metered centrally for all apartments together. Household C: Apartments in blocks, but ACP is in direct contract with the apartments and water consumption is metered individually for each apartment.

Table 9 Estimated Number of Apartments Receiving Wastewater Service, 2005 and 2012

Household Category	Total Number of Apartments[18]	Apartments Connected to the Wastewater Network		Connection Rate to the Wastewater Network		Number of Accounts with Wastewater Service	
		2005	2012	2005	2012	2005	2012
Household A*	6 951	3 874	5 104	38.0%	55.7%	3 874	5 104
Household B*	52 378	52 378	52 378	100.0%	100.0%	1 063	1 063
Household C*	2 207	2 207	2 207	100.0%	100.0%	2 207	2 207
Total	61 536	58 459	59 690	95.0%	97.0%	7 144	8 374

***** Household A: Individual houses with independent metering. Household B: Block of apartments. ACP is in contract with the block, and not with the individual apartments. Consumption is metered centrally for all apartments together. Household C: Apartments in blocks, but ACP is in direct contract with the apartments and water consumption is metered individually for each apartment.

[17] Lacking actual data, it was assumed that the number of apartments is constant. Nevertheless, as the city spreads and as the economy develops, the number of apartments is likely to increase to some extent year after year.

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5. ASTEC ANALYSES OF RECENT AND FUTURE REFORMS

The Accounts Simulation for Tariffs and Effluent Charges (ASTEC) spreadsheet model was designed to examine the interaction of a MWWU's service prices with investment strategies, cost structures, customer behavior and physical conditions. It does this by developing a baseline set of accounts – physical accounts of water system flows, cost and revenue accounts for the water system and its services, and expenditure accounts for customer groups – and then applying scenarios to the baseline that vary investments, tariffs, collection programs, and representations of a wide variety of other policies. For example, if a new investment is undertaken, ASTEC will compute an new set of water or wastewater rates that will just cover the additional costs (and cost savings) associated with this investment. ASTEC can also explore the effects of policy changes e.g., new billing and collection strategies, introduction of a fixed charge into the tariff structure. It is well-suited to examining the financial and operational implications of tariff and related reforms for municipal water systems e.g., new billing and collection strategies, introduction of a fixed charge into the tariff structure.

The scenarios fall into three broad categories: baseline, the current conditions; counterfactual scenarios that explore what would have happened if past decisions and policies had been different and prospective scenarios that examine what is likely to happen under a future set of polices. ASTEC explores the implications of these scenarios relative to the baseline for both water system finances and customer budgets.

5.1. Baseline Data and Documentation

We developed a set of data that represented the baseline conditions of the ACP water system. The ASTEC model was "calibrated" to this baseline. In this instance, we chose conditions and data from 2005 for the baseline. The following sections describe these baseline data and their development.

5.1.1. Service User Categories

Based on accounting and invoicing information from the company, 34 original service user categories were identified. These categories are distinguished from each other based on the characteristics of the customer, including type of structure, ownership, location, and service received.

Since ASTEC can accommodate no more than 15 service user categories at present[19], we needed to create at most 15 groups out of the original 34 groups. In undertaking this consolidation we considered the following criteria:

- It is preferable to merge categories which individually consume only a small share (less than 0.5%) of services of ACP.
- Since the customers in Pitesti are responsible for 92.2% of water consumption and 97.5% of wastewater discharge, maximize the detail of Pitesti service users.
- Merge service users outside of Pitesti even if they were at different locations if they were homogenous in other important respects.

[19] This is due to the limitations of the computing capacity of Solver, the tool of Excel used for solving for multiple-variable equations.

- In isolated cases customers with water service might be merged with customers with both water and wastewater services if the customers in the service user categories were similar in other important respects.

For all those service user categories, which were created by merging some of the original 34 categories, specific model inputs were computed by summing the number of accounts and using weighted averages to estimate service use and tariffs.

After the new service user categories and characteristics were compiled, we verified the computations by comparing the water consumption, wastewater discharge, water service revenues, wastewater service revenues and the number of accounts between the 34 original and the 15 newly created groups. Table 10 provides data for each of the fifteen service user categories derived as describe above for application of the ASTEC model to Pitesti. Section 4.1 elaborates on the compression of service user categories used to develop baseline data.

5.1.2. Costs in 2005

The ASTEC model includes fixed and variable costs for water and wastewater services in 2005 based on the data received from the ACP Accounting Department. These costs are from the balance sheets and Profit/Loss accounts for Pitesti and for neighboring areas (Maracineni, Bascov, Stefanesti, Albota, Bradu, Cotmeana Platform) served by ACP.

Fixed costs for water and wastewater are drawn from accounts entries such as salaries, repairs, municipal taxes, postal services, transportation, services related to third parties, studies and research, depreciation and others with lower value. Variable costs include raw materials, electricity, and the royalty fee; they are costs that clearly vary with the level of consumption in the short run. For water services there are also variable costs for purchase of raw water.

The transformation of variable costs for both water and wastewater services from total RON/year to RON/m^3 was made by dividing the cost data by 2005 throughput. This calculation was made in the 'SideCalc' spreadsheet provided by ASTEC[20]. The SideCalc spreadsheet also contains raw data and calculations used to allocate fixed costs for three localities (Maracineni, Bascov, Stefanesti).

ASTEC also allows the user to assign costs to particular service user categories. In the ACP Baseline we used the automated ASTEC option of allocating fixed and variable water and wastewater costs to service users on the basis of water use. In other words each service user category was assigned a share of the costs proportionate to water use. This allocation is a very crude approximation of true costs, but time and data necessary to make this allocation on a better basis are not available at the present. Fortunately this assumption is of little practical significance unless one runs scenarios for the purpose of assigning different tariffs to different customers based costs of service. We don't use scenarios for that purpose in this report.

[20] Many of the calculations discussed here are documented and carried out in the Sidecalc spreadsheet of ASTEC. This spreadsheet is also a good place to store notes and comments related to data and methods. This way the sources, background, and assumptions of the Scenarios are readily available to the user.

Table 10 Service User Categories for ASTEC Modeling, 2005 Data

Service user category	Description	Number of accounts	Service W = water WSc = water and sewage as composite services	Annual average consumption of water per account (m^3/year)	Drinking water variable tariff (RON/m^3)	Annual average discharge of wastewater per account (m^3/year)	Wastewater variable tariff (RON/m^3)
HH A, Pitesti	Individual houses, not all are connected to the sewer	5 724 for water, 3874 for wastewater	WSc	134	1.0262	127 for accounts with sewer connection	0.9044
HH B, Pitesti	Block of apartments. Apa Canal is in contract with the block, and not with the individual apartments. The apartments do not have individual metering. In addition to their share of total consumption they also pay their share of leakage within the building. The typical account represents a few dozen apartments.	1063	WSc	6 652	1.0262	6 319	0.9044
HH C, Pitesti	Apartments in blocks, but Apa Canal is in direct contract with the apartments and their consumption is metered individually. These households pay their metered amount, but nothing beyond that (like leakage within the building).	2 207	WSc	94	1.0262	89	0.9044
Industry A, Pitesti	Big industrial facilities, both services	140	WSc	25 069	1.0262	25 069	0.9044
Industry B, Pitesti	Big industrial facilities, water service only	59	W	25 069	1.0262	0	0
Public institutions A, Pitesti	E.g. hospital, schools, local government.	97	WSc	16 705	1.0262	16 705	0.9044
Private enterprises A, Pitesti	These are small enterprises. Not all are connected to the sewer.	1 380	WSc	619	1.0262	542	0.9044
HH D, out of Pitesti	Individual houses in all other settlements, except for Pitesti. Only a small share is connected to the sewer.	2 392	WSc	90	0.85	5	0.72

Service user category	Description	Number of accounts	Service W = water WSc = water and sewage as composite services	Annual average consumption of water per account (m^3/year)	Drinking water variable tariff (RON/m^3)	Annual average discharge of wastewater per account (m^3/year)	Wastewater variable tariff (RON/m^3)
HH E, out of Pitesti	Blocks of apartments in all settlements out of Pitesti, some with individual household metering and contract, the majority has just one contract per block of building. All connected to the sewer.	231	WSc	995	0.85	946	0.72
Industry C, out of Pitesti	Big industrial facilities, both services	11	WSc	5 105	0.85	5105	0.72
Industry D, out of Pitesti	Big industrial facilities, water service only	3	W	13 735	0.8352	0	0
Public institutions B, out of Pitesti	E.g. schools, local government. Not all are connected to the sewer.	8	WSc	16 757	0.84	4 875	0.72
Private enterprises B, out of Pitesti	These are small enterprises. Not all are connected to the sewer.	105	WSc	577	0.85	172	0.72
Industry E, out of Pitesti	Big industrial facilities and public institutions in Albota and Bradu.	3	W	94 555	0.5126	0	0
Industry F, out of Pitesti	Wholesale of water to Cotmeana.	1	W	281 683	0.15	0	0

5.1.3. Calculated tariffs

Baseline tariffs for use in ASTEC are a weighted average tariff for water and wastewater for each locality based on tariffs that applied on January 1, 2005 and new tariffs approved by the National Authority for Public Services and the Local Council in late 2005. All SU categories in one area have the same tariff for water and for wastewater. The tariffs used and the calculation are shown in Table 11 below.

Table 11 Weighted Average Water and Wastewater Tariffs for Localities Served by ACP in 2005

Locality	Water tariff (RON/m^3)	Wastewater tariff (RON/m^3)
Pitesti	[(0.9587*8.5)+(1.19*3.5)]/12 = 1.0262	[(0.8445*8.5)+(1.05*3.5)]/12 = 0.9044
Stefanesti	[(0.8667*8.5)+(1.07*3.5)]/12 = 0.9259	[(0.7223*8.5)+(0.88*3.5)]/12 = 0.7682
Maracineni + Bascov	[(0.8352*8.5)+(1.03*3.5)]/12 = 0.8920	[(0.7202*8.5)+(0.89*3.5)]/12 = 0.7697
Albota + Bradu	[(0.5126*8.5)+(0.63*3.5)]/12 = 0.5468	No Wastewater Service Provided
Cotmeana Platform	0.24*12/12 = 0.24	No Wastewater Service Provided

* 8.5 and 3.5 represents number of months during which each tariffs applied in 2005.

Table 12 below provides a description of the evolution of water and wastewater tariffs for Pitesti and neighboring areas since ACP was financially and institutionally separated from other local public services in 2000.

Table 12 Water and Wastewater Tariffs from 2002 to 2005 in Areas Served by ACP

	Water Tariff (RON/m3)					Wastewater Tariff (RON/m3)				
Period	Pitesti	Maracineni + Bascov	Stefanesti	Albota + Bradu	Platf. Cotmeana	Pitesti	Maracineni + Bascov	Stefanesti	Albota + Bradu	Platf. Cotmeana
27.06.2002	0.4840	0	0	0.2632	0	0.3090	0	0	0	0
01.04.2003	0.5945	0	0	0.3290	0	0.4720	0	0	0	0
01.07.2003	0.7020	0.5945	0.5945	0.3290	0	0.5752	0	0.4720	0	0
01.11.2003	0.7730	0.5945	0.5945	0.3290	0	0.6764	0.4720	0.4720	0	0
01.05.2004	0.8581	0.7544	0.7810	0.4817	0	0.7893	0.6770	0.6770	0	0
01.11.2004	0.9587	0.8352	0.8667	0.5126	0.24	0.8445	0.7202	0.7223	0	0
15.09.2005	1.19	1.03	1.07	0.63	0.24	1.05	0.89	0.88	0	0
Tariffs are without VAT.										

Due to limitations in the number of SU categories that can be used in ASTEC, households and industry SUs from Stefanesti, Maracineni and Bascov are combined into the same household and industry SU categories. In these cases we also used in these service user categories of ASTEC a weighted average tariff based on their consumption of water or wastewater.

5.1.4. Effluent Treatment Surcharge (ETS)

The total amount of money collected under the effluent treatment surcharge in 2005 was of 173.871 RON. There are four SU categories that have to pay the fee: Industry A - Pitesti, Private enterprises A - Pitesti, Industry C - out of Pitesti, Private enterprises B - out of Pitesti. The proportion of that effluent treatment surcharges as a percentage of total wastewater revenues in those SU categories is 4.45%. We could not model this fee directly since we had neither latitude

nor ready data for dividing up these customer categories into ETS payers and non-payers. As an approximation we increased the wastewater tariff for those SU categories by 4.45% percent. This preserved the Baseline calibration with wastewater service revenues.

5.1.5. Storm Water Fee

The storm water fee is added to each customer's bill once a year usually in September or October. ACP billed customers in 2005 for 1,701,753 m^3 of storm water. The total revenue from storm water fees collected in 2005 was 85,100 RON. We decided that this fee was too small to incorporate into the ASTEC revenue baseline.

5.1.6. Non-payment

Total value of unpaid bills for 2005 was of 603,729 RON. This represents 1.98% of total revenues. In making this calculation, we didn't include those unpaid bills whose payment is simply delayed for a few weeks.

5.1.7. Calibration

The revenue data for ACP for 2005 were roughly 1.5 million RON greater than those of the Baseline Scenario. This is due primarily to the inclusion of revenues from laboratory services and, to a more limited extent, revenues from construction of the final connection to new customers, treatment of septic system wastewater and sludge, etc. After removal of these factors, from both the costs and revenue stream, the baseline costs and revenue data matched adjusted ACP accounting data.

5.1.8. Burden Estimates

Burden indices provide a broad sense of how burdensome investment, tariff, or financing policies will be to water system customers. One set of burden measures is based on comparison between a customer's expenditures on water and wastewater services and that household's disposable income. This is usually expressed as a percent, and the large the percentage, the greater the burden of paying for water and wastewater services will be on the household. The smaller the household's disposable income, and the greater the households water bill, the greater the burden.

There is no rule as to what constitutes a "reasonable" burden for water and wastewater services. This is a judgment that changes with the geography, level of economic development, scope of services, and the perspective of the individual or organization making the judgment. A more detailed discussion of burden indices used here, along with a review of their serious shortcomings in principle and practice, is contained in Section 5.

In our work we computed several burden estimates for Pitesti households by computing ratios of monthly income to monthly water and sewer expenditures. These calculations and their results are summarized in Table 13.

Table 13 Selected Burden Estimates for Residential Pitesti Customers in the Baseline

Customer Characterization	Estimated Household Income (2005 RON/month)	Estimated Water and Wastewater Expenditure (2005 RON/month)	Burden Estimate (Percent)	Method and Comments
Household A with Median Household Income	793	25.1	3.16%	Median household income estimated by scaling 2002 Pitesti Household Income to 2005 using salary data and income distribution for Romania in 2003

Customer Characterization	Estimated Household Income (2005 RON/month)	Estimated Water and Wastewater Expenditure (2005 RON/month)	Burden Estimate (Percent)	Method and Comments
Household B	627	25.2	4.03%	Mean income estimated taking 2/3 of mean Pitesti HH income estimated for 2005. Use per apartment estimated by dividing use per account by the average number of apartments per account.
Household C	627	17.6	2.81%	Mean income estimated taking 2/3 of mean Pitesti HH income estimated for 2005.
Pensioners	304	15.0	4.94 %	Average Income for "Complete" Pensioner in 2003 inflated to 2005. Water use estimated to be 60% of that of Household A.

Data Sources: Average Monthly Pitesti Household Income in 2002 from BDO Management Consultants, 2003. Salary, Pension, and other household income data from National Statistics Institute of Romania website.

These baseline burden estimates reflect our attempts to show the budget burden of current tariffs and billed water consumption for "typical" customers in each of the household groups represented. They also reflect the assumptions we have built into the calculations for the purpose of constructing these typical customers. Obviously some customers in each group will be atypical and the actual burden will be higher or lower, depending upon circumstances.

These data suggest that individual unit metering e.g., Household A and Household C, provides conservation incentives, and results in customer behaviors that are rewarded with significantly lower budget burdens. They also suggest that for low income customers the ACP bill is likely to be a significant component of the monthly expenditure out of their budget.

5.2. Counterfactual Data and Scenarios

5.2.1. Core Counter Factual Scenarios for 2002

The counterfactual scenarios use ASTEC to explore some of the effects of recently introduced reforms in tariff and related policies. ASTEC's 2005 Baseline scenario reflects the consequences of these changes in various aspects of ACP operations e.g., costs, revenues, service users, consumption, etc.21 In order to estimate the effects of various changes already undertaken we can run "counterfactual" ASTEC scenarios. In these scenarios we adjust Baseline ASTEC data to "undo" history and then re-run ASTEC. The new ASTEC results estimate what the production, usage, revenues, and costs of ACP would have been without the reforms. A summary of the various elements included in the Counterfactual Scenarios is produced in Table 14 below. The text below Table 14 elaborates on the scenario elements and the data methods used to support them.

[21] Some of the effects of recent tariff and related policy changes may not be fully reflected in the 2005 Baseline data due to lags in response behavior or physical implementation.

Table 14 Counterfactual Scenarios: Reversing Changes in Policy from 2001-2002 to 2005

Year or Period	Elements of Change	Policy in the Baseline	Description	Change from Baseline in Counterfactual Scenario – Monetary and Physical[22]	Comments
SHORT RUN COST SAVINGS					
2001-2005	Size of Workforce	Reduction in the number of workers employed by ACP.	Workforce was reduced from 1046 to 560 over four years. The work force was 775 in 2002.	Total workforce payroll increases by RON 3.346 million. This total was allocated to water and wastewater labor costs and fixed and variable operating costs in proportion to baseline costs.	The average salary of ACP employees in 2005 was RON 15,289 in 2005 and 9017 in 2002. The changes in salary are due to both to the workforce reduction, which favored keeping the most skilled and trained members of the workforce, and an increase in real wages of about 10% per year, necessitated by market conditions and ACP's desire to retain it most productive employees. The estimated cost savings in the baseline made allowances for the increase in real wages and computing a new salary cost based on 2001 employment levels.
INTERMEDIATE TERM COST SAVINGS					
2001-2005	Wage Rates of Work Force	Increase in the real salary of ACP workers by ten percent a year through 2005.	This policy was implemented and salaries were increased in excess of the rate of inflation. Between 2002 and 2005 the average real salary per employee increased by a continuous compound rate of 17.6% annually. In this analysis we assume that most of the excess in average real increases above ten % per employee were due to the general improvement in the skill level of the ACP workforce as it was reduced in size.	An adjustment for this policy was made as part of the calculation for the change in the size of the labor force. See above.	We believe that ACP was compelled to undertake the salary increase in order to keep the core of its skilled workforce. As such, we do not treat it here as a policy that will be "undone" in the counterfactual characterization. Indeed, we would be hard-pressed to come up with a reasonable characterization of costs and service levels in light of likely mass resignations from ACP of its most of its skilled employees.

[22] All monetary units are in 2005 RON unless otherwise noted.

Year or Period	Elements of Change	Policy in the Baseline	Description	Change from Baseline in Counterfactual Scenario – Monetary and Physical[22]	Comments
2002-2005	Increasing Repair and Maintenance (R&M)	Increase in R&M expenditures to begin system upgrade and reduce leakage.	R&M expenditures had been insufficient to maintain the system in good order for years. This resulted in a variety of operational problems, including more frequent equipment failure, pressure loss, etc. Investing in R&M that sharply reduces these problems may increase R&M costs in the short run but may lower overall costs due to longer equipment life and better service.	No reduction in baseline R&M was made in the Counterfactual scenarios. See the "Comments" column.	The R&M cost item went from 0.73 million RON in 2002 to 2.246 million RON in 2005, an increase of RON 1.516 million per year. Unfortunately, however, we don't know how much of this increase is attributable to the out-sourcing of R&M activities, and how much was attributable to greater levels of R&M relative 2001 levels.
2002-2005	Out-sourcing Repair and Maintenance	Out-source repair and maintenance costs: staff reduction.	The water system continued to function with a much smaller workforce in 2005 because more R&M was performed by labor under contract to ACP. The principle contractor, Aquaserv, was founded in 2004 and staffed by many former employees of ACP. This policy shifted activity performed by ACP employees to the R&M budget item.	Since this policy is primarily a shift in budget categories, and the reduction in salary costs is already addressed in our calculation of lower salaries, we do not further adjust the R&M cost of the baseline.	We attribute all the increase of 1.516 RON per year of R&M in 2005 relative to 2002 to out-sourcing of work formerly done by employees of ACP.
2001-2005	Technological changes at the DWTP	Automation of some of the DWTP processes.	Automation of chemical treatment of input water and disinfecting the filtered water before distribution. Also, by-pass of an old settling tank and less efficient filter beds and up-grade of the boiler unit for heating water used at the DWTP..	Reduce investment by the annualized equivalent of 0.869 million RON. No change made in the baseline operating costs of the DWTP.	ACP invested 0.869 million RON in the DWTP over this period, but we do not have data to support quantification of how much, if any, of this investment resulted in reduced costs in the baseline relative to the counterfactual. Moreover, any resulting increase in labor productivity may already be embodied in credit taken for reduction in labor costs above.

Year or Period	Elements of Change	Policy in the Baseline	Description	Change from Baseline in Counterfactual Scenario – Monetary and Physical[22]	Comments
2001-2005	Technological changes at the WWTP	Automation and re-configuration of WWTP processes.	Multiple changes of the operation of the WWTP. Changes including Parts of WWTP were taken off-line beginning in 2001. Sludge dewatering improvements.	Reduce investment by the annualized equivalent of 0.921 million RON. Increased baseline wastewater system operating costs by 0.13 RON/m^3 of wastewater treated due to a decrease in unit electricity use.	ACP invested 0.921 million RON in the WWTP over this period, but, again, we have little data to support quantification of reductions in operating costs. The adjustment is limited to estimated savings in electric use. .
2004-2005	Apartment metering	Subsidize installation of meters in individual apartments.	Approximately 800 apartments had individual water meters retrofitted with financial assistance from ACP. About 200 apartments also had radio-based automated reading of the meters installed.	Reduced water and wastewater investment cost by the annualized equivalent of 0.233 million RON. Shifted the equivalent of 800 apartments into centrally metered units with higher consumption per unit.	Investments costs borne by ACP were about 0.233 million RON. The costs to participating customers is not known, but we can assume that they expect to cover these costs by reduced costs of water and wastewater service. ACP benefited from the policy by reduction in operating costs, but its particular interests, not reflected in these data, were 1) demonstrating the feasibility and merit of apartment based meters to customers and 2) testing remote reading of meters that would reduce the cost of system administration.
2001-2005	Water network	Replacement and expansion of the water network, including pipes, storage, and pumps.	Investment in network replacement and expansion that would reduce system losses and increase the coverage of the system.	Reduced investments by in the water network by the annual equivalent of 3.1 million RON. Reduced the drinking water system penetration from 98% to 97% by changing the number of HHA accounts. Increased the losses in transmission by 1 million m^3 per year from 6.5 million to 7.5 million m^3/year.	ACP undertook investments of RON 3.1 million in the water network. These investments are said to be mainly responsible for the reduction in system leakage by 1 million m^3 per year and to have contributed substantially to the general reduction in system flows over the period. Other possible benefits, including possible improvements in efficiency of energy use, and lower repair and maintenance costs are not supported unambiguously by the data available to us. This investment also supported expansion of the network to more customers so that 98% of Pitesti citizens had ACP water service in 2005.

Year or Period	Elements of Change	Policy in the Baseline	Description	Change from Baseline in Counterfactual Scenario – Monetary and Physical[22]	Comments
2001-2005	Wastewater network	Replacement and expansion of the wastewater network.	Investment in network replacement and modernization, but most especially expansion of network coverage. .	Reduced investments in the wastewater network by the annual equivalent of 0.747 RON. Reduced the wastewater system penetration from 95% to 93%.	Investments of 0.747 million RON. These investments are mainly responsible for increases in the number of wastewater customers.
REVENUE ENHANCEMENT					
2002-2005	Tariffs	Increase tariffs to provide a sustainable level of revenue to cover costs.	Both water and wastewater tariffs were increased to cover current and anticipated increases in scope and level of service.	Reduction in ACP water tariffs. In Pitesti, water tariffs from 1.0262 to 0.634 RON/m^3 and wastewater tariffs in Pitesti from 0.9044 to 0.4048 RON/$m^{3.}$ Outside of Pitesti, water tariffs from 0.8352 to 0.516 RON/m^3 and wastewater tariffs from 0.7219 to 0.3231 RON/m^3	Scale back water and wastewater tariffs the counterfactual to the 2002 level after adjustment to 2005 RON.
2004-2005	Effluent Treatment Surcharge	Introduce a surcharge on large wastewater customers.	An effluent treatment surcharge was introduced for large commercial customers based on monitored and estimated effluent discharge.	Reduce the large customer's tariff to eliminate the equivalent of the ETS.	Revenue of RON 0.174 million from this charge in 2005
2002-2005	Bill collection ratio	Introduce changes designed to increase collection efficiency, including use of legal system and reductions in, or loss of, service.	More efficient bill collection resulting in reduced delinquency and higher revenues.	Increase un-collected bill rates to by a factor of two over Baseline 2005 levels: 4.0 % for water and 4.4% for wastewater.	Water service uncollected bills decreased from 4.9% to 2% from 2001 to 2005. Wastewater Service uncollected bills decreased from 5.3% to 2.2%. We allow for the possibility that improved economic conditions were partly responsible for the improved collection rates.

As the descriptions in Table 14 indicate, our effort to estimate the short run and intermediate term cost saving investments and operating changes since ACP took over the Pitesti water system have been only partially successful. While there are many policy changes that the ACP management introduced, the consequences of these changes on costs and behavior have been numerous and difficult to quantify. Furthermore, some of the changes have interacted with each other and it has been difficult to untangle the web of interdependence and modify 2005 conditions to reflect the absence of the various ACP management initiatives. We have done the best we can in quantifying the consequences of the various policy changes and then removing them from 2005 Baseline data to construct the Counterfactual Scenarios. In some cases we had to abandon representation of a policy because we did not feel that the information at our disposal supported quantification well enough. In other cases we were forced to make some assumptions in order to quantify the policy change or its effects and to implement it in ASTEC. In Table 14 we have tried to make these decisions explicit so that readers may judge for themselves how well the Counterfactual Scenarios approximate conditions in 2005 without the policy changes adopted by ACP.

There are three Core Counterfactual Scenarios adapted from Table 14. In the spirit of the Counterfactual Scenarios, these core scenarios "undo" some of the tariff and related policy and investment changes instituted from 2002 to 2005. The first withdraws all the changes under the "Cost Savings" section of the Table for which we could construct some quantitative representation. The second withdraws the quantifiable "Revenue Enhancement" measures described in the second part of Table 14. The third Core Counterfactual Scenario combines these two and examines the composite effect on 2005 without the quantifiable cost saving and revenue enhancement changes that we list in Table 14. These three scenarios are referred to by the mnemonics CF-w/oCS, CF-w/oRE, and CFw/oCS&RE.

5.2.2. Counterfactual Sensitivity Analyses

There are numerous examples in which outsourcing to private organizations of functions once performed internally by public utilities resulted in improved productivity. It is definitely speculative for us to assume that this has happened in the case of Pitesti's outsourcing of R&M activities. Still, experience with outsourcing suggests that this is a likely outcome and it is interesting to test what an improvement in R&M productivity of approximately twenty percent might mean to the ACP. We therefore ran a variation of the core Counterfactual Scenario in which R&M costs are increased by 304 thousand RON over the Baseline and distributed proportionate to baseline R&M between water and wastewater R&M fixed and operating costs. This scenario is termed the Counterfactual Scenario without a presumed productivity increase or CF-w/oP.

In addition, we ran versions of this and the other Core Counterfactual Scenarios with a requirement for cost-recovering, rather than 2005 or 2002, tariffs. These sensitivity analyses allow us to see more clearly how the counterfactual scenarios might have affected customers rather the ACP's production and financial condition. Their mnemonics add CR – for cost recovery – to the Core Counterfactual Scenario names.

5.3. Future Data and Scenarios

5.3.1. Core Future Scenarios for 2009 and 2012

The future scenarios represent ACP plans for various tariff reforms and associated investment, service user, production, and other changes. These planned changes are used to modify the data of ASTEC's Baseline Scenario to develop the various future scenarios. ASTEC may then be run using this new scenario data and ASTEC results are estimates of the future operating and financial

conditions at ACP with these plans in place. These can be compared to the 2005 Baseline data as a way of estimating the full effects of the plans.[23]

The particular changes that are represented by these scenarios are summarized below in Table 15. The changes pertain, especially, to the scenarios associated with implementing the remainder of the ISPA-supported ACP investment program. In these scenarios, we also try to reflect the changes anticipated as an adjunct of that program: improved efficiency in collection of bills, extensions of service, changes in unit operating costs, reductions in repairs and other fixed costs due to system refurbishment, reductions in non-billed water and wastewater, etc. The assumptions and data used in developing these scenarios are described in more detail below.

One aspect not included in the future scenarios is growth in demand due to expansion of service area population or growth in the local economy. While we observe substantial construction and economic vitality in the City of Pitesti, we believe that much of this is driven by improved living standards and better housing options rather than population growth. We believe that much of the growth in population and water demand will likely occur outside the current City limits. This is something that ACP must be concerned about, especially as it may become a "regional" water system. We do not, however, try to factor these developments into the future scenarios developed here.

[23] This method isolates and measures the consequences of the ACP policies. Such measures can fruitfully be used to identify possible problem outcomes and to refine or revise plans in ways that might be more attractive. These scenarios are not intended to be forecasts of conditions in some future year. Such a forecast would require insight into trends and futures changes in broader economic, financial, and institutional conditions that are not addressed in these scenarios.

Table 15 Future Scenarios – 2009 and 2012

Year or Period	Elements of Change	Policy	Change from Baseline in Future Scenario – Monetary and Physical[24]	Comments
FS 2009				
2009	EIB loan payment	Make interest-only payments on the EIB loan until 2012.	Estimated interest payments by investment: DWTP: 259,000 RON/year Water network: 232,000 RON/year Wastewater network: 343,000 RON/year WWTP: 613,000 RON/year The first two were added as a fixed cost to the water sector and the last two were added as a cost to the wastewater sector.	Interest payment on the EIB loan will be in effect in 2009. This expenditure is split among the major investment categories based on the corresponding investment estimate. Principal repayment does not start yet. It is assumed that during 2009 none of the new investments is operational, so there are no corresponding changes in physical operation of the system and no new operating costs or cost savings adjustments to be made. The interest rate of the loan is expected to be 3.85%.
2009	Risk commission payment.	Pay a risk commission to EIB for the years 2007-2010	Risk commission of 32,000 RON added as a cost entry to water: DWTP at 17,000 RON/year and network at 15,000 RON/year. Also added as cost entry 62,000 RON to wastewater: network at 23,000 RON/year and WWTP at 39,000 RON/year.	Beginning in 2007 a risk commission is to be paid by ACP to the EIB. This expenditure is split among the major investment categories in proportion to the investment at risk.
2009	Non-eligible expenditures	Cover non-eligible expenditures related to the implementation of the ISPA investment program.	Added 4,527,000 RON/year to water sector expenditures. Added 4,939,000 RON/year to wastewater sector expenditures.	Expenditures which take place in relation to the ISPA and EIB financed investments, but which are not covered by the ISPA grant or the EIB loan. These are multi-year expenditures which still take place in 2009, but not in 2012. In ASTEC the average annual values are used. Contract-specific estimates in 2005 RON are: Contract A (DWTP), 2,788,000 RON/year for 5 years; Contract D (water technical assistance), 115,000 RON/year for 5 years; network water service, 1,624,000 RON/year for 5 years; Contract D (wastewater technical assistance), 115,000 RON/year for 5 years; network wastewater service, 2,435,000 RON/year for 5 years, and the WWTP, 2,388,000 RON/year for 5 years.

[24] All monetary units are in 2005 RON unless otherwise noted.

Year or Period	Elements of Change	Policy	Change from Baseline in Future Scenario – Monetary and Physical[24]	Comments
2009	Tariffs	Raise tariffs at the end of 2006.	Increased tariffs for Pitesti customers (before VAT) to 1.61 RON/m^3 for water and 1.33 RON/m^3 for wastewater service.	Tariffs were increased effective January 1, 2007 as called for by the Financing Memorandum. The nominal increases in tariffs were 28.8% for water and 19.8% for wastewater at 31st of December 2006 compared to the tariffs at 1st of January 2006 (according to condition 8.5.b from the FM). While not required by the FM, the tariffs for out-of-Pitesti customers are also raised compared to 2005, in line with the tariff change in May 2006. Tariffs for most out-of-Pitesti customers were raised to between 1.13 and 1.17 RON/m^3 for water, and 0.96-0.98 RON/m^3 for wastewater services.
2009	Salaries	Continue an increase in real salary levels by increasing them by 10% in total over a six year period through 2005 to 2010.	Salary costs are increased by 0.879 million RON/year. Increase of salaries for water service: 472,000 RON/year. Increase of salaries for wastewater service: 407,000 RON/year.	10% real increase in salaries is forecasted between 2005 and 2010. We assume that all of this increase takes place by 2009.
FS 2012				
2012	EIB loan principal and interest	Make principle and interest payments as required by the EIB loan.	Increase water system costs with a P&I payment of 891,000 RON/year; wastewater system costs by a P&I payment of 1,735,000 RON/year.	Starting in 2012 both principle and interest are paid to EIB. This expenditure is split among the major investment categories. The figures are based on 20 year loan duration and real interest rate of 3.85%. These annualized figures are different from the actual EIB loan repayment schedule, which requires higher payments initially, and lower payments toward the end of the loan period. Here we use the constant payment equivalent of this long run financial obligation. The risk commission paid to EIB does not have to be paid in 2012 and subsequent years.

Year or Period	Elements of Change	Policy	Change from Baseline in Future Scenario – Monetary and Physical[24]	Comments
2012	DWTP operations	Pay the new operating costs of the DWTP	Add additional chemical costs of about 180,000 RON/year over the baseline. Reduce 236,500 RON/year in electricity costs.	It is estimated by ACP that new processes will require about 50% more chemicals than in 2005. ACP also estimates a saving of 12%, or 1100 MWh/year, in electricity consumption at the DWTP in 2012, compared to 2005. With a 2005 price of 215 RON/MWh, the annual electric saving is about RON 236,500. Part of the reduction in electricity costs is associated with reduced water loss on the water network, as a result of which less water needs to be pumped. While we expect that salary costs for the DWTP will be reduced, we are uncertain about their extent and we do not try to reflect these economies in this adjustment.
2012	WWTP operations	Pay operating costs of the WWTP	Add additional chemical costs of about 2,869,000 RON/year. Reduce electricity costs by 1,198,500 RON/year. .	The cost of chemicals is expected to rise to about 2,869,000 RON/year by 2012, which is half of the perceived ceiling value used on current discussions. At the same time a 61% drop in electricity consumption is expected.
2012	Water network	Replace, refurbish, maintain and repair the water network to keep it reliable in the long run.	Additional repair and maintenance costs of 337,000 RON/year. Leakage reduced from 6,500,000 m^3/year in 2005 to 5,500,000 m^3/year in 2012.	Repair and maintenance costs are forecasted to increase by 15% compared to 2005. Leakage will be reduced compared to 2005.
2012	Wastewater network	Maintain and repair the wastewater network to keep it reliable in the long run.	Additional repair and maintenance costs of 234,000 RON/year. The volume of infiltration and storm water is reduced from 7,000,000 m^3/year in 2005 to 3,500,000 m^3/year in 2012.	Repair and maintenance costs are forecasted to increase with 15% compared to 2005. We expect there to be lower infiltration and storm water due these investments and new operating policies.
2012	Increase connections to water network		Increase Households A water service users by roughly one percent.	Connection rate of citizens in Pitesti is forecast be 99% as opposed to 98% in 2005. Most of the new connections will be to individual households (Household A Service Users). We increase the number of accounts in this category from 5724 in 2005 to 6335 in 2012.

Year or Period	Elements of Change	Policy	Change from Baseline in Future Scenario – Monetary and Physical[24]	Comments
	Increase connections to water network		Adjust the Households A data profile to reflect an increase in wastewater customers from 3874 accounts in 2005 to 5104 accounts in 2012.	Connection rate of citizens in Pitesti is forecast to be 97% as opposed to 95% in 2005. Most of the new connections will be to individual households (Household A Service Users). Since these customers are characterized as having sewer service, we have to revise the adjustment we made in the characterization of wastewater production and costs in this service user category.
2012	Tariffs	Keep tariffs at 2007 levels.		In the Financing Memorandum ACP agrees to raise tariffs beyond those agreed to if this is necessary to pay debts and cover all costs. We will examine such options in our sensitivity analyses.
2012	Salaries	Continue an increase in real salary levels by increasing them by 10% in total over a six year period through 2005 to 2010.	Salary costs are increased by 0.879 million RON/year. Increase of salaries for water service: 472,000 RON/year. Increase of salaries for wastewater service: 407,000 RON/year.	10% real increase in salaries is forecasted between 2005 and 2010. No further real increase is assumed in 2012.
2012	Other Operating Costs	Cover increased costs of administration.	Increase of other op. costs for water service: 265,000 RON/year. Increase of other op. costs for wastewater service: 297,000 RON/year.	10% and 15% real increase in Other Operating Costs is forecasted by ACP for water and wastewater services, respectively, between 2005 and 2010.
2012	Royalty fee	City of Pitesti waives the royalty fee to help keep the tariff burden of the loan and new operating costs down.	0 royalty fee is to be applied in ASTEC	All of the royalty fee is returned to ACP to help repay the EIB loan

It is also assumed that the non-eligible and additional costs borne by ACP in 2009 do not have to be paid after 2010. Thus they are excluded in FS-2012.

5.3.2. Sensitivity Analyses of Future Scenarios

These future scenarios do not formally incorporate some of the policies begun by ACP at the outset of the decade. Among them are:

- Continued subsidization of conversion of metering in some apartment block apartments to individual accounts and metering.
- Continued development and installation of automated reading of meters in apartments.

ACP also plans to introduce additional policies over the next few years that have some potentially large cost and revenue implications but that have not been incorporated into these future scenarios. Prominent among them is a plan, discussed above in Section 4.3.2, to replace and up-grade meters to prevent under-measurement of water use by large and medium sized customers.

5.3.2.1. Sinking Fund to Cover Depreciation of ISPA-Financed Investment

In our discussion of capital accounts, full cost tariffs, and sustainable economics above, we discuss the various strategies for dealing with providing for replacement of the infrastructure that is being funded by the ISPA grant. One strategy would be to create a sinking fund that would help defer the cost of replacement when the equipment and structures of the water and wastewater system financed by the ISPA grant reached the end of their economic life. We did not include a sinking fund among the costs of the core 2012 scenario.

We have, however, run a scenario in which we have added such a cost. This scenario assumes that ACP will begin funding the ISPA Sinking Fund by 2012 that would be fully funded to replace ISPA financed plant and equipment in twenty-five years for the plants and ISPA financed network in forty years. Assuming that the Fund earns a real rate of 3% per year and that the Fund the same amount would be added to the fund each year, we would need to add the following costs to the 2012 core scenario for each component of the ISPA investment program:

- DWTP: 525,000 RON/year
- Water network: 207,000 RON/year
- Wastewater network: 307,000 RON/year
- WWTP: 1,133,000 RON/year

5.3.2.2. Royalty Fee as a Depreciation Allowance

In this scenario we confront the fact that replacement of those sections of the ACP network that haven't been refurbished or replaced under the ISPA-sponsored investment program is not included in the current financial provisions of ACP. This would, under ordinary conditions, be included as a depreciation item. Granting that estimates of both the economic life and replacement costs of the system are difficult to fix, we propose here to use a surrogate for such estimates by reinstating the "royalty fee" that the City of Pitesti has agreed to rebate to ACP to help pay off the EIB loan. Since the royalty fee is, in most respects, an attempt to reimburse the City for use of City-owned infrastructure, this seems a ready, if not particularly well-documented, way to introduce at least a nominal consideration for the depletion of that infrastructure that is carried over with the new ACP investments. This, together with the sinking fund described above, allow us to explore the financial, tariff, and burden implication of formally making current customers responsible for long term sustainability of the system.

6. RESULTS OF CURRENT AND FUTURE REFORMS

6.1. Counterfactual Scenarios

Before beginning the discussion of Counterfactual Scenarios we believe it is worth noting again the methods and key assumptions used to transform 2005 Baseline conditions into 2005 without some of the key policy changes adopted by ACP management.

1. The workforce reduction is estimated to have saved ACP about 3.346 million RON/year. This is based in part on the assumption that ACP's granting an average of 10% annual real wage increases to all workers was dictated by market conditions.
2. Excess increase in the average real wage observed during the period 2001-2005, amounting to about 7% per year, is attributed to the general increase in the skill level of the labor force i.e., the less skilled and lower paid workers were the workers ACP let go.
3. Out-sourcing Repair and Maintenance (R&M) activities by ACP accounts for the entire increase in R&M activities in the period. In other words, we do not reduce R&M costs to 2002 levels in the Counterfactual Scenarios because the increase is assumed to reflect a displacement of some of the work force from ACP employment to outsourced employment and this shows up in 2005 as increased R&M.
4. Extensions in networks to increase coverage of the system have been rolled back. These investments have been withdrawn and the number of accounts and customers have been reduced as a result.
5. Some revenue-enhancing measures were rolled back in the Counterfactual Scenarios: the Effluent Treatment Surcharge on large wastewater customers was withdrawn, improvements in bill collection were reduced, and tariffs were returned to 2002 levels (in 2005 RON).

6.1.1. Core Counterfactual Scenarios

The results of running ASTEC for ACP without the quantifiable impacts of the reforms itemized above are shown in the following figures. Not surprisingly, Figure 3 shows that elimination of fees and return to old tariffs for CF-w/oRE substantially reduces household and industrial tariffs. VAT is omitted in case of industrial tariffs, since industry can reclaim the VAT component of its expenditures.

Figure 3 Pitesti Household and Industrial Tariffs for Core Counterfactual Scenarios (RON/m^3)

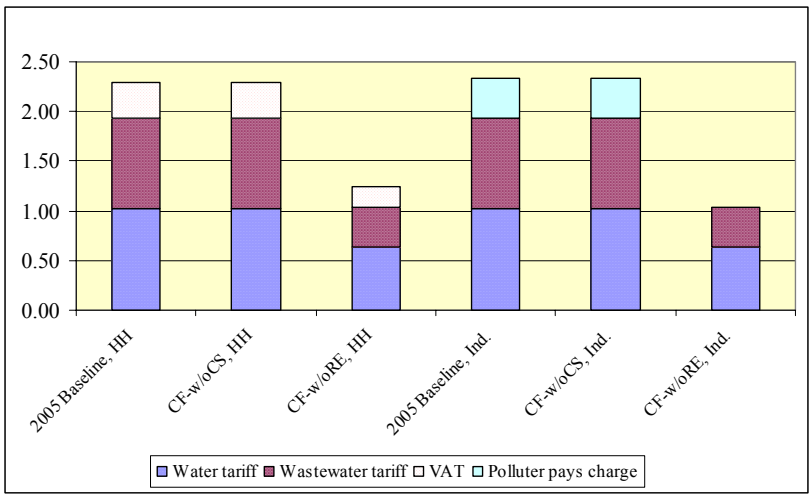


Figure 4, Figure 5, and Figure 6 show the extent to which the absence of cost saving investments or revenue enhancement increases water consumption, water production, and wastewater treatment. Without cost saving investments, 900 thousand m^3/year more water is produced, primarily because of higher leakage from the water network. Without revenue enhancement, water consumption would have risen to 18.7 million m^3/year, an increase of 1.9 million m^3/year over the baseline, and wastewater treated to 22.2 million m^3/year, and increase of 1.5 million m^3/year. This is due to the fact that lower tariffs stimulate higher consumption of water, and therefore discharge of wastewater by consumers.

Figure 4 Water Consumption (m^3/year)

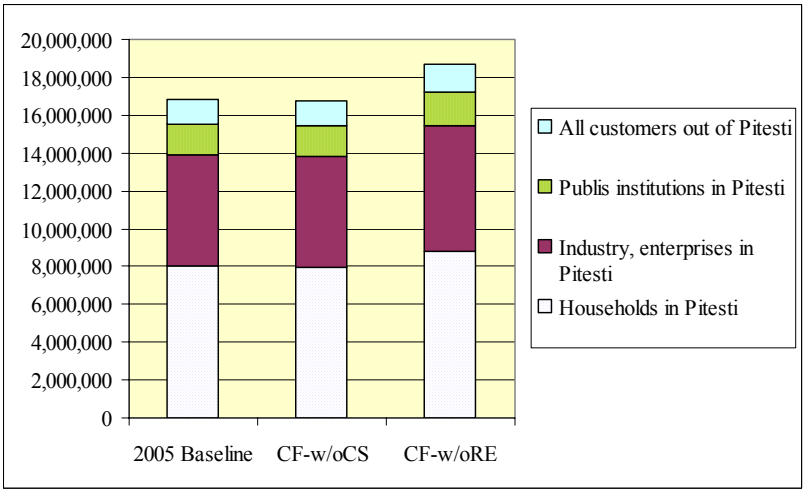


Figure 5 Water Production (m^3/year)

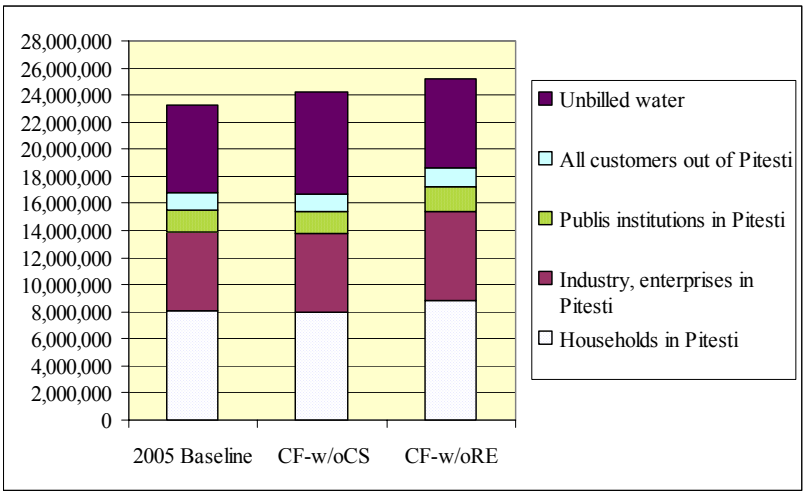
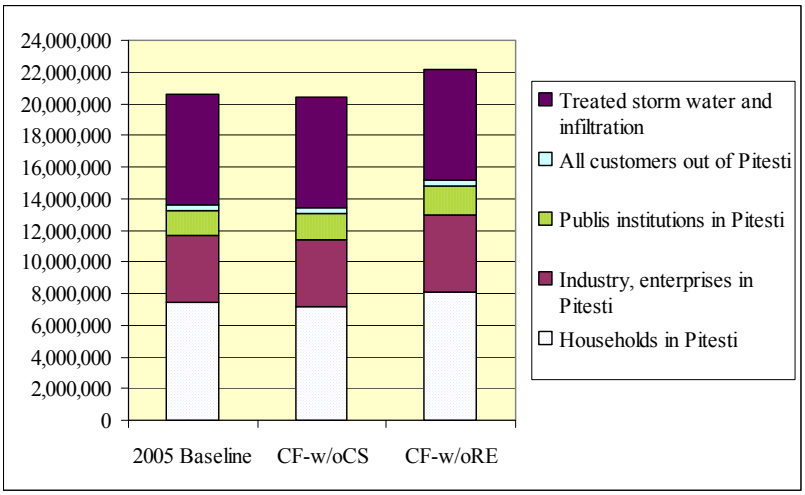


Figure 6 Wastewater Treated (m^3/year)



The Counterfactual Scenario cost and revenue estimates are shown in Figure 7 and Figure 8.

Figure 7 Fixed and Variable Costs of Water and Wastewater Service (Thousands RON/year)

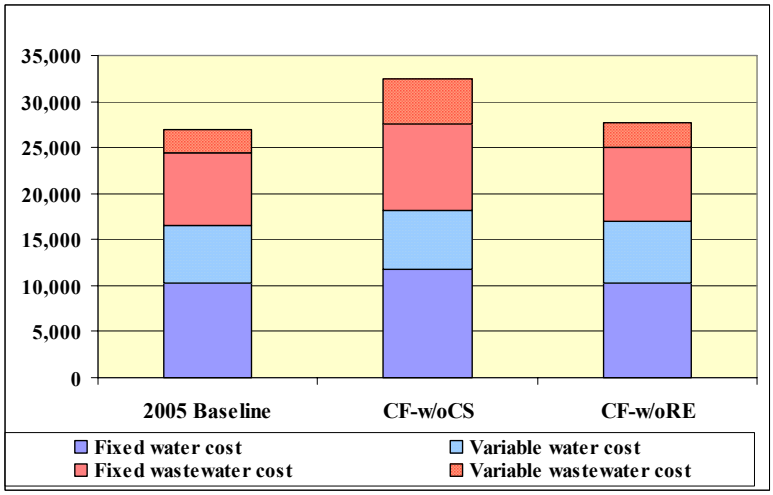
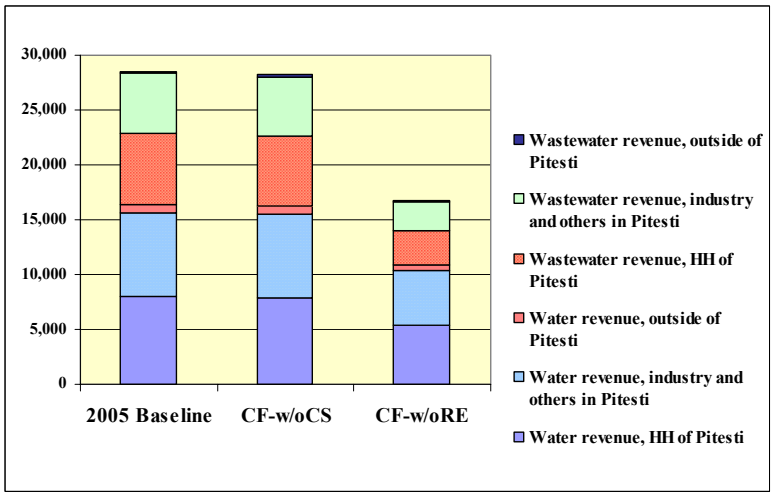
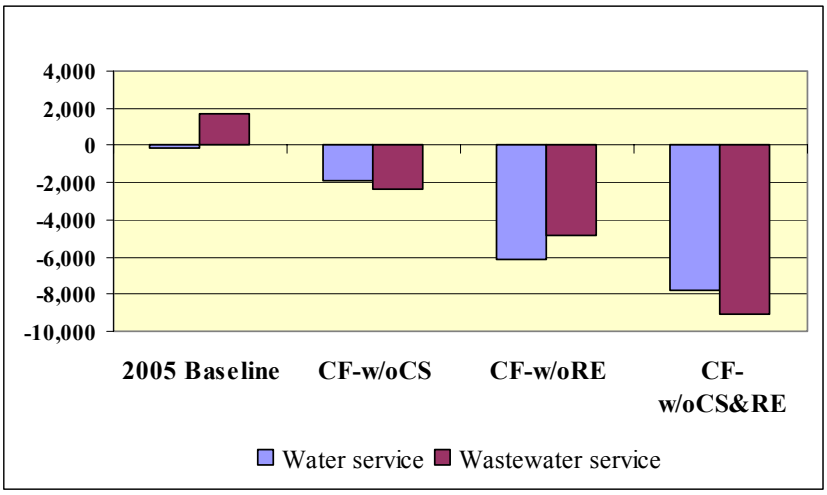


Figure 8 Revenues of Water and Wastewater Service (Thousand RON/year)



The net effect of these changes, as well as the compound effect of cost savings and revenue enhancement together, is shown in the net revenue data presented in Figure 9. The ASTEC-generated data shown on this Figure indicate that ACP's financial condition in 2005 would have been dire without the changes in investment, tariffs, and other policies initiated between 2002 and 2005. Instead of a small 2005 surplus on the wastewater side (1.6 million RON/year), without cost-saving policies ACP is forecast to have significant deficits for both water and wastewater sectors - 1.9 million RON/year and 2.4 million RON/year respectively. The impact would be even greater without revenue enhancement: deficits of 6.1 million RON/year and 4.8 million RON/year in the water and wastewater sectors, respectively. "Undoing" all the cost saving and revenue enhancement policies would have resulted, according to these ASTEC-based estimates, in a total loss in 2005 of 16.9 million RON/year – equal to roughly 60% of the entire budget.

Figure 9 Financial Balance for Water and Wastewater Service (Thousands RON/year)



6.1.2. Sensitivity Analyses for Counterfactual Scenarios

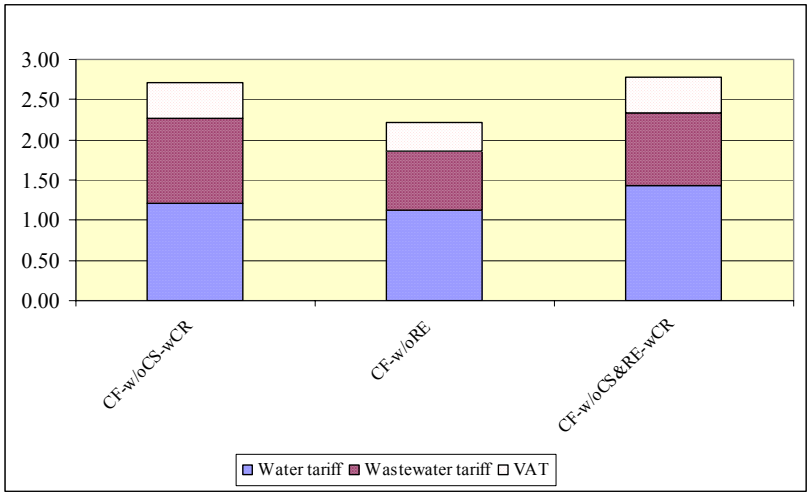
While ACP's finances would have been devastated without the cost-saving and revenue enhancing policy changes, the customers might, at least in the short run, have been better off. After all, their tariffs were fixed and they didn't have to cover deficits or finance the investments and other new costs with higher tariffs. Ultimately, however, customers would have had to pay for the deficits run up by ACP under counterfactual conditions. To examine this eventuality, we ran Counterfactual Scenarios with the requirement that ASTEC determine those tariffs the just cover the costs of operating ACP under the various Counterfactual Scenarios.

6.1.2.1. Cost Recovering Tariffs

The results of these Cost Recovery Scenarios are shown in Figure 10. In examining these data, the reader will recall that Baseline tariffs on water were 1.03 RON/m^3 and for wastewater were 0.90 RON/m^3. The sum is 1.93 RON/m^3. As shown in Figure 10, however, the scenario CF-w/oCS with CR cost recovery would have to have **higher** tariffs: tariffs of 1.21 RON/m^3 for water and 1.06 RON/m^3 for water for ACP to break even. Even this understates things a little since, because of the 1.4 million Baseline net revenue for the wastewater sector, the Baseline tariffs for wastewater could have been reduced still further to achieve exact cost recovery. Thus, cost-saving investments and re-structuring policies do appear to have yielded saving greater than the imputed cost of those investments.

The situation is less clear for CF-w/oRE with cost recovery. The cost recovery tariffs for water are higher than in the Baseline Scenarios (1.13 RON/m^3 to 1.03 RON/m^3) but the cost recovery level for wastewater is lower (0.72 to 0.90 RON/m^3). With respect to wastewater, it seems that the cost of adding length and customers to the wastewater network and processing the additional effluent was not offset by 1) the Effluent Treatment Surcharge and 2) improved collection rates.

Figure 10 Cost Recovering Water and Wastewater Tariffs in Pitesti (RON/m^3)



As one might expect, when both cost savings and revenue enhancement are combined, cost recovery tariffs for water and wastewater are significantly higher for the Counterfactual Scenario than for the Baseline scenario.

These differences can also be seen in the burden estimates computed for the Baseline and the cost recovering variation of the core Counterfactual Scenarios. These are shown in Table 16. Here we present rough estimates of the impact of the tariff and related reform policies adopted by ACP over the period 2002-2005 on the burdens borne by Pitesti customers. Without these reform policies, burdens would have been 15%-18% higher.

Table 16 Burden Estimates for Counterfactual Scenarios with Cost Recovery

Customer Characterization	Burden Estimates (Percent)		
	Baseline	CFw/oCSwCR	CFw/oCS&REwCR
Household A	3.16%	3.63%	3.69%
Household B	4.03%	4.62%	4.75%
Household C	2.81%	3.22%	3.31%
Pensioners	4.94%	5.67%	5.77%

6.1.2.2. Speculative Productivity Increases

The restructuring reforms introduced by ACP may well have had broad productivity impacts. In our core counterfactual scenario we did not fully account for these changes. We did take account of changes in the gross number of employees and the increase in the skill levels of remaining employees. We also, however, believe that there may have been a broader increase in labor productivity in ACP that is not captured in the increases in wages. Such increases, if indeed they occurred, would have been realized as part of restructuring. Unfortunately, without more detailed study, we have no way of verifying this hypothesis or to quantify its magnitude. If the hypothesis

is correct, however, we may be underestimating the cost savings attributable to ACP management over the last five years.

One innovation initiated by ACP management was the out-sourcing of R&M activities. This type of innovation usually results in cost savings through productivity increases. The out-sourced activity accomplishes more with the same expenditures. We have no direct evidence to support this beyond the common finding, for both private and public enterprises, that out-sourcing non-core activities often reduces costs by not-trivial amounts. In CF-w/oP, we assume that outsourced R&M services are 20% more efficient than in-house R&M would have been had it remained at ACP.

Productivity improvements of this magnitude, if they occurred, would further increase the advantage of the tariff and related reforms, especially restructuring reforms. If the hypothesized productivity increase is real, then it would further reduce burden estimates of the baseline relative to the counterfactual by an additional 1%.

6.2. Future Scenarios

As we discuss the results of the ASTEC Future Scenarios for ACP, the reader should bear in mind that, unlike the Counterfactual Scenarios, the costs, tariffs, and other changes referred to here apply only to the Pitesti component of the water and wastewater system.

6.2.1. Core Scenarios: Baseline, FS_2009, and FS-2012

The Baseline, FS-2009 and FS-2012 examine the physical and financial status of ACP and its customers as a result of tariff and related reforms up to 2005 and project future status based on changes planned for the future years. The results are summarized below.

Figure 11 Baseline and Future Household and Industrial Water and Wastewater Tariffs in Pitesti (RON/m^3)

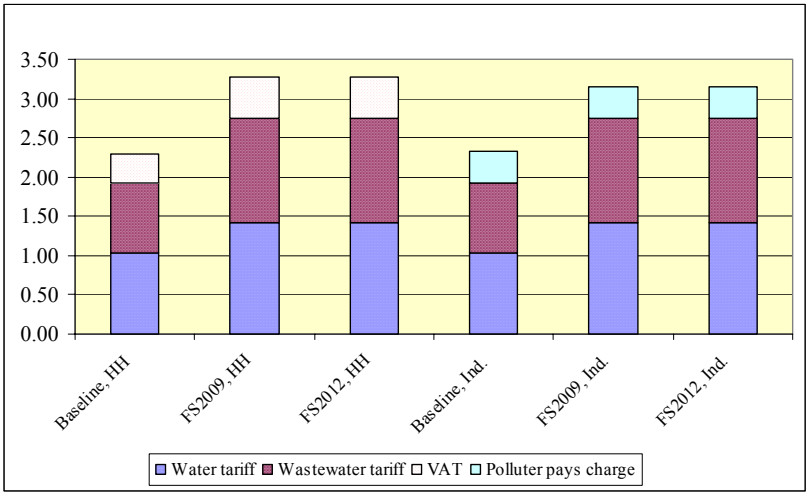


Figure 11 shows that, after successive tariff increases at the end of 2005 and 2006, real tariffs of both household and industrial/commercial customers jumped considerably in 2009 and were expected to stay at this level in 2012. Driven primarily by our assumptions, the Effluent Surcharge on large wastewater producers yielded the same revenue in the future as in the baseline.

Figure 12 and Figure 13 show the Baseline and projected future consumption and production of water and wastewater, respectively. With the higher tariffs, future consumption of water declines by nearly 1 million m^3/year. In 2012, this is offset slightly by the anticipated increase in the coverage of the water system. Total water produced is estimated to drop even more sharply in the future as a result of both decreased consumption and improvements in the distribution network: by nearly 2 million m^3/year in 2012.

Figure 12 Baseline and Future Water Consumption (m^3/year)

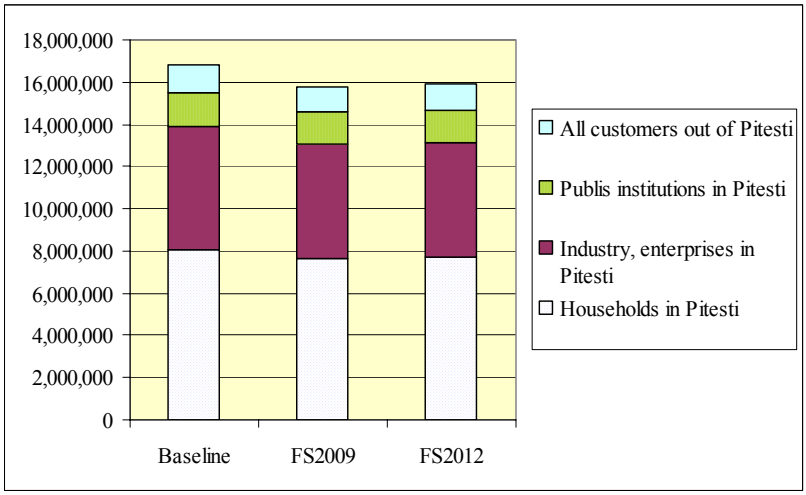
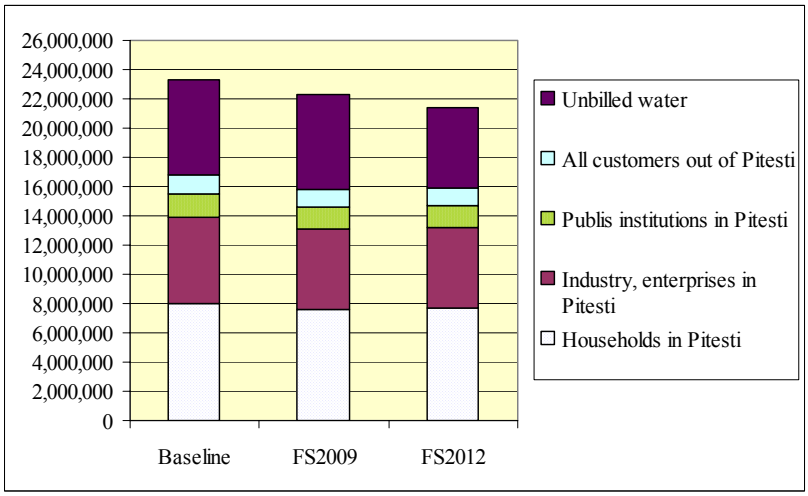
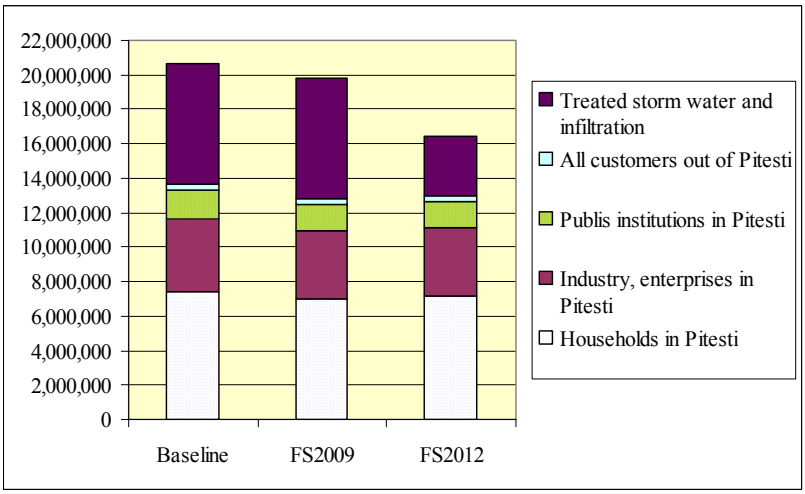


Figure 13 Baseline and Future Water Production (m^3/year)



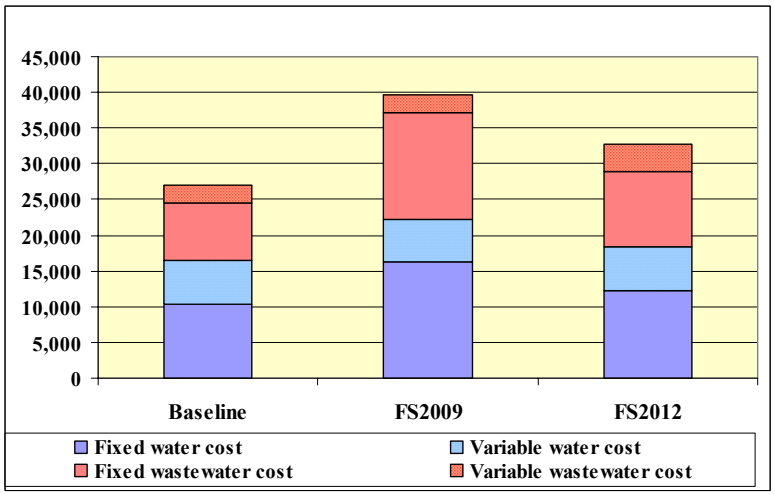
All of these investment, policy, and behavioral changes impact wastewater flow and treatment depicted in Figure 14.

Figure 14 Baseline and Future Wastewater Collection and Treatment (m^3/year)



In combination with wastewater network and treatment investments, the estimated future wastewater service declines 800 thousand m^3 in 2009 and, with new wastewater connections, rebounds a little in 2012. The additional completion of the new network, separation of storm water in the old town, and ancillary holding basins are anticipated to reduce the amount of wastewater treated in 2012 by over 4 million m^3/year.

Figure 15 Baseline and Future Costs of Water and Wastewater Service (Thousand RON/year)



All of this, of course, impact future costs and revenues. The pattern of costs is shown in Figure 15. Here we observe that the costs in 2009 increase sharply even with only interest payments on ACP's new debt to EIB. A big reason for this are the ineligible and additional costs borne by ACP as a result of expenditure requirements connected with the ISPA grants and EIB loan. Together with the other increases, they bump up 2009 costs by nearly 12.5 million RON/year. The good news is that ACP believes that these expenses are transitory in nature and that the costs in 2012, while still dramatically more than the baseline, are 7.5 million RON/year less than in 2009. This means that ACP can expect a cost "bulge" over the last few years of the decade but there is a substantial drop in expenses thereafter, even with assumption of the principal portion of the EIB debt.

Figure 16 shows the estimated changes in future revenues. While revenues jump with costs from 2005 to 2009, they remain high in 2012. This pattern, contrasting with the pattern of declining costs in estimated for 2012, results in the net-revenue pattern shown in Figure 17. ACP goes from having a moderate 1.6 million RON surplus in the Baseline (on expenditures of roughly 27 million RON), to a modest deficit of 1.4 million RON in 2009, back to a surplus of substantial surplus of 5.7 million RON in 2012, on expenditures of 32.8 million RON.

Figure 16 Baseline and Future Revenues of Water and Wastewater (Thousand RON/year)

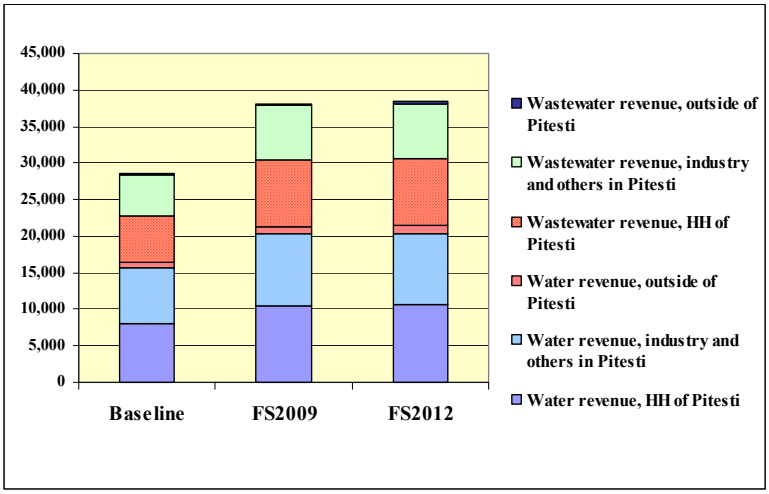
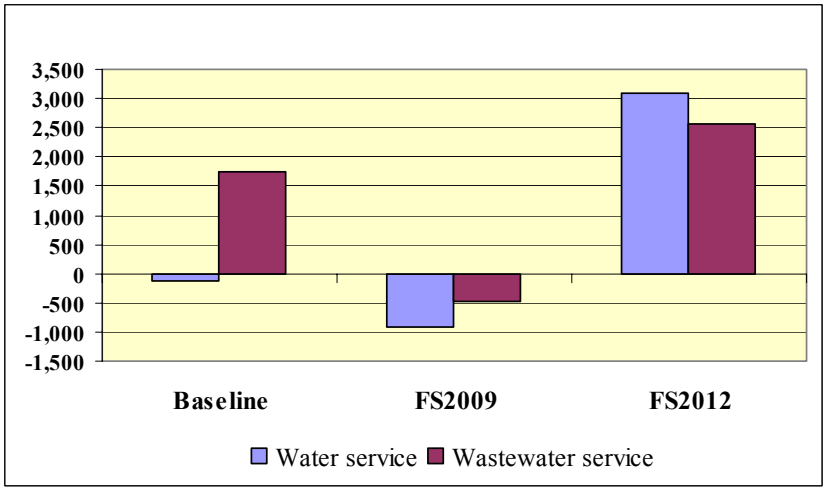


Figure 17 Baseline and Future Financial Balance for Water and Wastewater Service (Thousand RON/year)*



* Balances do not take account of "unpaid bills" for water or wastewater. Unpaid bills amount to a little over 2% of revenues and in these scenarios they are proportionate to total revenues.

Figure 17 also suggests that the water and wastewater revenues are more closely aligned with their corresponding costs in 2009 and 2012. This reflects, in large measure, the fact that wastewater costs will comprise in increasing share of ACP system costs in these future years and the "imbalance" of costs and revenues for the wastewater sector in the baseline probably anticipates the increasing share of wastewater costs.

The tariff increases for 2009 and 2012 increase the burden measures relative to the baseline. These are shown in Table 17. The future burden estimates do not allow 1) for any increase in real incomes in the future or 2) any future increase in incomes with inflation without any corresponding change in the nominal tariff rates. Both such occurrences would slightly reduce the future burdens on ACP customers. However, the burden levels represented, in combination with high net revenues in 2012, might concern ACP management since they may occasion both economic and

political resistance e.g., increases in unpaid bills and appeals to the City of Pitesti to protect especially vulnerable customers from these burdens.

Table 17 Burden Estimates for Future Scenarios

Customer Characterization	Burden Estimates (Percent)		
	Baseline	FS 2009	FS 2012
Household A	3.16%	4.27%	4.26%
Household B	4.03%	5.44%	5.44%
Household C	2.81%	3.79%	3.79%
Pensioners	4.94%	6.68%	6.67%

6.2.2. Sensitivity Analyses for Future Scenarios

We ran ASTEC to explore the implications of several variations of the core scenarios for the future of ACP. In particular, we examined the impact, in 2012, of adjusting tariffs to "cost recovery" levels and making explicit allowances in the near future for depreciation in the infrastructure gifted to the City of Pitesti by the ISPA program and past investments by the central government.

For the former variation, we simply had to run ASTEC in "cost recovery" mode. The software automatically makes calculation of what tariffs for water and wastewater in Pitesti will just cover water and wastewater costs, respectively. These scenarios effectively eliminate any positive or negative net revenue balances for either the water or wastewater sectors. The latter variation, as described 5.3.2.1 above, adds new costs to the FS_2012 scenario to establish and fund an account which may be used to re-construct "gifted" infrastructure when it reaches the end of its economic life. In each of these latter instances, ASTEC is run in the "cost recovery" mode, so that the cost of covering depreciation of gifted infrastructure is translated by the model into tariff changes that would just cover that (and all other) costs.

Tariff estimates for the Baseline and each of the Future Scenarios are shown in Table 18. These data show that tariffs established in 2007 and assumed to apply in 2012 are the highest for the FS-2012 scenario.[25] These data also show how the VAT taxes boost the effective water and wastewater tariffs for households. Table 18 also shows that, assuming the ACP transition costs connected with ISPA investments and financing borne can be financed out of surpluses during the 2005-2011 period, it might be possible in 2012 to substantially reduce tariffs. The tariffs that just cover costs in 2012 are seventeen percent and eleven percent lower than ACP tariffs in 2007 for households (after VAT) and industry respectively.

Table 18 Tariff Estimates for Baseline and Future Scenarios

Service Users	Service Sector	Tariff Estimates for Selected Scenarios (RON/m^3)				
		Baseline	FS-2012	FS-2012 w. Cost Recovering Tariffs	FS-2012 w. Sinking Fund and Cost Rec. Tariffs	FS-2012 w. Sinking Fund, Royalties and Cost Rec. Tariffs
Pitesti Household Customer*	Water Tariff	1.22	1.69	1.40	1.51	1.52
Pitesti Industrial-Commercial Customer	Water Tariff	1.03	1.42	1.17	1.27	1.28
Pitesti Household Customer*	Wastewater Tariff	1.08	1.58	1.31	1.41	1.42

[25] Since these tariffs were set at the very outset of 2007, they would also apply to the FS-2009 scenario.

Service Users	Service Sector	Tariff Estimates for Selected Scenarios (RON/m^3)				
		Baseline	FS-2012	FS-2012 w. Cost Recovering Tariffs	FS-2012 w. Sinking Fund and Cost Rec. Tariffs	FS-2012 w. Sinking Fund, Royalties and Cost Rec. Tariffs
Pitesti Industrial-Commercial Customer	Wastewater Tariff	1.03	1.42	1.17	1.27	1.28

* Tariffs for Household Customers include 19% VAT. At the same time, these data suggest that provision can be made for depreciation of "gifted" infrastructure with relatively modest increases in tariffs. Given our working assumption regarding the economic life of assets and the rate of depreciation on older components of the water and wastewater network, water and wastewater tariffs need only increase by roughly 0.11 RON/m^3 over tariffs that would cover all other cost. The increases are modest for two reasons: the resources can be assembled over the lifetime of the asset (not the truncated lifetime of a particular loan agreement) and the fund balances are invested and are assumed to yield a modest rate of return.

While we term 0.11 RON/m^3 to be a relatively modest increase, it again is worth considering the impact such changes have on customer burdens. Burden indices for scenarios included in our sensitivity analyses of Future Scenarios are shown in Table 19. They show that with cost recovery tariffs it might be possible to substantially reduce the burden of 2012 tariffs.

Table 19 Burden Estimates for Selected Future Scenarios

Customer Characterization	Burden Estimates (Percent)				
	Baseline	FS 2012	FS-2012 w. Cost Recovering Tariffs	FS-2012 w. Sinking Fund and Cost Rec. Tariffs	FS-2012 w. Sinking Fund, Royalties and Cost Rec. Tariffs
Household A	3.16%	4.26%	3.62%	3.87%	3.90%
Household B	4.03%	5.44%	4.62%	4.93%	4.97%
Household C	2.81%	3.79%	3.22%	3.44%	3.46%
Pensioners	4.94%	6.67%	5.67%	6.06%	6.10%

Table 19 also shows how establishing a policy of where current customers begin making provision for replacement of physical infrastructure they are consuming today will affect customer burden estimates. These burden estimates are higher than Baseline burdens, but still markedly lower than the burdens estimated for current tariff levels.

7. REFLECTIONS ON THE PITESTI EXPERIENCE

7.1. Reforms Undertaken Appear to Have Been Effective

The Counterfactual Scenarios run in ASTEC allowed us to examine the efficacy of some of the tariff and related reforms adopted by ACP over the period 2002-2005. We used available data and what we believe are plausible assumptions to construct Counterfactual Scenarios that captured some, but not all, of the changes that the new policies were likely to have precipitated. Our qualified conclusion is that the tariff and related reforms were instrumental in:

- Assuring that ACP in 2005 was a financially stable and economically sustainable producer of drinking water and wastewater services,
- Supporting the extension of water and wastewater service to un-served residents of Pitesti, and
- Reducing the cost pressure on tariffs by 15% or more, depending on what assumptions one is willing to make about the effectiveness of the policies.

This examination also helps illustrate why we regard cost-saving innovations as tariff-related reforms. Such innovations, if effective, allow water systems to use local resources to support up-grading of the water and wastewater systems that would otherwise have to be dedicated to cover existing operating and infrastructure costs. Local resources for up-grades, including reductions in transboundary pollutants, cannot be "captured" by tariffs unless cost-saving innovations create "slack" between the maximum burden that policy makers are willing to impose on customers (or customers are willing to assume) and the costs of maintaining current service levels in an economically sustainable fashion.

7.2. Tariff Levels and Structure Should be Re-examined in Light of Experience

7.2.1. Setting Tariff Levels in Advance of Investment Obligations

The Baseline and Future scenarios run in ASTEC show modest and then substantial budget surpluses in the baseline and 2012, respectively. In 2009, however, ASTEC estimated a substantial deficit at current tariff levels. This pattern is due to the ISPA-FM tariff requirements: they do not appear to have been well calibrated with the current costs or presently anticipated costs of ACP. Even so, they were incorporated as formal requirements of the FM.

This has perhaps resulted in unwarranted burdens on ACP customers. When we examined the long-term costs of the investment program in combination with the tariff and other policy reforms to date, we found that 2007 water and wastewater tariffs are 0.25 to 0.29 RON/m^3 higher than they need to be to cover anticipated 2012 costs. This is a pretty significant difference; roughly half the tariff increases instituted by ACP over the past two years may not be necessary by 2012.

Before pressing this point too strongly, however, we should note that, as a strategy, the approach adopted by the Financing Memo is not without advantages. It may provide ACP with cash balances that serve as:

- a contingency fund to cover un-foreseen costs or surprises e.g. adverse move in exchange rates or interest rates, increases in energy prices, increases in inflation;
- a contingency fund to cover reasonably anticipated future costs that are not formally part of the analysis e.g., increased costs of sludge disposal; and
- financing for short term peaks in cost such as those reflected in scenario FS-2009.

This having been said, the policy also works to protect the interests of the EIB, as lender to ACP. The provision works to assure that tariffs will be sufficiently high to cover repayment of the principal and interest on the loan. This assurance, however, may have been purchased at the extra expense of ACP customers.

7.2.2. Review of Present Tariffs That Are Not Cost-Based

Current tariff levels certainly appear to be more than high enough to sustainably support high quality water and wastewater services in Pitesti. In addition, Pitesti pursues a policy of setting household and industrial tariffs per unit of water delivered at the same level if these sectors receive essentially the same service. In these respects, current ACP tariff policy conforms to the reform principles and recommendations made in Phase 1 of our work (Morris and Kis, 2004a).

Some additional consideration, however, might be given to the structure of tariffs. The principle of cost-based tariff setting might be extended further than it has at present. This principle of "cost reflective" tariff setting has already been implemented in a rough way with the introduction of the Effluent Treatment Surcharge (ETS) levied on large industrial wastewater customers. In the future ACP might refine the ETS to be more certain that the surcharge, as applied, is linked to additional treatment costs. Other instances where ACP might review tariffs in consideration of differential costs of service include the following.

- Tariffs for provision of storm water service might be reviewed, especially if retention basins will be built and used to treat some of the storm water runoff.
- Tariffs for peripheral communities should be reviewed to assure that they cover the full costs of service, including the cost of the new plant and equipment used to treat water provided to these communities. The lower tariffs paid by customers in peripheral communities or industrial customers outside Pitesti may indeed be justified, as currently argued, by the infrastructure costs that have been born by the communities or the industries in the past. Given the variety of present and anticipated future change in investment and service levels, the tariffs assessed on customers in peripheral communities should be reviewed again and, if appropriate, adjusted to reflect costs of service under current or new conditions.
- The ASTEC results suggest that extension of water and wastewater service within Pitesti would not be justified on economic grounds. The costs of providing the service are apparently higher than the average cost of serving current customers. A way of correcting this problem is for new customers to agree to pay tariffs commensurate with their cost of service, not simply the average cost of service for the system as a whole.

ACP might also give more consideration to the use of adding a fixed fee or non-variable component to its tariff. In ASTEC accounts, fixed costs in the Baseline amount to 68% of costs and, in 2012, they are estimated to amount to 69% of all costs. While we use a particularly broad definition of "fixed cost" in our ASTEC account, even a much narrower definition would results in a substantial share of fixed costs. It makes more financial and economic sense to begin decoupling payment of these costs from the amount of water billed to customers.

Table 20 Fixed Costs in ACP Cost Structure

	Baseline		**FS-2012**	
	Fixed Cost (million RON/year)	**Fixed Cost (percentage of total cost per year)**	**Fixed Cost (million RON/year)**	**Fixed Cost (percentage of total cost per year)**
Water Fixed Costs	10.4	63%	12.3	67%
Wastewater Fixed Cost	8.0	76%	10.6	74%
Total Fixed Cost	18.4	68%	22.9	69%

7.3. The Current Information Systems: Capabilities and Limitations

The current financial accounts used by ACP are, as best we can tell, highly developed and well-implemented. ACP also has initiatives in process to both develop and extend the current and capital accounts and to create a broader management information system, including a geographic information system, to better support management analysis and decision making.

We applaud these initiatives and urge that they include the ability to better assign costs to particular customer groups or provision of particular services. This would allow ACP management to more fully develop "cost-reflective" tariffs. The discussion in 7.2.2 above noted some of the distinctions that would be important for this purpose e.g., costs of providing service to peripheral communities.

Beyond this, our experience suggests that the management information system should include more detailed information on various capital expenditures and infrastructure condition. This detail might include purpose, specific activities, locations, time frame, etc. Especially import, we think, is that the system link capital projects and infrastructure activities to particular physical performance and operating costs of the water system.

Included in these changes might be a continuing effort to estimate depreciation for the various components of the water system. This might be done on several basis, reflecting the different perspectives and uses of such depreciation e.g., for tax, financial, and economic calculations.

In making these recommendations, we recognize the limits of our ability to classify activities and costs according to various principles. For example, some administrative costs are impossible to assign unambiguously to either the water or wastewater sector. We don't encourage arbitrary classification, but urge a system that can support using a variety of classification principles e.g., classification differences based on different time perspectives can shift some costs form a fixed to variable classification.

7.4. Sensitivity Analysis

7.4.1. Grants and Grant Beneficiaries

The Water Framework Directive strongly urges adoption of full cost pricing by water systems in the European Union. When the water system is self-financing its operations through tariffs on users, the practical implications of this policy are relatively clear. When, as in the case of Pitesti, some support for an up-graded system come in the form of a grant, the thoughtful policy maker must consider how to allocate the cost savings and what to do when the cost savings are exhausted due to depreciation of the infrastructure. This issue is discussed at some length in Section 2 and again in Section 5.3.2 and Section 6.2.2.

We find that, at present, Pitesti is making no financial provision for replacement or refurbishment of gifted infrastructure. There is no economic efficiency argument that we believe compels ACP to adopt one policy or another in this regard. Indeed, the current policy may be advisable given the very high burden already imposed by current tariffs on customers. We do note, however, as a result of our sensitivity analysis on Future Scenarios, that a longer time frame and a positive real interest rate make such provision less burdensome than one might imagine.

7.4.2. Exchange Rate Risk

ACP and its customers face some financial risk from changes in the exchange rate because its loan re-payments to the Ministry of Finance are denominated in Euros. If the exchange rate between

the two currencies makes the Euro more valuable in RON terms, then the annual loan repayment in RON increases. This risk is not something ACP has much control over, short of participating in exchange rate hedging transactions. We did not run any scenarios to test the impact of an adverse movement in exchange rates, but this is something about which ACP and its customers should be concerned. ACP should, at a minimum, alert its customers to the nature and extent of this financial risk, as well as other risks that could affect its future costs and tariffs.

7.5. Broader Recommendations for Improving the Reform Process

7.5.1. Developing Independent Data and Tools for Advanced Assessment

More broadly, we recommend that in the future municipal water utilities like ACP and their owners establish an independent data base and analytical capabilities that allow them to more fully evaluate investment options in advance during pre-feasibility and feasibility assessments. This is especially true for those large scale investments involving grants that are conditioned by financing and performance requirements and requiring substantial increases in tariffs. Only with this background can all parties discuss in a balanced way the physical and financial implications of the choices involved and arrive at agreements that most efficiently assess both costs and benefits of these options and equitably spread the associated burdens and risks.

Such a capability should help ACP prepare for some of the future challenges already described. For example, it might be used to:

- Consider, and prepare for, growth on Pitesti periphery and ACP's possible role as a regional water system.
- Dealing with the need to find a repository for the sludge.

7.5.2. Support for Independent Exchange of Information and Experience

We feel that substantial advantages can be gained by support and encouragement of a program of national and international cooperation among water system managers and owners. The experience gained by ACP managers and City of Pitesti policy makers should not be lost to other water systems and communities. Their experience has made them acutely aware of the importance of independent assessment and advance planning to successfully meeting the interrelated challenges of investment selection and tariff and related reforms. They also have first hand experience of important implementation details that are of immeasurable value to water systems and water system customers that are just beginning to confront these challenges. It would be a great loss if steps are not taken to assure that this experience is effectively preserved and transferred.

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APPENDIX 1 - ELABORATIONS OF VARIOUS ECONOMIC DATA AND PRINCIPLES USED IN THIS REPORT

1 Costs and Investment Allowances in Tariff Accounts

Table 21 below list Pitesti's operating and investment cost components of tariffs as presented in its tariff proposal for November, 2004. These are subdivided into "Variable Expenditures", "Fixed Expenditures" and, finally, a set of special factors to be included as components of the final tariff. The categorization of components follows, in large measure, the accounting practices of ACP.

Table 21 Calculations Supporting Tariff Proposals for Drinking Water and Wastewater Service in Pitesti – Cost-Based Expenditures Per Cubic Meter Plus Special Items

Accounting or Cost Category		**Drinking Water: Tariff Calculation (2004 RON/m³)**	**Drinking Water: Tariff Calculation (2005 RON/m³)**	**Wastewater: Tariff Contribution (2004 RON/m³)**	**Wastewater: Tariff Contribution (2005 RON/m³)**
		Proposal for Nov. 2004	**Proposal for Sept. 2005**	**Proposal for Nov. 2004**	**Proposal for Sept. 2005**
Variable Expenditure of which:		0.341	0.426	0.2600	0.215
	Raw water	0.0735	0.081		
	Water Quality Protection			0.0186	0.012
	Technical Electricity	0.1863	0.281	0.1470	0.154
	Technical Materials	0.0158	0.026	0.0750	0.024
	Other Specific Expenditure	0.0384	0.038	0.0194	0.025
Fixed Expenditures of which:		0.4967	0.602	0.4460	0.691
Materials	Materials	0.0150	0.360	0.0114	0.026
	Electricity	0.0013	0.017	0.0011	0.002
	Annual Depreciation	0.0320	0.001	0.0220	0.036
	Royalty Fee	0.0064	0.043	0.0067	0.035
	Repairs (by ACP)	0.0250	0.039	0.0350	0.113
	Repairs (by contractor)	0.1118	0.071	0.0800	0.094
	Studies and Research	0.0179	0.077	0.0173	0.045
	Other 3rd Party Services	0.0615	0.015	0.0485	0.056
	Other Material Expenditures	0.0153	0.063	0.0100	0.030
Labor	Wages	0.1475	0.170	0.1532	0.180
	Heath Taxes	0.0325	0.037	0.0337	0.040
	Unemployment Fund	0.0044	0.005	0.0046	0.005
	Social Security	0.0103	0.012	0.0107	0.013
	Risk Fund	0.0008	0.002	0.0008	0.002

Accounting or Cost Category		Drinking Water: Tariff Calculation (2004 RON/m³)	Drinking Water: Tariff Calculation (2005 RON/m³)	Wastewater: Tariff Contribution (2004 RON/m³)	Wastewater: Tariff Contribution (2005 RON/m³)
		Proposal for Nov. 2004	Proposal for Sept. 2005	Proposal for Nov. 2004	Proposal for Sept. 2005
Financial Expenditures		0.0150	0.016	0.0110	0.017
Total Expenditures		0.8107	1.028	0.7060	0.906
Profit		0.0405	0.050	0.0353	0.044
Development Quota		0.0975	0.090	0.0932	0.080
MRD Quota		0.0100	0.020	0.0100	0.020
Tariff Proposal		0.9587	1.19	0.8445	1.05

"Variable expenditures" include current material and energy expenditures directly connected to water acquisition, treatment and distribution or, in the case or wastewater, collection, treatment, and discharge. "Fixed expenditures" are connected to the administration, maintenance, and repair of the system, including third party services. All labor costs are itemized as a type of "fixed expenditures". Also considered as "fixed expenditures" are "financial expenditures".

Based on discussions with the ACP's accounting department, these entries include several items related to investment in the water and wastewater system of Pitesti. In this Appendix we comment on the economic background of each of these.

2 Investment-Related Expenditures Classified as "Fixed Expenditures"

2.1 Depreciation

MWWUs in Romania are permitted, under current regulations, to use a cost plus fee system of tariff construction. The costs include actual direct expenses, including interest on debt. Costs also include "depreciation". Depreciation, as used by economists, is a real resource cost that reflects the loss in the value of an asset with time and use e.g., a piece of equipment used to produce output and, due to wear and tear on the equipment, has a lower market value. As such, depreciation has a solid foundation in economic principles. An enterprise that prices its product without considering depreciation will not be economically sustainable and an economy that allows its capital and infrastructure to degrade without provision for its replacement is an economy that is, inevitably, in decline.

Unfortunately, it is often difficult to estimate precisely estimate depreciation and calculations of depreciation can vary widely in practice. Some of this practice also deviates widely from the economic principles that give rise to the concept. In Romania, as in other countries, depreciation is an accounting item in current costs that sometimes has little or no link to the changing value of plant and equipment as they are consumed by time and the process of production. The basis and schedule for depreciation may be arbitrary or seriously in error as these values vary from market-based estimates of replacement costs and economic life.[26] Certainly, in 2000 ACP inherited a

[26] The accounting or calculated "depreciation" may be accepted as a legitimate cost by regulatory or tax authorities. Or the procedures used or quantities included under the "depreciation" heading may meet "domestic" or "international" accounting standards. Neither condition assures that the depreciation value is economically sound. Moreover, as one review noted, even proper calculation of economic depreciation does not provide for renewal of the infrastructure if revenues designed to provide for such renewal are used for other purposes, for example, to balance underestimates of operating costs.

system whose infrastructure is in serious need of repair, replacement, and upgrade. Past depreciation allowances clearly did not prevent degradation of Pitesti's water system over time.[27] As shown in Table 3, calculations of depreciation for Pitesti in 2004-5 amount to about 3 percent of the composite tariff on water and wastewater. It isn't clear that this is an adequate adjustment for real depreciation of the system and it certainly isn't adequate to compensate for past neglect of depreciating infrastructure.

Just as important, if not more so, for some water systems the revenues raised by the depreciation component of tariffs are not used to either finance current investments that offset depreciation or to build a cash reserve that can be used to replace the depreciated capital stock in the future. We don't know that this is the case for Pitesti. Certainly, the combination of various reserve categories described above works to encourage repayment of loans and provision for financing of infrastructure replacement and/or refurbishment.

2.2 Royalty

The "Royalty Fee" is a payment to the City of Pitesti by ACP. In 2004 this fee was 0.064 RON/m^3 for water and 0.067 RON/m^3 for wastewater. This fee was based on the estimated rate of depreciation of the water or wastewater infrastructure owned by the city by the amount of water or wastewater billed in the past**.** As such, it is essentially an estimate of depreciation of the City's investment in the water and wastewater system.

The City is not required to use royalty revenue to re-build the water and wastewater system. In practice the City has complete discretion over use of royalty revenue. In recent years the City has provided financial support for extension in the water and wastewater networks.

2.3 Special Fees

There are three special fees or "quotas" that are used to set the base for the tariffs in Pitesti. In economics these would be regarded as "net revenues"; revenues in excess of all direct and indirect costs. If all costs are fully and properly reflected in the accounts, then the other revenues can be used to fully cover costs and the net revenues can, in principle, be used for any purpose without threatening the long term operation of the water and waste water systems.

2.3.1 Profit Fee

Tariffs in Romania can include an allowance for "profit". As an economic concept, profit is a return *in excess of* all costs, including depreciation and a "normal" return to owner/investors. Economic profit accrues to successful "entrepreneurship"; to extraordinary ability to assess and deal with uncertain markets. In the context of a public utility that is a monopoly producer of a basic commodity, there is little risk and entrepreneurship. In such a case, the "profit" component of the tariff may actually be a special fee or tax built into the tariff structure with any net revenue accruing, in this case, to the system owner, the City of Pitesti. Alternately, "profit" as used here, may simply be a mislabeled normal depreciation to infrastructure investments undertaken but not otherwise appearing in the books of ACP i.e., like the royalty fee. For Pitesti's tariffs, "profit" is computed as five percent over estimated costs of operation. If "profit" is really related to depreciation of infrastructure, one needs to know the nature and size of the investment in order to assess if the size of the fee is appropriate.

2.3.2 Development Fee

In Pitesti this is the largest fee added to the cost base of the tariff. On the composite water and wastewater tariff, it accounts for 10.6% of tariff. As its name suggests, ACP - with approval from the Pitesti City Council and the National Regulatory Authority - created this fee to provide revenues for development of Pitesti's water and wastewater system to compensate for the shortfall in depreciation allowances in previous years. Certainly, the level of this fee suggests a seriousness of purpose in providing resources for system renovation and extension.

2.3.3 Maintenance, Replacement, and Development (MRD) Fee

Toward the end of 2004 this fee was introduced into tariff calculations at a rate of 1.11 percent of the composite tariff. The ISPA Financial Memorandum (2003) with Romania for the City of Pitesti required the establishment of an MRD Fund whose objective was "to set aside adequate resources for the loan repayment and for ensuring proper operation and maintenance" of the water and wastewater systems. The MRD fee was introduced by ACP to provide revenues to finance the MRD Fund.

2.4 Revenues Available for Investment in the Water System

As noted above, "depreciation" and the four "fees" – "royalty", "profit", development, and MRD – are included in Pitesti's water and wastewater tariffs in order to provide direct or indirect financing for investment to replace and/or upgrade water and wastewater system infrastructure. They were calculated to yield roughly 19.5% of revenues for these purposes. Based on the actual cost accounts for 2005, depreciation and the other fees amounted to roughly 10.9% of total revenues, or 3.17 million RON. Thus, while ACP has made tremendous progress in tapping local resources to support rejuvenation and upgrade of its infrastructure, the tariffs did not produce quite as much net revenue for local financing of investments in the system as anticipated.

3 Basic Economic and Price Data for Romania

3.1 Currency Conversion Factors

A number of currencies, dated with different years, are used throughout this document. In order to better compare these monetary units, we have converted many of these values into 2005 RON. The conversion factors used are based on Romanian government price deflators and currency exchange rates.

Table 22 Currency Conversion Factors to 2005 New Romanian Lei (RON)

Date	Euro (RON/€)
2000	1.9955
2001	2.6026
2002	3.1255
2003	3.7555
2004	4.0532
2005	3.6234
2006	3.5245

Source: National Bank of Romania. http://www.bnro.ro/

3.2 Price Deflators

Table 23 Price Deflators for Converting to 2005 New Romanian Lei (RON)

Date	Romanian Lei (ROL/2005 RON)	New Romanian Lei (RON/RON)
2000	4,558	0.466
2001	6,153	0.615
2002	7,633	0.763
2003	8,709	0.871
2004	9,345	0.935
2005	10,000	1.000
2006	10,656	1.066

Source: National Bank of Romania. http://www.bnro.ro/

National Institute of Statistics. www.insse.ro

4 Baseline Data Development and Compilation

4.1 Service User Categories

Customer characteristics used to develop service user categories:

Characteristics of service users:

- individual households
- households in block houses with individual contract with ACP
- block houses in contractual relation with ACP
- public institutions
- state owned industrial facilities
- small private enterprises
- another water system buying bulk drinking water from ACP

Geographical location and, in most cases, different tariffs:

- Pitesti
- Stefanesti
- Maracineni
- Bascov
- Albota and Bradu
- Cotmeana

Type of service received

- Water only
- Water and wastewater

Table 24 Expanded Customer Category Data

Service User Category Number	Service user category	Service User Category Description	Number of accounts	Type of service W = water WSc = water and sewage as composite services	Annual consumption of water per account (m^3/year)	Drinking water variable tariff (RON/m^3)	Annual discharge of wastewater as a percent of water use on average (%)	Annual discharge of wastewater per account (m^3/year)	Wastewater variable tariff (RON/m^3)
1	HH A, Pitesti	Individual houses, not all are connected to the sewer	5 724	WSc	134	1.0262	51%	68	0.9044
2	HH B, Pitesti	Block of apartments. Apa Canal is in contract with the block, and not with the individual apartments. The apartments have individual metering, but in addition to metered consumption they also pay their share of leakage within the building. The typical account represents a few dozen apartments.	1063	WSc	6 652	1.0262	95%	6 319	0.9044
3	HH C, Pitesti	Apartments in blocks, but – as opposed to HH B Pitesti – Apa Canal is in direct contract with the apartments. These households pay their metered amount, but nothing beyond that (like leakage within the building).	2 207	WSc	94	1.0262	95%	89	0.9044
4	Industry A, Pitesti	Big industrial facilities, both services	140	WSc	25 069	1.0262	100%	25 069	0.9044
5	Industry B, Pitesti	Big industrial facilities, water service only	59	W	25 069	1.0262	0%	0	0
6	Public institutions A, Pitesti	E.g. hospital, schools, local government.	97	WSc	16 705	1.0262	100%	16 705	0.9044

Service User Category Number	Service user category	Service User Category Description	Number of accounts	Type of service W = water WSc = water and sewage as composite services	Annual consumption of water per account (m^3/year)	Drinking water variable tariff (RON/m^3)	Annual discharge of wastewater as a percent of water use on average (%)	Annual discharge of wastewater per account (m^3/year)	Wastewater variable tariff (RON/m^3)
7	Private enterprises A, Pitesti	These are small enterprises. Not all are connected to the sewer.	1 380	WSc	619	1.0262	88%	542	0.9044
8	HH D, out of Pitesti	Individual houses in all other settlements, except for Pitesti. Only a small share is connected to the sewer.	2 392	WSc	90	0.85	6%	5	0.72
9	HH E, out of Pitesti	Blocks of apartments in all settlements out of Pitesti, some with individual household metering and contract, the majority has just one contract per block of building. All connected to the sewer.	231	WSc	995	0.85	95%	946	0.72
10	Industry C, out of Pitesti	Big industrial facilities, both services	11	WSc	5 105	0.85	100%	5105	0.72
11	Industry D, out of Pitesti	Big industrial facilities, water service only	3	W	13 735	0.8352	0%	0	0
12	Public institutions B, out of Pitesti	E.g. schools, local government. Not all are connected to the sewer.	8	WSc	16 757	0.84	29%	4 875	0.72
13	Private enterprises B, out of Pitesti	These are small enterprises. Not all are connected to the sewer.	105	WSc	577	0.85	30%	172	0.72
14	Industry E, out of Pitesti	Big industrial facilities and public institutions in Albota and Bradu.	3	W	94 555	0.5126	0%	0	0
15	Industry F, out of Pitesti	Wholesale of water to Cotmeana.	1	W	281 683	0.15	0%	0	0

Since ASTEC can accommodate no more than 15 service user categories, we needed to create at most 15 groups out of the original 34 groups. In undertaking this exercise we considered the following:

- It is preferable to merge categories which individually consume only a small share (less than 0.5%) of services of ACP, and leave larger consumer categories separate.
- Since the consumers of Pitesti are responsible for 92.2% of water consumption and 97.5% of wastewater discharge, and most of the planned future investments will take place within Pitesti, we preferred to keep a fair amount of detail of Pitesti service users.
- We agreed that in case of service users outside of Pitesti the characteristics of customers (e.g. small or large, household or industry) were more important organizing principles for modeling purposes than the location of the customers. For instance, the households in Stefanesti and Bascov together appear to make up a more homogenous group, than the households and industry of Stefanesti together.
- In some cases consumers with water service, and consumers with both water and wastewater services, were also merged into one service user category. This was the case for some of the individual houses, some of the public institutions, and the small private enterprises. Wastewater discharge as a percent of water consumption in these categories was estimated as the weighted average of the water used by customers belonging to the two types of accounts. In the case of households connected to the sewer, a 95% discharge ratio was used instead of 100%, reflecting present conditions in Pitesti.
- For all those service user categories, which were created by merging some of the original 34 categories, specific model inputs were computed in the following way:
- Number of accounts in each sub-category were simply summed,
- Annual water consumption per account is the weighted average of annual consumption of the original groups, with the weight being the number of accounts,
- Annual wastewater discharge per account is the weighted average of annual wastewater discharge of the original groups, with the weight being the number of accounts,
- The water tariff per m^3 is the weighted average of the tariffs of the original groups, with the weight being annual water consumption, and
- The wastewater tariff per m^3 is the weighted average of the wastewater tariff of the original groups, with the weight being annual discharge of wastewater.
- After the new service user groups have been created and the respective variables for them have been computed, we verified the computations by comparing the water consumption, wastewater discharge, water service revenues, wastewater service revenues and the number of accounts between the 34 original and the 15 newly created groups.

5 Burden Estimation

A common metric that is thought to be of help in evaluating the merit of a water tariff proposal tariffs is one that measures, in one way or another, the budget share required to purchase the good. This is frequently referred to as an "affordability" measure. Unfortunately "affordability" is a term of art that strikes us as at best misleading - since anything is affordable up to the limits of disposable income (and sometimes beyond) if the consumer values it enough – and at worst a willful miss-representation of economic theory – since it suggests that any good that one can afford

is worth purchasing. We prefer the term "burden" when discussing such a metric, since its aim to measure the burden that consumption of a good places upon potential consumers.

Burden indices are usually computed as a percentage ratio of expenditures on the service to some measure of budget or disposable income. The numerator should include all elements of the cost of the service that will reduce the amount of money available for other purchases. In the case of households, this means inclusion of VAT on water and wastewater services.

Choosing a denominator is a little trickier. In principle, one wants a denominator that reflects the disposable income of an average customer in any service user category. Disposable income measures are most commonly computed intermittently e.g., with every census of population, and for large aggregates e.g., on a national basis. Computing disposable income measures for a given service user category, in a given locality, in a given year, usually requires application of approximation and estimation methods since direct data are not ordinarily available. In our burden estimates, we used related data e.g., median salary data rather than median disposable income, to scale and adjust past disposable income data for households in Pitesti and to construct estimates of disposable income for several service user categories.

Despite our best efforts, these burden estimates must be regarded with skepticism. At a minimum, we are characterizing a typical condition in world in which many customers – households and businesses alike – are atypical. Both consumption and financial circumstances can vary considerably within a service user category. The burdens actually imposed will range from trivial to abusive. At best, burden estimate provides decision makers with a better sense of how burdensome their investment and tariff decisions are likely to be, not whether the decisions made are good or bad and certainly not whether the decisions are economically defensible.

The real question to answer – the one an economist would be most comfortable with - –is whether the decision will produce incremental value or benefits commensurate with the incremental tariff or cost customers and others are being asked to pay. Answering this question is real key to evaluating the economic merit of an investment program and its financing. Tariff and effluent charge reforms may support the program by providing more efficient financing as a result of cost savings or more efficient allocation of costs. The reforms may also support an economic evaluation by providing a better basis for judging the merit of the investment program. Our work here focuses on the former advantages of these reforms. A broader evaluation, including an evaluation of the service and environmental benefits of an investment program was beyond the immediate objectives of our work on tariff reforms. Calculation of burden indices provides a deficient surrogate for such evaluation, but it may be useful if the decision maker is aware of, and understands, its limitations.

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