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ENVIRONMENTAL GOVERNANCE OF WATER AND SANITATION NETWORK. ANNABA'S EXPANSION NETWORK REGULATORY CASE STUDY

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ABSTRACT

Regulation is a key tool for achieving the social, economic and environmental policy objectives of governments. Governments have a broad range of regulatory schemes reflecting the complex and diverse needs of their citizens, communities and economy. This paper is intended to facilitate better institutional arrangements the issue of water management and sewerage in wilaya of Annaba with a creation of a new area with significant investments over a period of 30 years. We try to determinate a governance framework, by a new pricing services, and provide tools for decision making to local authorities.

Keywords: Environmental Economics & Policies; Health Economics &Finance; Environmental Economics &Policies; Economic Theory &Research; Environmental Governance; Regulation

1. CONTEXT

Algeria is a North African Country which gained independence from French colonial rule in the 1962. It is the largest country in Africa in terms of land area.

The country has a mixed geography with a large portion falling in the Sahara desert region and a long coastal line along the Mediterranean Sea in the north.

Based on 2010 estimates, the country had:

- Population of 36 million;
- Surface: 2.400.000 km²;
- Algeria's GDP US $ 244.3 billion;
- GDP (PPP) per capita was US $4.798;

Hydrocarbons are the primary sources of revenue for Algeria. They account for 60% of total budget revenues and 30% of the GDP.

Annaba, in the northeast of the country, is home to around one million people living in 36 communities. It is par excellence an industrial city with the greatest metal industry in Algeria.

2. OVERVIEW OF WILAYA ANNABA

The Wilaya is bordered:

- In the North by the Mediterranean Sea.
- In the south by the province of Guelma.
- In the east of the wilaya of El Tarf.

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- In the west of the wilaya of Skikda.

It covers an area of 1,412 km ², and features by a varied topography, consisting mainly of mountains, hills and plains.

- Mountains are 52% of the territory of the Prefecture is an area of 736 km². They are distinguished by the massif of Edough whose highest point is Mount Bouzizi with 1,100 m above sea level. The hills and foothills, occupying 26% of the total, or 365 km².
- Plains represent 18% of the territory is 255 km ², and consisted mainly in the plain of Kherraza. The rest of the landscape consists of plateaus, and others, representing 4% of the area, 56 km².

The Wilaya of Annaba consists of six Daïrates around which twelve municipalities, five Urban, namely: Annaba, El Bouni, Sidi Amar, El Hajar and Berrahal, totaling to them almost 85% of the population, or 596.000 residents.

Wilaya is strategically located on the northern coast of the Mediterranean. It has a good position from the environmental and geo-economic point of view, this make it a potential magnet for regional market:

- A long coastline that extends over 80 km, representing a potential important market for fishing and tourism;
- An agricultural area (UAA) of 43,850 hectares near more than 60% of agricultural land and receiving a rainfall of nearly 1100 mm / year on average;
- A major river system consists of wadis and lakes;
- A rich and varied forest with more than 52.16% of the area of the Wilaya. It also has assets that are mainly related to its function as a regional metropolis, as well as its specific geo – morphological;
- Agro - favorable soil with high value agricultural soils;
- The existence of a dense and diverse industrial base;
- A multimodal infrastructure network (air - land - rail and sea) provides good coverage of the regional space and the necessary connections both with other parts of the country with the world;
- A university science park with a wide range of special technologies;
- A first-class tourist potential through the point of view of natural sites it contains as support equipment and communications infrastructure and existing access;
- A growing market.

3. SIMULATION

In our simulation, the French automobile manufacturer Citroën, decided to invest in a new area in Annaba called Belkacem Chouali.

This industrial activity will result in an important growth of population in the area. Consequently, besides the overall aim of increasing water supply, the municipality decided to improve the water facilities by the implementation of a new network.

Most networks in the old part of the city are in an extremely poor condition. It is not unusual for more than half of water production volumes to be lost as a result. The water collected in the project area consists of 70 % surface water and 30 % groundwater.

Water supply is currently largely intermittent in nature, and the population cannot be guaranteed a continuous water supply. Smaller communities and some urban districts, in particular, are supplied

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with water only once or twice each week. These leads to biological contamination of water that can result in inadequate drinking water quality.

4. REGULATORY FRAMEWORK

The municipality is the owner of network infrastructure and responsible for the investments and operation of the system.

Water and sewage treatment plants can be managed by private agents that can also implement investments, but the assets return to the public owner at the end of the concession period (generally 30 years).

So in this model there can be competition for the market (tenders) in the production of drinkable water and in the sewage treatment.

5. AIM OF CASE STUDY

Given the situation of Water and Sanitation Services (WSS) in Annaba, together with the regulatory framework within the municipality, our purposes are:

- To investigate, through the public government point of view, the financial sustainability of the water and sewage networks improvement project;
- To fix a tariff for the citizens that covers the cost of the network water distribution and sewage collection improvement.

6. INVESTMENT ANALYSIS

Old Annaba has 1 million habitants that consume an average of 4 m^3 per capita monthly.

The new part of the city will receive a very large industrial plant (automobile sector) and needs the infrastructure to provide water and sewage collection to the people attracted to this area.

Anabba's municipality will invest DA 1 billion in 10 years to construct water distribution and sewage collection networks. The drinkable water production and sewage treatment are not considered in this work since investments and operation are provided by private agents.

For the investment analysis, two scenarios were constructed:

A. Scenario 1: the new area has population growth rate of 3% per year;
B. Scenario 2: the new area has population growth rate of 2% per year.

The old city population growth rate is 0,5% in both scenarios.

Tables below bring the initial assumptions (100 DA = 1€):

Water cycle tariff was divided in 4 sectors. Only these related to the water and sewage networks are considered in this work.

Current Tariff

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Activity	Tariff (DA)
water treatment	1,26
water distribution	**1,89**
sewage collection	**2,21**
sewage treatment	0,95
Total	**6,30**
networks	**4,10**

The water consumption per capita is estimated to be 4m³ per month, or 133 L per person per day. With population and tariff information, it is possible to calculate the revenue related to water and sewage networks.

Initial population and water consumption

population	1.000.000
m³ per person/month	4,0
m³ year	48.000.000
tariff DA/m³ (networks)	4,10
revenue per year (DA)	196.560.000

Rates

taxation	17,0%
depreciation (30 years)	3,3%
Expected inflation rate on revenues and operating costs	3,7%
Expected nominal change in cost of employees	5,0%
Real Cost of equity	7,5%
Real Cost of debt	6,1%

Before the investment, in year 0, the revenues and costs produce a small profit that can be used as investment reserve.

In the simulation, the cost of employees is divided into 75% fixed and only 25% variable. Other operating costs are mostly fix as well (70%). The variable cost is related to energy.

Initial Revenue, Costs and Profit

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Revenue	196.560.000	
Cost of employees	39.312.000	75% fixed
Other Operating costs	137.592.000	70% fixed
Gross Profit	19.656.000	
Depreciation	17.000.000	
Operating profit	2.656.000	
Financial Expenses	-	
Profit (loss) before taxation	2.656.000	
Taxation	451.520	
Profit (loss) after taxation	2.204.480	

The investment of DA 1 billion in the new networks will be done in 10 years and will produce and important externality: the reduction of the amount of losses in the water distribution system. In the old Annaba, the losses are 40% and increase 0,8% each year. In the new area of Annaba, with the new network system the losses will be only 20% for the first five years. Then it increase 0,8% each year.

Besides the direct revenue, calculated with tariffs and water consumption, it is possible consider another indirect revenue due the saving water. The consumption in the new part of the city will demand less water production then the consumption in the old city because of the lower loss rate. Without the investment, Annaba's growth will be in the old city with old network and high loss rate.

The water losses can be calculated as:

$L = (PW - WC) / PW$

L: Water Losses;

PW: Produced Water (measured in the water treatment plant);

WC: Water Consumption (sum of clients measured volumes).

The produced water is:

$PW = WC / (1 - L)$

If losses are reduced, the water production can be smaller and the municipality can save money that would be paid for water production.

A. Scenario 1 – 3% population growth rate

If the new part of Annaba grows at 3% rate each year, the Net Present Value of the investment is positive which means that the investment is good from the industrial point of view.

Given the fact that the costs are more fix then variable, as the consumption increases 3% each year, the revenues cover the costs and the municipality will be able to pay all the investment in the 30 years.

B. Scenario 2 – 2% population growth rate

With 2% growth rate in the new part of the city, the Net Present Value becomes negative which means that it is a bad investment

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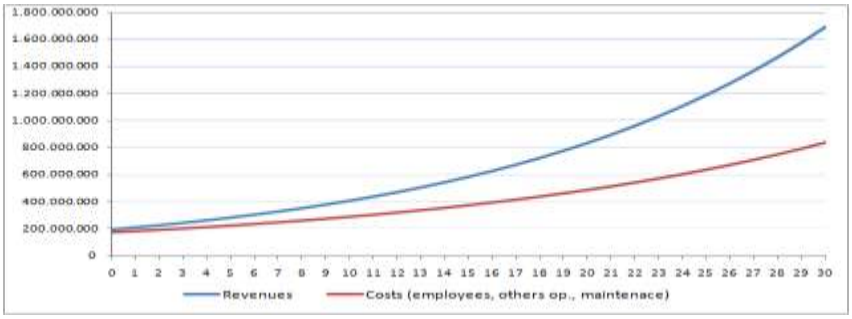
from the industrial point of view.

But, with a financial operation (soft loan) at 3% rate for 20 years, which returns a Financial Net Present Value of DA 79 million, the Total Net Present Value can be positive and the investment becomes possible.

7. TARIFF

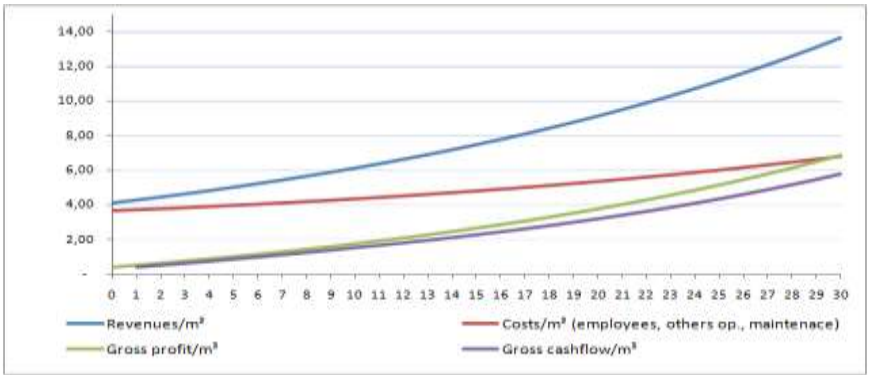
As fix costs are important in water distribution and sewage collection networks, the revenues increase much more than costs in the Scenario 1considering the previous tariff. The revenues increase due consumption growth, inflation and the "saved water effect". The difference between revenues and costs are gross profits as in the graphic below shows, economy of scale effect.

Revenues, Costs and Gross Profit – Scenario 1



The gross cashflow (gross profit – taxation) provides DA 1,13 billion (present value sum), that is more than the one necessary to cover the investment.

Revenues, Costs, Gross Profit and Gross Cashflow per m³ – Scenario 1



Because tariff must cover the costs and the municipality don't need profit, the 30 years average tariff could beDA 3,51, 14% less than the previous one in Scenario 1.

But municipality needs cash for the investment and tariff should not decrease in the earliest years. The networks (both water distribution and sewage collection) tariff could increase 5% in the first year and decrease 1,4% in the next years

to reach the same present value average in 30 years.

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In the Price Cap mechanism, the decrease would be the X factor, related to economy of scale:

$$P_n = P_{n-1} * (I - X)$$

P_n: Price year n

P_{n-1}: Price of the previous year

I : Inflation

X : reduction factor (economy of scale)

The whole water cycle tariff would increase 3,3% in the first year plus the inflation rate

	old	average 30 years	year 1	
water treatment	1,26	1,26	1,26	0,0%
water distribution	**1,89**	**1,62**	**1,98**	5,0%
sewage collect	**2,21**	**1,89**	**2,32**	5,0%
sewage treatment	0,95	0,95	0,95	0,0%
Total water cycle	**6,30**	**5,72**	**6,50**	3,3%

Tariffs (DA)

CONCLUSION

As the main costs are fix, the high growth rate made the investment in expansion of the networks in the new part of Annaba city a good one from the industrial point of view if the consumption grows at 3% rate per year (scenario 1).

It will be necessary a soft loan to make the investment possible if the consumption grows only 2% as in scenario 2. In fact, financial operation will not be necessary if the growth rate in the new part of Annaba is more than 2,36%.

The Investment Analysis needs several initial assumptions, some of them long term prediction, which can change significantly the result. In some countries, predict inflation rates for the next 30 years, for example, can be a very difficult task and may compromise the investment analysis result and the interpretation. It seems more appropriated for countries with some degree of stability and historical data for predictions.

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