

**Title of case:**

Slovakia: Development of Accounts Simulation for Tariffs and Effluent Charges (ASTECH) Model in water and wastewater services (#243)

**Subtitle:**

Modeling Water Tariffs and Effluent Charges for Better Pricing Policy of Water and Waste Water Service Providers

**Lessons learned:**

One of the most important results of the development and testing of the ASTEC model at selected water company was that water operators do not have a transparent system of book keeping and accounting practices. More specifically, the books must have a better developed cost structure. Such a cost structure should support cost-of-service pricing through cross tabulation of costs by activities, service areas, and accounts. The municipal board representatives cannot meet their responsibilities unless they have access to information that clearly shows the financial condition of the water operators and has enough detail to explain why it is in that condition. Their responsibility is to ensure that the municipal water companies do not abuse the privileged economic position as a public monopoly.

**Importance of the case to IWRM:**

Use of economic instruments supports to achieving the IWRM management objectives. Firm and clear regulation of tariffs set by water operators is one of the most important preconditions for the successful cost recovery policy. In many cases, both regulators and water providers are not fully familiar with economic implications of changes, such as new investments planned to up-grade the technical performance of water utility, proposed increase in pollution charges, changes in social and economic development of area provided by water. Application of models to simulate different scenarios might help to better decision on future development.

**Tools used:**

A3.3 Generating basic revenues for water  
B2.1 Public sector water utilities  
C1.2 Data collection  
C7.1 Pricing of water and water services

**Key words:**

Pricing of water and water services, cost-recovery of water services, modeling water tariffs and pollution charges, decentralization

**MAIN TEXT****Background**

Territory of Slovakia covers 49.034 km<sup>2</sup>. The country is divided into 8 regions and 79 districts. Within this broader administrative division there are 2 883 municipalities. Slovakia has a population of around 5,4 million and a population density 109,9 inhabitants per km<sup>2</sup>. Slovakia is a rural country of small settlements, the urban population is 56% concentrated in few larger cities. Slovakia is country in economic transition. In 2000, the GDP reached 887,2 bill. SK (constant prices). The average unemployment rate in 2002 was 19,6%. The rates of inflation have increased

dramatically in 1999, when large portion of price reform for public services was introduced (including water services). From May 1, 2004, Slovakia is a member of the EU.

Water for drinking water purposes is produced mainly from ground water sources (more than 83%). The public water supply provides 82,6 % of the population. There do exist different regional levels of water supply, e.g. Bratislava, Prievidza, Martin, Banska Bystrica with the highest supply rate of 94 % and a worse situation in the rural areas in eastern and southern Slovakia, with a supply rate of app. 50 % (Vranov nad Toplou, Sabinov, Bytca, Kosice-okolie).

The ratio between produced and invoiced water represents water losses (28.5%) and technological water (2.3%) (data of year 2001). There is a decreasing trend in the specific consumption of drinking water that might cause operation problems in the production and distribution systems. Typical drinking water supply system consists of well, distribution system (main and network pipes), treatment facility (one-stage or two stage), pumping system, water reservoirs.

Development of public sewer system is not as advanced as the water supply network. 54.3% of the population is connected to sewerage and this has not increased significantly over the last several years. The main users of sewerage are households and provide for 57.5% of the wastewater. The rest is for "others" represented by industry, commercial and institutional, and administrative bodies. Almost all municipal wastewater entering WWTPs is treated by mechanical and biological treatment (96.4%). The sewer systems and wastewater treatment plants are behind the overall development of Slovakia's economy and society. Only 55% of inhabitants are connected into sewer system. There are 205 municipal wastewater treatment plants (as December 2000) that treat municipal (in most cases municipal and industrial) waters of which:

- 3.8 % of wastewater is discharged only after the mechanical treatment
- 96.2 % of wastewater is discharged after the mechanical – biological treatment.

There are cases that biological nutrient removal step is already installed in existing WWTPs, however, most of WWTPs are obsolete and will require upgrade and modernization.

## **1. Problems**

Management of water resources did not undertake any economic restructuring after political changes in 1989. The Government has had the responsibility to regulate, develop, and provide water services to all users, such as population, industry and agriculture. With respect to infrastructure development, the water and wastewater (w&ww) services were funded directly by the Government (through the Ministry of Soil Management<sup>1</sup>). These services were provided for both inhabitants (so called "Households") and industry (so called "Others")<sup>2</sup>.

Water industry was not privatized (in comparison of other economic sectors in Slovakia after a brake down of centrally planned economy). The w&ww services were provided by the state-own water works (WW) utilities, even according to the Act on Municipalities (from 1990) delegated the public services (among w&ww services) to municipalities.

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<sup>1</sup> The name of this ministry changed from the Ministry of Forest and Water Management to the Ministry of Soil Management, but still included the provision of water services. The water quality issues belongs to the Ministry of the Environment

<sup>2</sup> Industrial activities were also in the state hands, no private companies existed before 1989.

### ***Decentralization of water services***

In 1997, the Slovak Government decided on the decentralization of state owned w&ww services<sup>3</sup> and a transfer of assets to municipal level. Unfortunately, the process was politically hampered and several times postponed. The final decision on the decentralization was taken in 2003. There were 5 W&WW utilities subdivided into “*odsepne zavody*” (daughter or smaller units without budgetary, development and planning autonomy, totally 47 units in Slovakia). Sizes of units varied and usually were attached to a specific town or service area. The operation unit thus involved a physically integral unit of drinking water supply and distribution and collecting wastewater and treatment.

The decentralization period was a period of dramatic situations, and several conflicts and problems attended the decentralization process:

- The Ministry of Finance regulated the maximum prices applied to municipal consumers (thus, the transformed w&ww services operators would operate in a distorted market).
- The Ministry of Soil Management lacked the capacity to process and to approve transformation projects received from applicants.
- It was not clear what rules (type of ownership, concession, lease, full divestment) would be applied to new operators of water services.
- Municipalities without water infrastructure in place were excluded from the transformation.
- Municipalities (agglomerations of concentrated industries), where water supply and sewerage services resulted in the profit, were not willing to join w&ww companies with other municipalities in the region that had money-losing systems.
- Municipalities were reluctant to receive facilities under construction due to a lack of finances, as the Government did not allocate resources for completion.
- In addition, municipalities were reluctant to take over the services due to unclear future development in tax, price, insurance and depreciation policies.

### ***Establishment of public/private partnerships***

In addition to the decentralization, the Slovak Government adopted a new Act on Water Supply and Sewerage Utilities. According to this Act, the owner and operator could be any physical or legal person that receives a license to own or operate the system. As the result of the transformation of water service provisions, municipalities are obliged to establish Municipal water companies (as successor companies of old WW utilities) where the involvement of private sector is not regulated. Currently, in Slovakia, there are municipal water companies that either provide services as public entities or contract public/private entities for limited period (from 10 to 25 years).

### ***New water legislation***

In 2003, the Water Act was adopted in order to meet the EU water related legislation. According to the Water Act, the polluter is obliged to treat wastewater according to the state-of-art technologies (that is secondary treatment at the minimum). The Water Act also requires treating wastewater to meet the emission limits. Therefore, there are cases that the polluter had to add tertiary step in order to meet the standards.

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<sup>3</sup> The state ownership meant that planning, development, monitoring and budgeting was done by the Ministry of Soil Management.

According to the EU Urban Waste Water Directive (that was transposed into the national legislation), agglomerations larger than 2000 pe must be connected to sewer and wastewater treatment system. It is reported that only 12 Slovak WWTPs currently meet the EU obligations and would not need any change. There are 290 municipalities in the category of 2000 - 5000 pe without any WWTPs in place (1). The number and type of WWTP to be constructed or upgraded are as follows (2):

- 287 new plants with technology to remove organic pollution with the complete nitrification
- 3 new plants with the technology to remove organic pollution with an enhanced biological removal of  $N_{tot}$  and  $P_{tot}$  (by chemical or biological methods)
- 243 existing plants that need an upgrade that will include complete nitrification and/or nutrient removal.

### ***Economic regulation***

Formerly (till 2002), economic regulation was conducted by the Ministry of Finance that:

- regulated tariffs of w&ww services for “Households”; rates were gradually increased from 1990 but still did not cover the full operating costs of operators<sup>4</sup>. It is necessary to mention, that tariffs for “Others” were not regulated and were individually negotiated between provider and client.
- provided budgets for the state-owned entities (including w&ww utilities); municipalities were excluded as they received annual budget based upon the size and number of population. The municipalities invested municipal infrastructure under so called “infrastructure development budget”. Only few municipalities included the development of water infrastructure into their investment plans, as this was a role of the central government. It should be noted that the state budget allocation in period from 1989 – 2002 dramatically decreased.
- provided non-investment subsidies to recover the costs of w&ww service providers. The state subsidies gradually decreased and stopped in 2001. This was due to state budget constrains rather than to correct the distortion in household tariffs. Also, there might be an explanation that the Government did not budget the w&ww utilities from 1996 due to planned decentralization (and possible privatization). In practice, the Government let the w&ww utilities “dry out” and allowed the assets to depreciate (and lose value) before the completing the transfer to municipalities.

From 2003, the economic regulation of the central government stopped the National Office for Regulation of Network Sectors was established to monitor and regulate water tariffs based upon the “justified” costs of each individual operator. Each provider of w&ww services must apply for the permit to charge “Households and Other” clients in a given year and the National Office issues a decision (that is publicly available) for each individual provider.

Basic rule is that the tariffs are designed to cover the operation costs of w&ww operator but discriminates against “Other Users” in favor of “Households and Other” consumers. Peculiar situation is when the operator has a high share of households where the maximum tariff is given and the rest of the production cost must be reallocated among other clients (big cake of cost is divided among “Households” and “Other” users artificially and is based upon a “social affordability” of Households). It is not clear, what the basis for the maximum tariff was in the past. The annual increase of coefficients are also “arithmetically” design to meet the same price of both groups (Households and Others) in 2005.

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<sup>4</sup> The level of rates was constant until 1990 (the price of drinking water was 1.74 SK/m<sup>3</sup> and price of sewage water was 1.31 SK/m<sup>3</sup>). In 2002, the price of drinking water was 11,50 Sk/m<sup>3</sup> and price of sewage water was 7,50 SK/m<sup>3</sup>. In 2002, USD 1 was 35 SK (Slovak crown) in average.

### *Other problems*

Till now, municipalities and municipal governments have been “passive” players in the transformation process. Old w&ww utilities were turned into municipal water companies without any assessment and review of their economic portfolio and performance. Anticipated problems will come when new investments should be done and clearly, municipalities are not prepared to make informed and experienced decisions. In addition:

- Municipal authorities are not trained to make contracts and to deal with private companies
- Municipalities are not ready to plan new investments due to the lack of expertise and will rely on operators` proposals
- Municipalities do not have a tradition of, or practice in, working in partnership with each other. They usually regard each other as economic competitors and this is amplified by the fact that representatives of different and competing national political parties are often in charge of municipal affairs. In addition, municipalities regard each other as political competitors.
- Municipalities are not aware of environmental requirements, as they were not part of legislative process of EU accession.

## **2. Action taken**

There has been some dissatisfaction in the international environmental community with the pace of improvement of pollution control in the Danube catchment’s countries. Representatives of governments at all levels in these countries say that there is simply not enough money (resources) to make quick and substantial progress. Representatives of the international environmental community sometimes reflect the view that there is simply not enough political "will" to make such progress and that there is simply not enough political pressure. Thus, the UNDP/GEF Danube Regional Project (DRP) was launched to support:

- Policy reform and legislation measures for the development of cost-covering concepts for water and wastewater tariffs, focusing on nutrient reduction and control of dangerous substances,
- Implementation of effective systems of water pollution charges, fines and incentives, focusing on nutrients and dangerous substances.

These objectives included review, analysis, and evaluation of municipal w&ww utility tariffs and effluent charges in the countries of the South and Southeast (SSE) Danube River Basin (DRB) including Slovakia.

Recognizing that economic and financial conditions, both current and prospective, are critical to the effectiveness of various tariff and effluent charge reforms, the experts involved in the DRP adopted an analytical framework based on the notion of a system of accounts (3). These accounts are "balance sheet" systems that represent: 1) current account or budgetary balances based on current costs and current revenues, 2) capital accounts that allow for long-lived debt and infrastructure services and 3) social accounts that reflect environmental and social goods (and bads). Each of these accounting schemes broadens the basis of the accounting calculations: the movement from current to capital accounts to examine financial sustainability, the expansion from capital accounts to social accounts to examine the sources of economic welfare that aren't well reflected by markets.

In order to do so, the ASTEC model was developed. The ASTEC model simulates municipal w&ww accounts. This simulation includes separate accounts for drinking water and wastewater services and both financial and physical accounting for those services. In ASTEC model, water customers can be divided into up to nine groups and distinguished by any dimension considered important by the model user. In general, service users are distinguished by

- the type of activity in which they are engaged e.g., households vs. industrial;
- the type of services they use e.g., water only vs. water and wastewater;
- and the costs they impose on the municipal w&ww companies e.g., local vs. remote location.

The input data of the model can be changed to represent different conditions. For any data set, ASTEC also allows the model user to make some choices as to how costs are allocated to different w&ww service user groups and what these groups must pay the same rates. The model user can also select some built-in options regarding tariff design e.g., fixed fees vs. fixed fees and commodity charges. The ASTEC model also has an "optimization" option: the model user can ask the model to compute the minimum tariffs necessary to just cover the costs of service. The ASTEC model also has features that allow the model user to incorporate into a scenario the consequences of tariff and effluent charge levels for water use, wastewater production, and effluent output.

### **3. Outcomes**

The ASTEC model was used and tested in several SSE Danube river countries, including one municipal water company in Slovakia. The water company was selected based upon the willingness to cooperate. The only criterion was that such case study area should have a plan to invest into water infrastructure in order to test what will be implications of new investments on economic portfolio of the WW utility.

Then the model was run for a variety of scenarios. One scenario confirms the current financial condition of the WW utility. Other scenarios can explore the financial, effluent, and other impacts of different tariffs or effluent charges, maintenance programs, and management practices under the "baseline" conditions.

The case study data was also used to investigate the implications of "sustainable" service levels. In this instance one includes full capital accounts in the ASTEC data entry. The "sustainable" data entries for the case study community could be supplemented with cost and financing data for WW utility development plans. This combined data constituted the basis for "expansion/upgrade" scenarios with ASTEC. The development plans included new and improved levels of wastewater treatment. The ASTEC also simulates concurrent changes in water consumption, debt payments, and other physical and financial conditions. The present version of the model requires Excel 2000 or a more developed version of Excel, with Solver installed and Excel enabled to run macros. The user surface of the model is in English, but the Excel itself can be in any language, that is not supposed to affect the proper functioning of the model. In older versions of Excel or obsolete computers running some of the scenarios may require a lot of time or it may not be possible.

In tested WW company, following main conflicts were identified:

- Tariffs for the same product are different for Households and Others
- Pollution charges do not have significant impact on treatment improvements (and tariffs)
- Potential company savings (internally e.g. by good housekeeping) will reduce the profit
- Construction of new WWTP is a must due to a new environmental legislation

- Increased tariffs bring the reduction in water consumption (in the case of industry this might lead to disconnection)

#### 4. Lessons learned and replicability

In order to test the ASTEC model and to provide WW utility management with the alternatives, following “modeling questions” were assessed:

1. What is the balance of revenues and costs of the operator when maximum tariffs are applied? In 2002, the operator run the system in a profit 45.2 mill. SK. Unfortunately, the positive result of the operation of w&ww services was distorted by those clients that do not pay the bills. In addition, the economic results of selected WW unit were not reported or monitored as the selected case is a part of a larger WW company.
2. How tariffs change if full cost recovery feature of the ASTEC model is applied? The results showed that drinking water tariff for Households should be decreased by half and tariff for Other should be four times lower. Also, tariff of wastewater applied for Others should be decreased by half. This was important finding as the WW utility now understand that there is a cross subsidization from drinking water to waste water operation. The WW utility did not justify this phenomenon before.
3. What will happen in 2015 when new (stricter) environmental charges will be applied but WW company will not invest into the environmental improvements (only replacement of facilities)? WW company will still run in the profit 32 mill. SK. In other words, company is not under the pressure to invest into environmental improvements (even when pollution charges will increase from 7,6 mill. SK to 31 mill. SK annually).
4. What will happen when new planned investment will be placed (plus new environmental charges applied)? WW company would need to slightly increase tariffs, but it would pay less for pollution charge (mainly in Ntot and Ptot)

The purpose of the examination of the investment plan in the selected w&ww service unit was to provide a more concrete background and specific insight for use in identifying and evaluating selected institutional and policy reforms connected to water and wastewater tariffs and pollution charges. A main lesson learnt is summarized in following table.

Strategy Name	Strategy description	Comments/Concerns
Revision of legal and institutional arrangement	Establish a clear (unambiguous) responsibility of Municipal Boards Develop clear contracting conditions between municipalities and operators Establish transparent organization structure of operators and management	Training of municipal representatives needed
Introduction of regulation over monopolies	Revisiting the role of National Office for Regulation of Network Sectors Examination of individual constituents of costs and tariffs Clear description of cost items including depreciation and future savings Removal of indexing HH tariffs Independent auditing Allow for increasing/decreasing block tariffs Informing the public about future rising	Time consuming legislative process Needs to improve enforcement

Strategy Name	Strategy description	Comments/Concerns
	costs	
Introduction of cost center	Examination of individual constituents of costs and tariffs Examination of two-part tariff structure Clear description of cost items including depreciation and future savings Development and use of costing models	Increase costs in a short-term Unwillingness of operator to introduce a cost center with the argument of an additional burden to “reporting” requirements Unwillingness of municipal boards to be involved in examination with the argument of highly specialized issue to deal with at political level High willingness of industry to participate
Revision of pollution charges	Examination of unit cost of pollution reduction Allow for payment holidays in case of mitigation investments Allow for increasing/decreasing tariff depending on input pollution load (mainly valid for industry) Public assess to information on pollution charges	Needs to improve enforcement and monitoring of polluters Transaction costs with respect to monitoring and public assess

The ASTEC model was tested only at one w&ww service operator in Slovakia. There is a plan to disseminate the model and provide it to other operators on voluntary base. One should consider some limitations or problems in using the ASTEC model, as identified by experts in the study unit:

- Concentration to insert data is necessary and the WW company should spent the time to break down cost items that is not normally requested by anybody
- In many WW companies, there is a “murky” interpretation of investment costs
- The ASTEC model provides for several variables that were not tested.

## 5. References and Contacts

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### *References and websites:*

[www.icpdr.org](http://www.icpdr.org)