

Drinking water policy in the frame of the Directive 2000/60/EC with emphasis on drinking water prices

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Abstract The Water Framework Directive (WFD) 2000/60/EC, which has been transposed into the national legislation with the Law 3199/2003 (MoEPPW, 2003), will cause substantial changes in the drinking water pricing policy and the domestic water authorities involved such as the Municipal Enterprises for Water Supply and Sewerage (DEYA). Up to date, drinking water pricing policy has been based only on the recovery of the economic cost and in some cases neither this. Therefore, domestic water is not priced taking into account its real cost. Based on data provided by 74 DEYA representing 2.10 million inh, the average water price is estimated to be 1.19 €/m³. Analysis of these data reveals a deviation of 41.67% from the real cost. The relation of consumers with the Enterprise, but also that of management and employees, should be a bidirectional relation, in order to be comprehensible by all. Thus, an agreement that will point out that the most excellent quality of water presupposes water policy which will consider sustainability and the current requirements of the Enterprise and of course the consumers should be established between them.

Keywords DEYA; water enterprises; water resources; water pricing

Introduction

The rapid population growth, decreasing water resources availability, contamination of surface and ground water sources, competitive use of water and the increase of the frequency of droughts is bringing about the intensive need to develop alternative schemes to manage water resources in an integrated manner (Kolokytha *et al.*, 2002; Tsagarakis *et al.*, 2003; Tsagarakis *et al.*, 2004). This is particularly important in areas with a semi-arid climate such as the South and East Mediterranean countries.

Although most of the countries' urban water constitutes a low percentage of the total water use, it is considered to be the most important component of water management policy. This is because urban water is related to the public health and environmental protection. In Greece, there are three distinct types of domestic water supply agencies.

- (a) In Athens and Thessaloniki cities – owned companies (non profit making corporations) own and operate the treatment plants (for water supply and wastewater) but function as private enterprises with a 20-year concession contract. In Athens, the Company for Water Supply and Sewerage of the Capital (EYDAP) and in Thessaloniki, the Company for Water Supply and Sewerage of Thessaloniki (EYATH). They are inspected by the Ministry of Environment, Planning, and Public Works (MoEPPW) that approves the pricing policy. The networks account for 45% of the volume supplied. EYDAP was partially floated (28% of shares) and listed on the Athens stock exchange in 2000. Also, EYATH has been listed on the Athens stock exchange since 2001. The population served by EYDAP and EYATH is estimated to be 53% of the total population of Greece.
- (b) Cities with more than 10,000 inhabitants are managed by Municipal Enterprises for Water Supply and Sewerage (DEYA) operating as private companies, but owned by

the municipalities, as enacted by Law 1069/80 (MoIPaD, 2003). However, there are also cities with population less than 10,000 inhabitants in which DEYA have been established. Till now more than 200 DEYA responsible for water and wastewater services have been established. Population served by DEYA is estimated to be 35% of the total population of Greece.

- (c) Municipalities (about 830) which are responsible directly for water supply and wastewater services and account for only 12% of the total population served.

Pricing policy of drinking water is an important issue since it determines the reliability and quality of water supplies and the possibility for the development of new projects for meeting future quantitative and qualitative demands. In Greece today's total water consumption is estimated to be more than 8,000 million m³/yr, while that of urban water is estimated to be 11% of the total consumption (Safarikas, unpublished data). However, the urban water is considered to be the most important component of the water management policy. In Greece, as in the most of the European countries, determination of prices undertaking a business risk is not usual issue. The basic elements – points calculated for the cost assessment – are: (a) personnel's remuneration and expenditure, (b) third parties' remuneration and expenditure, (c) third parties' allowances, (d) taxes – duties, (e) miscellaneous expenditure, (f) interests and related expenditure, (g) depreciation of capital assets, and (h) anticipation for investments.

The above elements constitute the point of reference for DEYA as for the determination of cost and the application of pricing of their services. The popular view on full cost recovery appears to be that a balance should be achieved between social acceptability and the need to cover investment costs. The deposit and loans funds in Greece recommend that water should not exceed 1.5% of household income. In Greece applying full cost recovery would have considerable impact, particularly on domestic prices, and strong public opposition would be expected.

The present study evaluates the economic appraisal of drinking water in Greece. The existing drinking water pricing policy in the DEYA is discussed and a comparison with Athens and Thessaloniki governmental Companies is undertaken. In addition, the amendments that will be brought about by the Water Framework Directive (WFD) (EU, 2000), which was transposed into the national legislation with the Law 3199/2003 (MoEPPW, 2003) are analyzed.

Pricing policy of Greek enterprises in the framework of the Directive 2000/60/EC

The implementation of the WFD is mainly directed to the establishment of a framework for any Community action in the sector of drinking water policy. WFD faces the problem of integrated and sustainable management of water resources in an innovative way, also looking into environmental issues. We need to note that this WFD was incorporated in the national legislation with the Law no. 3199/2003 (MoEPPW, 2003). However, it postpones the question of recuperation of water cost for later regulation. Its application to all Member States will have been completed by 2015.

The WFD will influence the operation of DEYAs, which are the administrative bodies of the management of urban water resources. A sector of DEYA that will be influenced immediately by the WFD is water pricing. Although water is recognised as a public good, it has also economic value that should be recovered. It is well known that the pricing of water supply services has been connected in the past with the management of water resources and the sustainable water policy. At present, the sector of water supply in EU deals seriously with the recovery of the water cost as this is demanded by WFD. According to that Directive we should take into consideration: (a) economic principles that report the WFD and more specifically the "polluter pays" principle, (b) economic

tools that are reported in the analysis of economic efficiency of measures, and (c) economic measures that concern the water services pricing. In addition, according to the WFD, the States-members should ensure that until 2010 the following things happen (Table 1):

- (a) the water pricing policies provide suitable incentives to the users for effective use of the water resources and for the pursuit of environmental goals of the WFD. Consequently, the water pricing policy will constitute a serious incentive tool for the achievement of environmental goals described in the Directive, i.e. water consumption, most effective water use, reduction of pollution, etc.;
- (b) the water cost recovery is distributed with economic analysis in key sectors such as the industry, the agriculture and various households.

Factors of setting the water pricing policy

Both profit and non-profit organizations, agencies and services have to determine prices for their products or services. Consequently, the price must cover expenses, such as payments for the rent of premises, transportation costs, electricity, water and telephone bills. In a competitive market prices are set at the point where demand meets supply. However, in the case of monopoly services such as Greek DEYA, the determination of prices should depend on the water cost.

Most citizens believe that the income taxes are the cost that they have to pay for the privilege to earn money. The question that is usually addressed by the citizens is “how the prices are determined” and more specifically: (a) How the initial price for a service or a product is determined, (b) how the price changes with time and in the long run, and (c) when the Enterprise should change the price and how it should go about doing this.

The answers to these questions are respectively the following: (a) In every case the cost of investments and operation in combination with the repercussion of price to the consumers should be taken into consideration, (b) with geographic pricing, with promotional pricing, with discrete pricing, with pricing based on the product, and with differentiation between sectors of water use, and (c) price should vary to cover the cost of investments, operation and maintenance expenses of the Enterprise, administrative cost due to inflation and the excessive demand.

The principle of the water cost recovery according to the WFD

A basic element that should be taken into consideration by the DEYA is the estimation of the degree to which the total cost of services of water is recovered so that the suitable pricing policies for the full recovery of the water services cost should be determined. Moreover, Tsagarakis (2005) goes further discussing even the perspective of wastewater pricing, which is one of the products of DEYA. However, the correct pricing of water is

Table 1 Timetable for implementation of the Directive 2000/60/EC

Year	Issue	Reference
2004	Characterization of river basin: pressures, impacts and economic analysis	Art. 5
2006	Establishment of monitoring network	Art. 8
	Start public consultation (at the latest)	Art. 14
2008	Present draft river basin management plan	Art. 13
2009	Finalise river basin management plan including programme of measures	Art. 13 & 11
2010	Introduce pricing policies	Art. 9
2012	Make operational programmes of measures	Art. 11
2015	Meet environmental objectives	Art. 4
2021	First management cycle ends	Art. 4 & 13
2027	Second management cycle ends, final deadline for meeting objectives	Art. 4 & 13

a prerequisite for wastewater pricing because people will not buy recycled water for irrigation when fresh water is cheap. The determination of cost is supposed to take place with the highest possible precision; complexity of its calculation is not to be overseen. That is to say, that we must take into consideration the economic cost, the cost of natural resources, as well as the environmental cost, in order to have full water cost recovery.

The DEYA should adapt their pricing policy (which is determined to a large extent by their founding Law) to the requirements of the WFD. Currently, water pricing substantially includes the recovery of operation and economic cost (and many times neither of these), while the recovery of cost of natural resources and environmental cost is not included.

Economic cost

The analysis which is considered in this study includes the economic cost of the Enterprises of water supply and sewerage, i.e.: the administrative cost, the maintenance cost of work, and investment cost. The costs are defined as follows:

- (a) The administrative cost is the cost of water supply services (cost of employment and cost of energy). Certain taxes could also be included in the operational costs.
- (b) The cost of maintenance concerns the existing infrastructure (the role of subsidisation should be clarified). Given that a lot of elements of infrastructure connected with the water supply and the sewerage are long-lasting investments and inside the ground, the cost of their maintenance is difficult to calculate. This is a key point, because a lot of water supply services could attempt to decrease the maintenance cost in order to decrease the water prices. However, this would render doubtful the viability of infrastructure for a long time.
- (c) The cost of investments is the cost of financing them (the subsidies should be considered). Capital costs are recovered through the depreciation of capital assets. The future investments should be taken into consideration in water pricing in the longrun, i.e. for 5–10 years.

The data used in this study (Table 2) are based on: the historical economic elements of DEYA of last five-year period (roughly 90 DEYA), pricing policy of 74 DEYA, divergence in operation expenses amounts up to 56% (55% for the model cost and 85.80% for the real cost). Historical data (revenue and expenses) used for investments are shown in Table 3. It is mainly due to the projects of water supply and sewerage, where is presented

Table 2 Municipal enterprises (DEYA) investigated in this Study in 2003

Administrative regions	DEYA (no.)	Population (no.)	Employees (no.)	Population/employee	Water consumption (m ³ /inh.)	Pricing (€/m ³)
East Macedonia	8	311,380	532	585	25,747,620	1.32
Central Macedonia	15	303,475	372	816	33,046,417	1.06
Western Macedonia	5	130,967	351	373	8,588,413	1.30
Thessalia	11	390,692	600	651	31,527,376	0.91
Epirus	3	113,502	282	402	8,932,000	1.59
Ionian Islands	2	43,070	139	310	3,674,533	1.55
Central Greece	5	114,957	180	639	9,945,380	1.10
Western Greece	4	118,284	178	665	9,093,679	0.91
Peloponnissos	5	127,475	259	492	10,142,102	1.16
North Aegean Islands	2	59,975	111	540	3,504,519	2.01
South Aegean Islands	7	113,298	375	302	10,924,188	1.42
Crete	7	277,894	455	611	19,926,816	1.23
Total	74	2,104,969	3,834	549	175,053,043	1.19

Table 3 Balance of historical expenses and revenues used for investments (in million €) in 2003

Revenue type	Expense type	Prototype	Real
From 80% on water services	195		
From the State Subsidy (Law 2065/92)	105	For operation	55.00%
From allowances	775	For taxes	4.02%
From loans	275	For projects	40.98%
Total	1,350	Total	100.00%

negative divergence of the order -82.31% (40.98% for the model cost and 7.25% for the real cost). However, the accounting cost of water is distributed as presented in Table 4.

As regards the DEYAs' revenues and expenses, they consist of: the wages and expenses of personnel (46.90% of the expenses and 70.26% of the income), income from others (18.89% of the expenses and 28.30% of the income), on depreciation (18.61% of the expenses and 27.88% of the income), and finally in annuities (6.95% of the expenses and 10.41% of the income). These data are presented in Table 4. Based on the available data of DEYA pricing policies the mean price of drinking water is 1.19 €/m^3 , with fluctuations from region to region. Also, the medium price of the sewerage connection is 3.48 €/m^2 .

Taking into consideration the water pricing policy that is used by the DEYA based on the population served, it is obvious that in a DEYA with population $\leq 10,000$ residents the mean price is 0.84 €/m^3 , in a DEYA with population from $10,001$ to $30,000$ residents the mean price is 1.17 €/m^3 , in a DEYA with population from $30,001$ to $50,000$ residents, the mean price is 1.39 €/m^3 , and finally in the DEYA with population from $\geq 50,001$ residents the mean price is 1.49 €/m^3 (Table 5).

Considering a general survey including 49 DEYA for which data are available, the total expenses amount to 175.77 million €, while the sales amount to 117.00 million €, and the remaining other incomes to 15.17 million €. Thus, we get a loss of 43.56 million € (Table 6).

Table 4 Pricing based on the revenues and the expenses

Category	Revenues	Expenses
Employees' expenses	70.26%	46.90%
Wages of others	2.96%	1.98%
Supplies	28.30%	18.89%
Taxes	0.33%	0.22%
Other expenses	6.62%	5.80%
Annuities	10.41%	6.95%
Depreciations	27.88%	18.61%
Estimates for operating costs	0.97%	0.65%
Total	147.73%	100.00%

Table 5 Pricing based on population in 2003

Company's size	Pricing (€/m^3)
Population $< 10,000$ inh.	0.84
Population $10,001 - 30,000$ inh.	1.17
Population $30,001 - 50,000$ inh.	1.39
Population $> 50,001$ inh.	1.49
Average	1.19

Table 6 General balance of expenses and revenues (in €) in 2003

Expenses		Revenues	
Category	Amount	Category	Amount
Reserves	3,862,023.45	Sales	116,999,403.17
Employees	81,744,925.63	Miscellaneous	15,167,643.97
Wages of others	3,447,594.13	Sub-total	132,167,047.14
Supplies	32,924,516.61	Deficit	43,596,049.61
Miscellaneous	8,106,576.61		
Depreciations	12,113,856.07		
Annuities	32,438,782.03		
Estimates	1,124,822.22		
Total	175,763,096.75	Total	175,763,096.75

Considering the determination of water price policy, the main issue that the DEYA are facing is the unbalance of operation expenses with the income of water supply and sewerage at infringement of Articles 25 and 26 of Law N. 1069/80 for “establishing Greek DEYA”. Indicative of the situation is the fact that while the calculated mean price of water for 74 DEYA amounts to 1.19 €/m³, in order to balance the income with the expenses the mean price should be 2.04 €/m³, i.e. there is a total divergence of price up to 41.67%.

Below it is explained how the two largest Companies of water supply and sewerage (EYDAP and EYATH), which are listed on Athens Stock Exchange, apply the right water policy which provides the possibility of viable growth of the two Companies; while the mean price of DEYA amounts to 1.19 €/m³, at the same moment the mean price in the Athens and Thessaloniki Companies is 3.26 €/m³ and 1.67 €/m³, respectively. The main conclusion of this comparison is that the mean water price of the DEYA has to increase from 1.19 to 2.04 €/m³ so that the functional expenses are covered. There is an average price difference of 41.67% between the real price and that applied today. In addition to the above, it should be noted that no consideration has been given to the creation of a reserve fund for new projects such as: replacement of networks, manufacture and extension of work of water supply and sewerage, etc., although it is referred to in the Law no 1069/80 (MoIPaD, 2003). More specifically, Article 11 imposes an 80% special fee for that purpose. Of course most DEYA charge that special fee, but they use it mainly for covering their operational expenses.

Cost of natural resources

The cost of natural resources that includes profit loss due to the restriction of available water resources is also very important. The decrease of water resources availability inevitably leads to the over pumping of groundwater, to the extension of water transportation distance, etc., and of course to the increase of operating expenses, as well as other expenses such as the energy and the maintenance cost which consequently increase water price. This should be avoided when the losses of natural resources are decreased or when better management of available water resources is achieved. From the analysis done in this study, it is indicated that for each 1% recovery of natural resources it is possible to achieve a price reduction up to 0.03 €/m³. Consequently, the objective that it should be placed is double: (a) balancing of incomes and expenses and (b) reduction of water losses for compaction of operating cost.

Environmental cost

A third principle that should be considered is the environmental cost. In general it includes the damages to the environment and the ecosystem which are caused by water

use. Estimation of the environmental cost in the water cycle is a very difficult task, because it includes the pollution due to the agricultural and the industrial activities, the conservation and maintenance of the reservoirs and aquifers, the repercussions from the water transport between water regions or water catchments, basins, etc. Under environmental cost should also be placed the pollution control and mainly the cost from sludge reuse and the pollution cost caused by the rainfall. Finally, an additional cost that could be incorporated is that of atmospheric phenomena with circular nature (drought and floods) that should be estimated by specific studies. At present, several institutions are involved within the environmental cost recovery.

Evaluation of customer-consumer and the relation of administration and employment

A problem that should be considered by the DEYA is the difficulty of citizens to comprehend the changes of water prices and second their weakness to comprehend the water real cost concept. This without any doubt is an important obstacle for the full cost recovery to be implemented in the price of domestic water. This “political” obstacle that concerns the unwillingness of users and/or consumers for any water price increases should be seriously taken into consideration. The present and future economic requirements that the recovery of the water cost entails will be important and will increase the lack of comprehension from the side of consumers. The users and/or consumers should be informed of the parameters and factors that determine the water price and this can occur only through well organised informative campaigns.

The “obstacle” of the changes of water prices and their comprehension by customers could be overcome by establishing excellent relations between administration and employment. These relations should be implemented through: (a) coordinated and hierarchical targets and (b) quantitative and explicit targets which will be supposed to lead to the development of the Enterprise.

Conclusions

The primary point of reference is the fact that DEYA operate according to private-economic criteria; this element gives them flexibility and efficiency in their operation. In the context of that both costing and pricing in DEYA constitute a point of reference, given that water price should keep step with its cost so that we can obtain an income–expenditure balance. The prices have to cover the operating cost. Today, an average water price for most of the Municipal Enterprises is 1.19 €/m³.

The WFD as was incorporated in the national Law no 3199/2003, referred to the water resources management, will have direct consequences to the DEYA with regard to the configuration of their water pricing policy. Up to date, pricing policy of the DEYA is based only on the recovery of the economic cost of water and many times this is not achieved so that the water is not priced at its real cost. This means that drinking water is under priced. The relation of customers and/or users with the Enterprise, as well as the administration and employment, should be bilateral. Thus, it is understood that the sustainability and an excellent quality of water presuppose a viable water resources policy, which would correspond to the modern requirements of both the Enterprise and the citizens and/or customers. Consequently, the accounting cost of drinking water should not consider water only as a commercial good, but as a very important natural source whose value should be estimated with scientific economic evaluation techniques of environmental goods.

References

- EU (2000). Council Directive of 23 October 2002, Establishing a framework for community action in the field of water policy (2000/60/EC). *Official Journal of the European Communities*. L327, 22 Dec., 2000.
- Kolokytha, E.G., Mylopoulos, Y.A. and Mentis, A.K. (2002). Evaluating demand management aspects of urban water policy- A field survey in the city of Thessaloniki, Greece. *Urban Water*, **4**, 391–400.
- MoEPPW (2003). The law for the management of water resources of Greece, Law N.3199/03. Athens, Greece.
- MoIPaD (2003). The law for establishing DEYA, Law N 1069/80. Athens, Greece, 1980.
- Tsagarakis, K.P., Paranychianakis, N.V. and Angelakis, A.N. (2003). Water Supply and Wastewater Services in Greece. In S. Mohajeri *et al.* (eds), *European Water Management Between Regulation and Competition*, Aqualibrium Project, EU-Directorate-General for Research, Global Change and Ecosystems, B-1049, Brussels, Belgium, 151–170.
- Tsagarakis, K.P., Dialynas, G.E. and Angelakis, A.N. (2004). Water resources management in Crete (Greece) and proposed quality criteria for use of recycled water in the Mediterranean region. *Agricultural Water Management*, **66**, 35–47.
- Tsagarakis, K.P. (2005). Recycled water valuation as a corollary of 2000/60/EC directive. *Agricultural Water Management*, **72**, 1–14.