Sustainable water management

Water management in Europe: price and non-price approaches to water conservation

European Union (EU) water policies encourage Member States to implement better water demand management practices. This is a response to the pressures on water resources that are continuously increasing. Management practices on water demand are being revised to improve the existing supply-demand balance and ultimately to bring about a more water-efficient society.

This European Environment Agency (EEA) briefing summarizes the main findings of a new assessment, Pricing and non-pricing measures for managing water demand in Europe, coordinated by the EEA, that provides insights into current water management practices with a focus on the household sector in Europe. The analysis is based on case studies of eight Member States: Cyprus (CY), Denmark (DK), France (FR), Germany (DE), Italy (IT), Romania (RO), Spain (ES) and Sweden (SE)[1].

The assessment addresses water demand management practices including price and non-price approaches and considers their relative effectiveness in terms of managing water demand. Barriers and enabling factors for implementing these approaches are also considered.

Main messages:

- There is a solid legislative basis in the EU for long-term, integrated water management including frameworks for applying water pricing (e.g. tariffs) and non-pricing (e.g. water saving devices, education and awareness campaigns) measures for more efficient water use.
- Water pricing policies implemented in combination with other non-pricing measures prove to be most effective in reducing household water consumption. Water demand management strategies need to find the right mix of pricing and non-pricing instruments.
- In some of the case studies, price does not appear to be a significant determinant of water demand. However, the overall results indicate that EU households facing a water price increase will react by reducing water consumption. Independently from water consumption targets - water pricing still remains a key instrument in achieving cost recovery for water services to ensure the maintenance and financing of existing and future water infrastructure.

Policy background

The main objective of EU water policy is to ensure access to good quality water in sufficient quantity for all Europeans, and to ensure the good status of all water bodies across Europe. Therefore, policies and actions are set up to prevent and to mitigate water scarcity and drought situations; to improve water quality and to ensure that polluted water is treated.

The EU Water Framework Directive (WFD) (EU, 2000) provides a solid legislative basis for long-term integrated water management in the EU. The implementation of Article 9 of the WFD (which requires Member States to take account of the principle of recovery of the costs of water services, including environmental and resource costs) is important for strengthening water efficiency. Indeed, it has been acknowledged that water pricing and non-pricing measures have a high potential to provide an incentive for more efficient water use and thus help to achieve the environmental objectives under the Directive.

Equally, the Roadmap to a resource-efficient Europe under the Flagship Initiatives of the European 2020 Strategy (EC, 2011), identifies resource pricing as a key issue to be tackled, recognizing that, in some cases, market and prices, taxes and subsidies do not reflect the real costs of resource use, locking the economy into an unsustainable path. The policy orientation and course of action indicated by the Roadmap focuses on water efficiency, efficiency targets and better demand management through economic instruments. Other relevant EU legislation related directly or indirectly to water demand management establishes frameworks to promote resource efficiency, including Directives like the Energy Efficiency Directive, Energy Labelling Directive, Ecodesign Directive and the Ecolabel Regulation. All have a common denominator of ensuring the promotion of efficiency and environmentally-friendly products (e.g. non-pricing measures).

A call for further research

In 2012 the EEA published a report Towards a more efficient use of water resources, where water pricing and non-pricing instruments were considered to have a high potential to provide an incentive for more efficient water use (EEA, 2012). This was followed by a report in 2013 on the Assessment of cost recovery through water pricing.

It was clear from these studies that increasing water prices, apart from recovering costs, appears to be a useful instrument to manage household water demand. However, one common obstacle to the implementation of cost recovery through water pricing was the lack of metering infrastructure in the household sector, which leads to households being short of incentives to use water wisely.

Metering infrastructure, a non-price measure, enables utilities to use pricing to encourage water conservation and efficiency. Charging customers by volume sends a price signal to customers to use the resource more efficiently. It is also clear that most reference studies on the price elasticity of water demand (i.e. the measure of the relationship between a change in the quantity demanded and a change in its price) date back 10-20 years, but are still being used to guide our thinking on the potential role of water prices on water demand. These studies need to be updated as incentive structures of water charge schemes are being disputed in many Member States. The 2013 EEA study highlighted a number of issues calling for further analysis. Against this background this new assessment was launched. It contributes to an update of the knowledge base on the price elasticity of water demand to gain insights into how price evolution influences water consumption. It also assesses the effectiveness of pricing instruments in managing water demand against technological developments or other non-price measures.

What are the main water management issues in the selected countries?

Different levels of water stress correspond to different main water management challenges, as shown in the table below for the eight selected countries. Water demand challenges were also reported in countries with no water stress, although it can be expected that in such countries such challenges are not as pressing as in water-stressed countries.

Main water management issues in the selected countries

Water management challenge	Countries				
Droughts and water scarcity (with increasing intensity and frequency in recent years), sometimes leading to abstraction restrictions	CY	ES	FR	IT	RO
Overexploitation of groundwater resources	CY	DK	ES	IT	
Mismatches between water demand and water availability: seasonal peaks in periods with low precipitations, geographical concentration of water demand versus distribution of water resources (e.g. along coasts)	CY	DE	ES	IT	
Scarcer groundwater resources due to pollutants	DE	DK	ES		
Low efficiency of the water network	IT	RO			

Drought and water scarcity events are posing challenges to water demand management strategies in all Mediterranean countries, as well as Romania, although different countries are affected in different ways. All case study countries, with the exception of Romania, experience overexploitation of groundwater resources. In Cyprus, for example, scarce water resources must meet a growing demand for water from the residential (including tourism), industrial and agricultural sectors. Only 40 % of total water abstraction is classified as sustainable and one aquifer has only 15 % of its original reserve left.

Water scarcity issues can be exacerbated when looking at examples of seasonal or geographical mismatches between water availability and water demand. Mediterranean countries certainly demonstrate this as water demand peaks occur along the coasts during the summer which is typically the driest season. The inhabitants tend to be concentrated in coastal areas which poses a further challenge to the management of water demand and the allocation of available resources. Pollution of groundwater resources can lead to reduced water availability, even in those countries generally characterized by abundant water resources, such as Denmark, where pesticide pollution accounts for 20 % of well closures, and nitrate pollution is responsible for 10 % of closures.

Low efficiency of water distribution networks can also be an important water demand management issue. There would be several reasons for such inefficiency: for instance, the water and sanitation sector would still be characterized by weak regulatory oversight and governance, as well as lack of funding (due to low tariffs); or conflicts of interests at the local level could occur, as the local regulators would hold shares in utility companies. These issues may impede private investment in the sector. This, coupled with inadequate pricing levels, often results in insufficient levels of funding for water supply and wastewater infrastructures and obsolete infrastructures and create conditions for low efficiency levels of water infrastructure, which would relate to all sectors (domestic, industrial, agriculture).

Pricing mechanisms do have an effect on water demand and water stress

The eight countries surveyed all have pricing mechanisms in place to provide an incentive for more efficient water use in the household sector, ranging from simple metering and tariffs based on volume to rising block tariffs[2]. The results of the case studies in the surveyed countries show that while pricing does affect water consumption, the impacts vary. For example, in the cases of France, Germany and Spain, the results for the household sector suggest that the prices set have a relatively minor effect on the quantity of water demanded (i.e. water demand is inelastic to price). This does not mean that the demand for water in these countries is unresponsive to price. Some examples illustrate that water demand is responsive to income and household size, meaning that water consumption increases more than the increase in income and household size. In Italy, for example, water demand increases by a factor of 1.5 with increasing income. In Italy and France, water demand is also correlated to household size (by a factor of 1.6 and 0.8 respectively).

Overall, it can be observed that the case study results are very diverse and do not allow for a homogeneous interpretation of the overall effects of water pricing in determining demand. The results suggest that on the one hand water demand is not responsive to price changes, but on the other hand, in cases such as Denmark, demand responds to price. This highlights the fact that price elasticity of water demand largely depends on the type of water market in each country.

Nevertheless, the results from the case studies are coherent with the outcomes from a recent study on price elasticity in the 28 EU Member States undertaken by the European Commission's Joint Research Centre (JRC) on modelling household water demand in Europe. The report,Modelling Household Water Demand in Europe,demonstrated that household water demand functions are typically inelastic for most of the EU-28 countries meaning that household water consumption decreases by less than 1 % for every 1 % increase in price. According to the JRC report a price increase by 10 % is expected to reduce household water consumption by 1-5 %. This demonstrates that water prices play a role in signalling water scarcity or water costs to households.

Low water prices and reduced water consumption - unintentional impacts on water supply networks and infrastructures

Low water prices and decreasing water demand would imply reduced revenues for water utilities, which can pose issues for cost recovery and hence challenge the water services' ability to maintain infrastructure and eventually water quality in the long run. However, mixed evidence is available on the effects of such decreases on cost recovery levels and the sustainability of water supply and sewage infrastructure.

The EEA assessment identifies two non-mutually exclusive approaches to deal with the negative effects of consumption reduction on cost recovery: 1) the development of a financial plan to ensure the self-sustainability of the water supply system in the face of an expected decrease of water consumption; and 2) the use of mixed tariffs, including a fixed charge – as is the case in the countries surveyed. Low levels (or absence) of the fixed charge impacts on the income for the service provider, thus posing a risk on cost recovery levels in case of decreased water demand.

These approaches should be balanced with the environmental benefits of water savings including healthier aquatic ecosystems, improved stream flows and aquifer levels, air quality improvements through reduced energy requirements for pumping, etc.

Non-pricing mechanisms reduce water consumption

The uptake of a range of non-pricing water demand measures, including the reduction of leakage in water supply networks, water saving devices and more efficient household appliances, has the potential to save up to 50 % of water abstracted and to reduce water consumption from 150 litres per person per day to 80 litres per person per day across Europe. For domestic water saving appliances, it is estimated that up to 40 % of water could be saved per year in each household. Public awareness campaigns are also considered to be effective in reducing household water consumption. In contrast, restrictions of water supply in times of acute water scarcity are generally considered to be effective in reducing the water demand in the short term, while they have little or no effect on water demand in the long term, if they are unaccompanied by other measures.

One of the key challenges of non-pricing mechanisms, in particular in times of restricted public finances, is that they often require considerable financial resources for their implementation. This is the case for subsidies for the installation of water saving devices and for consumer awareness campaigns – even though the implementation costs of awareness campaigns are relatively low as compared to many other similar measures.

Water demand management strategies should include a combination of pricing and non-pricing instruments

The results from the case studies show that water pricing policies are implemented in combination with other non-pricing measures, such as leakage reduction, water saving devices and awareness campaigns. In most of the cases, this combination of instruments has been effective in reducing domestic water consumption. It is more challenging, however, to assess whether non-price measures have been more or less effective than price measures – or than the combination of some non-price and price measures.

When designing an effective mix of pricing and non-pricing instruments, consideration should be given to the combination of measures on the specific features of each country in terms of water availability and water demand challenges. If decision makers want to use pricing policies as water demand management instruments, the first step is to ensure that the water supply system functions (at least partly) as a market. This means that water pricing must allow for recovering supply costs, and that consumers have complete information on the service provided and its real costs (for example on price levels). In many countries, this is far from being common practice as consumers are not yet aware of how much they are paying for water and the principle service of supply (and for one additional unit of water in particular), which also depends on geography, distances and needs for treatment before supply.

Any changes in pricing policies to manage water demand more effectively must account for the multi-level nature of water governance systems. Generally speaking, lower levels of governance (e.g. municipalities, private water companies, water boards, etc.) have full discretion for using pricing approaches, such as setting tariffs, including providing full transparency to their clients and consumers. Most EU Member States follow a framework in which policies made at the national level set the rules for the provision of water services. These rules are then followed by local or municipal governments which themselves are at the core of providing water services or regulate private utilities.

More information

- Assessment: Water Management in Europe: price and non-price approaches to water conservation

Endnotes

[1] The countries were selected on the basis ofgeographical coverage of EU countries reflecting the diversity of water demand management issues and approaches, as well as water stress levelsandgood data availability on water management and pricing instruments.

[2] Block tariffs are volumetric charges whereby a consumer, equipped with a water metre, is charged an increasing rate per unit as water consumption increases.

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