European Commission

Science for Environment Policy

New water billing system could cut usage whilst being fair and profitable

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Source: Lopez-Nicolas, A., Pulido-Velazquez, M., Rougé, C., Harou, J. J., & Escriva-Bou, A. (2018). Design and assessment of an efficient and equitable dynamic urban water tariff. Application to the city of Valencia, Spain. *Environmental Modelling & Software*. 101: 137–145. DOI: 10.1016/J.ENVSOFT.2017.12.018

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An innovative system for pricing household water is proposed in a new EU-funded study[1] researched in the US and UK. The tariff is designed by combining the economic value of water with reservoir storage data, and is intended to cut water usage during times of shortage by charging large-volume consumers a higher rate which increases as water becomes scarcer. The tariff increase subsidises water for other users, whilst also ensuring the system is economically stable. A case study suggests that the tariff could cut water consumption in the city of Valencia by up to 18%.

Shortages of water under climate change are a growing risk and there is a clear need to use this natural resource more efficiently. Raising the price of water to consumers can cut usage, but there are a number of important considerations to make when designing water tariffs, which can be challenging to implement in practice.

The tariff must consider the highly changeable value of water — which increases during scarcity and drops during abundance — while also providing enough revenue to cover the costs of supply in both the short- and the long term.

In addition, the rate should be perceived as affordable and fair by consumers, without charging too much for those on lower incomes or who use little water, for instance. It must also be legally acceptable and easy to understand for consumers.

The researchers present a new method for designing an urban water tariff which they believe meets all these criteria. The tariff charges all households a standard rate for the first 12 m^3 of water used every two months — this volume covers basic water needs for a typical household of two people. Where consumption exceeds this limit and enters into the second 'block' of usage, the price increases as water becomes scarcer.

To illustrate how the method calculates prices for this system, the researchers applied it to Valencia, Spain. The city has a complex water resources' system in the Jucar river basin and most of its 430 000 inhabitants have smart water meters which, with their frequent and automatic measurements, make it easy to vary the price of water. Furthermore, smart meters' real-time information on usage can encourage consumers to change their behaviour by indicating how close they are to the second, higher pricing block.

The researchers used a computer model that combines hydrological and economic data to determine the economic value of water at different levels of availability in the Jucar basin, and to predict the impact of different rates on consumption (based on previous research in Valencia[2]). The model considered a range of factors which affect the cost of supply and the value of water, including the capacity of all the reservoirs in the basin, targets for demand and storage, and the environmental inflow of water.

Continued on next page.

1. This study was supported by the European Commission under the Seventh Framework Programme project SmartH20: https://sw4eu.com/sh2o-the-smarth2o-project/.

2. Garcia-Valinas, M.A. (2005). Efficiency and equity in natural resources pricing: a proposal for Urban water distribution service. *Environmental Resource Economics*. 32:183-204. DOI: 10.1007/s10640-005-3363-0 **and** García-Valinas, M.A. (2006). Demanda urbana en la region de Valencia. Un enfoque econometrico. In: En Pulido, M. y., Andreu, J. (Eds.), International Workshop on "Hydro-Economic modelling and tools for the implementation of the EU Water Framework Directive". UPV, Valencia, 30-31 de enero, 2006 (in Spanish).

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For their tariff, the researchers used the current official rate in Valencia for the first pricing block for water usage: €0.44 per cubic metre (m^3). On the basis of their modelling exercise, and assuming demand and storage as per the year 2012; they set four different prices for the second pricing block. When total reservoir storage is above 507 million m^3 (Mm^3), water is considered plentiful with 'zero value' and consumers pay a 'baseline rate' of €0.56/m^3.

The second block price goes up as water's availability falls, with each price increase designed to meet a certain target for reduction in annual water demand. When reservoir storage drops to 367–507 Mm^3 the price increases to €0.60/m^3; which is calculated to lead to a 3% drop in demand. At 160–367 Mm^3 storage, the price increases to €0.66/m^3 corresponding to an 8% drop. When reservoir storage drops below 160 Mm^3 the highest rate of €0.78/m^3 is applied, which is predicted to trigger an 18% fall in demand.

The study suggests that the higher rates are priced to subsidise all consumers' basic water needs, i.e. the first 12m^3 used in the first pricing block. Furthermore, despite the drop in water use, the higher rates are calculated to lead to an increase in annual revenue for the supplier, from €0.38 million to €0.72 million, making the tariff a financially stable system. This additional income could be invested into infrastructure to increase water security, such as measures to reduce leakage, the researchers suggest.