Water-Efficiency in the Housing Sector. The Implementation of Certification and Labelling Measures in Portugal

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Abstract
As water is a limited resource which has to be safeguarded and conserved, its efficient use is an environmental imperative in every country in the world. Climate change in Mediterranean countries, like Portugal, could significantly affect the short- / medium-term availability of this resource, and so measures must be developed in all sectors, as a matter of urgency, to improve water-use efficiency.

In Portugal the government has recently chosen to implement a National Programme for Efficient Water Use, which provides for the water-efficiency labelling of products and buildings. The plan establishes that labelling should be entrusted to non-governmental organisations, working with official government bodies in the sector.

This paper describes some of the actions being promoted in Portugal that have this goal in mind. First, attention will be focused on a demonstration project that is currently under development. This is the AveiroDOMUS House of the Future, and it will be used to study various efficiency solutions for resources’ use in buildings, and assess their economic and environmental value.

The House will be built by a group led by the University of Aveiro, and it will be sited close to the saltwater lagoon, known as the Ria de Aveiro, that encircles the town.

In terms of water resources, in addition to developing water re-use and low-consumption solutions, it is intended to utilise rainwater, brackish water drained from the foundations and non-desalinated saltwater from the Ria.

Second, the paper describes an initiative by universities and firms in the sector. These have formed an association (ANQIP – National Association for Quality in Building Installations) to work on the implementation of water-efficiency certification systems for goods and buildings.
1 Introduction

As water is a limited resource which has to be safeguarded and conserved, its efficient use is an environmental imperative in every country in the world.

It may be recalled that, according to forecasts by the World Water Council, 23 countries will be facing absolute water shortage in 2025, and between 46 and 52 countries (encompassing 3000 million people) could be suffering “hydric stress” by then.

Climate change in Mediterranean countries like Portugal could significantly affect the short- / medium-term availability of this resource, and so measures must be developed in all sectors, as a matter of urgency, to improve water-use efficiency.

In EU, countries like France, Italy, Spain and Portugal will, indeed, be at risk of 40% or more hydric stress in at least some of their territory (Figure 1).

Figure 1: Hydric stress. Scenario in 2025 according to the World Water council

In terms of sustainability, the priority measure to is obviously to increase efficiency in the use of water.

In the housing sector, special heed should be paid to the use of efficient products and the overall efficiency of buildings. So not only should efficient fixtures and fittings be used, but water must be re-used or recycled and alternative sources tapped (like rainwater and groundwater).

In light of this context, the Portuguese government has recently chosen to implement a National Programme for Efficient Water Use, which provides for the water-efficiency labelling of products and specifies incentives designed to increase water efficiency in buildings.

The plan establishes that labelling should be entrusted to non-governmental organisations, working with official government bodies in the sector, and it will be voluntary, as a rule.
2 Water efficiency in buildings: a case-study

2.1 Aveiro’s House of the Future Project

The Portuguese city of Aveiro is 250 km from Lisbon, the capital, and 10 km from the Atlantic coast. It is surrounded by a saltwater lagoon system that occupies 110 km$^2$ of the River Vouga estuary (Figure 2 and Figure 3).

![Figure 2: Location of Aveiro](image)

The region of Aveiro is on the northern part of Portugal’s coast, and is regarded as a highly vibrant economic zone. A considerable number of industrial sectors are based there, involving all kinds of business activity, especially in the construction sector.

![Figure 3: Aveiro Ria – Lagoon Area](image)
The University of Aveiro, in association with a group of interested companies, has created an association called AveiroDOMUS, the main purpose of which is to design and build a "House of the Future". This house is developed under sustainable construction principles making use of state-of-the-art and environmentally friendly technologies (Figure 4). The design of the House of the Future was concluded in 2007, and it is hoped that work will start on its construction in the near future [1].

![Figure 4: AveiroDOMUS House of the Future](image)

The house must obviously be of an advanced design, but the main objective is to build it in accordance with sustainable building standards, ensuring proper interaction with local ecosystems and a good interior environment (air quality, absence of noise, comfortable temperature and humidity, light, etc.). Another pertinent aim is to reduce consumption of essential resources through the appropriate choice of materials and use of renewable energies and by optimizing the water cycle.

In fact, one of the major goals of the project is the optimization of the hydrologic cycle in the House, under sustainability principles such as water recycling and reutilization, the incorporation of low-flow fixtures and the use of rainwater, groundwater and salt water, which is abundant in the area where the house is to be built – the Aveiro Salt Lagoon [1], [2]. The AveiroDOMUS House of the Future will be a permanent research and development laboratory, open to both industry and the public. In fact, one part of the house will be open to visitors, another part will be inhabited and a third part will be under study and evolving. These areas will be rotated from time to time.

This project will also support the study and development of a possible model for the certification of water efficiency of buildings in Portugal, under the proposals of the National Programme for Efficient Water Use. This model, like the European model used for the Energy Certification of Buildings, will use an alphabetic hierarchy (A, B, C...) to rate the efficiency of a building. But in this case it will be a voluntary model, at least to start with.

### 2.2 The water cycle in the “House of the Future”

As stated before, the efficient use of water is an environmental priority today, and this is the main goal in terms of optimizing the water cycle in the House of the Future.
It is general knowledge that water use in the home has different quality requirements, and this creates the chance to make use of different sources of supply, depending on the quality needed for the specific use [2].

A rainwater collection system can save more than 50% of treated water (from the public mains system), with no loss of comfort or hygiene, within the consumption and precipitation profiles. Rainwater can be used for flushing toilets, in washing machines, for cleaning the floor, washing cars, watering the garden, although pre-treatment may need for some uses. First flush elimination is generally a minimum requirement here.

A system that includes the partial recycling of domestic wastewater has been planned for the House of the Future, with the aim of cutting the use of mains water to a minimum. At the same time, low-consumption devices will be used, linked to the use of alternative sources. In addition to rainwater, the House of the Future has also contemplated the use of saltwater and groundwater. Since the land occupied by the House is very close to the area of influence of the Aveiro Ria’s town canals, the groundwater is quite likely to have some salinity (Figure 5).

**Figure 5: Water use scheme**

The establishment of a non-desalinated saltwater supply line is one solution that could be a useful alternative when drinking water is in short supply, in coastal regions (like Aveiro), for purposes that do not need high quality water (toilet cisterns, for instance). But there may be some problems in terms of treating these wastewaters, and the University of Aveiro is currently looking at solutions for their appropriate treatment.

In terms of water-efficient products, the following were among solutions considered for the House of the Future: use of small volume cisterns; low-flow fixtures; timers and other automatic control devices; air emulsifiers; waterless/chemical urinals, and low-consumption washing
machines. Within this consumption-cutting goal, special attention will be given to cisterns, which can waste a considerable amount of water (over 30% of total consumption in the residential sector, in Portugal). In the case of urinals, the use of chemical ones (with a liquid sealant) that do not consume any water is envisaged.

In terms of wastewater, several treatment systems will be looked at in this project, bearing in mind the proposed water cycle. The ultimate aim for non-reused water will be to achieve a quality that will allow the effluent resulting from the treatment process to be used on the garden or to ensure a level of quality so that it can be discharged into the receiving environment.

3 Water efficiency of products: certification and labelling

3.1 The National Association for Quality in Building Installations (ANQIP) Brief description

ANQIP (www.anqip.pt) is a Portuguese non-profit association, established in 2007. Its members include several universities, firms from the sector, management organisations and self-employed technicians, whose basic aims are to promote and ensure water quality and efficiency in the water supply and drainage fittings and fixtures of buildings [3].

ANQIP hopes to do this by: developing or supporting technical and/or scientific studies; promoting training courses for technical workers, installers and other interested parties; publishing articles; organizing seminars, meetings and other technical and/or scientific events; disseminating studies, standards and regulations; creating voluntary water quality and efficiency certification systems for the use of its members and other interested parties; conducting audits of existing installations and those under construction, on request, and issuing opinions on projects and designs, also on request.

Under its powers and in accordance with the proposals of the National Programme for Efficient Water Use, ANQIP decided to introduce a product certification system, along with a water efficiency labelling scheme, in Portugal.

The model used (described below) will be implemented progressively and it is anticipated that product certification will start with cistern toilets, since these account for most consumption in building systems.

3.2 The water efficiency labelling model proposed for Portugal

The water efficiency labelling of products has generally been implemented voluntarily in various countries.

In some countries efficiency is not graded, but an efficiency label is awarded when consumption is less than a specific amount. This is the labelling system in use in the US and Nordic nations, for example.

In Australia and Ireland (Dublin), however, the label indicates a classification that varies with the product’s efficiency.

In Portugal, ANQIP has opted for a voluntary model of the latter kind. Figure 6 shows the labels used [3]. The base colours are green and blue.

"A" signifies the greatest efficiency, and there is a graphic indication by means of drops, for a better understanding of the symbol, and a small informative bar at the side. The A+ and A++ ratings are meant for special applications.
ANQIP is drawing up Technical Specifications (CTA) for different products so as to create and establish the necessary benchmark values to be assigned to each letter. These Technical Specifications also establish the certification testing conditions. Firms signing up to the system will sign a protocol with ANQIP which will define the conditions under which they can issue and use the labels.

In principle, the initial tests, which will be the basis for the conformity statement and permission to use the labels, are carried out by the manufacturer/importer. ANQIP conducts an initial certification of the internal control of production and carries out random tests at intervals of labelled products on the market. The schedule for introducing the water efficiency labelling of products in Portugal is given in Table 1. This schedule takes into account the significance of each product in overall consumption in buildings, giving priority to products that consume most [3].

Table 1: Schedule for the introduction of water efficiency labelling of products in Portugal

<table>
<thead>
<tr>
<th>Product</th>
<th>Date of labelling introduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flushing cisterns</td>
<td>4th quarter of 2008</td>
</tr>
<tr>
<td>Showers</td>
<td>1st quarter of 2008</td>
</tr>
<tr>
<td>Taps and flow meters</td>
<td>2nd quarter of 2009</td>
</tr>
<tr>
<td>Washing machines</td>
<td>3rd quarter of 2009</td>
</tr>
<tr>
<td>Other</td>
<td>After July 2009</td>
</tr>
</tbody>
</table>

4 Conclusions

The efficient use of water is an environmental must for every country in the world. Some countries, like Mediterranean countries, must develop measures to ensure this as a matter of urgency, since water availability could be significantly affected in the short- medium-run.
Washing machines, dishwashers and shower heads can all affect energy use by reducing water consumption. Reducing water use will also yield savings and improvements in the area of wastewater disposal. Indeed, savings in water use may reduce the costs of running and providing waste water collection and treatment systems.

In the housing sector, special heed should be paid to the use of efficient products and the overall efficiency of buildings. So not only should efficient fixtures and fittings be used, but water must be re-used or recycled and alternative sources tapped (like rainwater and groundwater).

By using water-efficient products and practices, homeowners can help save natural resources and cut their water consumption and costs. In order to achieve these savings, consumers need to be able to identify products and services that use less water, without sacrificing performance.

In Portugal, ANQIP, a non-profit NGO, has decided to launch a voluntary water efficiency labelling system for products, similar to those developed in other countries. But the best outcome would be for water efficiency labelling to follow a common worldwide standard, so as to facilitate the free trade in efficient products and stimulate habits leading to the sustainable use of water throughout the planet.

References

