

Water efficiency of products and buildings: the implementation of certification and labelling measures in Portugal

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Abstract

This paper outlines some of the actions being pursued in Portugal with a view to improving water efficiency in buildings and products. First, a demonstration project that is under development is described. This is the AveiroDOMUS House of the Future, and it will be used to study various efficiency solutions for resources' use in buildings, and to assess their economic and environmental value. Afterwards we examine an initiative by the universities and firms in the sector, which has led to the forming of an association (ANQIP – National Association for Quality in Building Installations) to decide on the implementation of a voluntary water-efficiency certification and labelling system for products.

Keywords

Water-efficiency; water-efficiency labelling; products 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.

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).

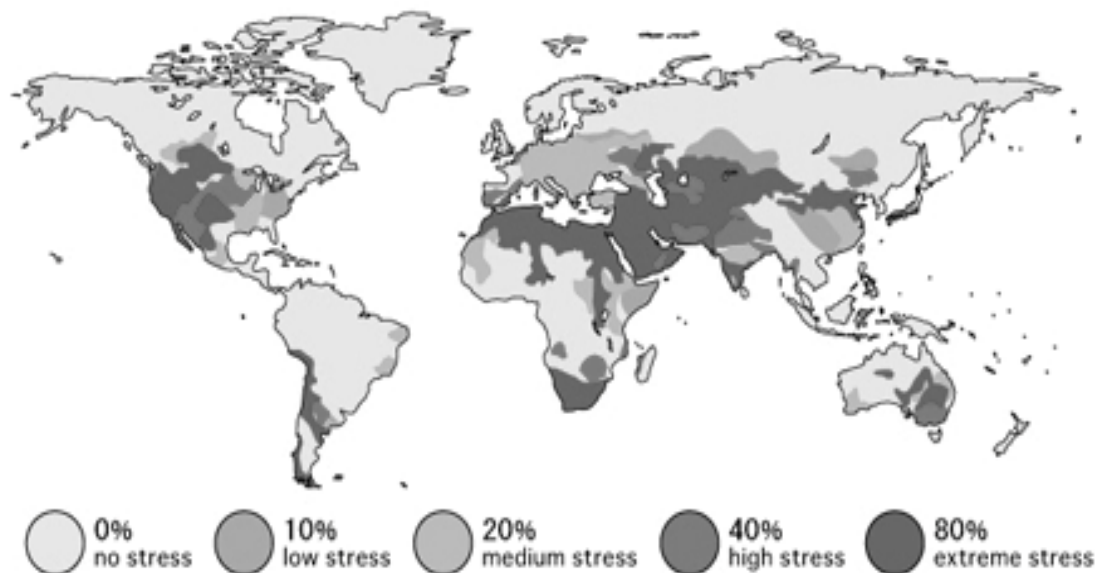


Figure 1 – Hydric stress. Scenario in 2025 according to the World Water council

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

It is reckoned that total inefficiency in water use in Portugal, in all sectors, amounts to $3100 \times 10^6 \text{ m}^3/\text{year}$, which represents nearly 0.64% of national GDP. About half this figure can be ascribed to inefficiencies in urban supply (public and building systems).

In the building 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 Plan 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 km² of the River Vouga estuary (Figure 2 and Figure3).



Figure 2 – Location of Aveiro

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

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 House of the Future was concluded in 2007, and it is hoped that work will start on its construction in the near future.

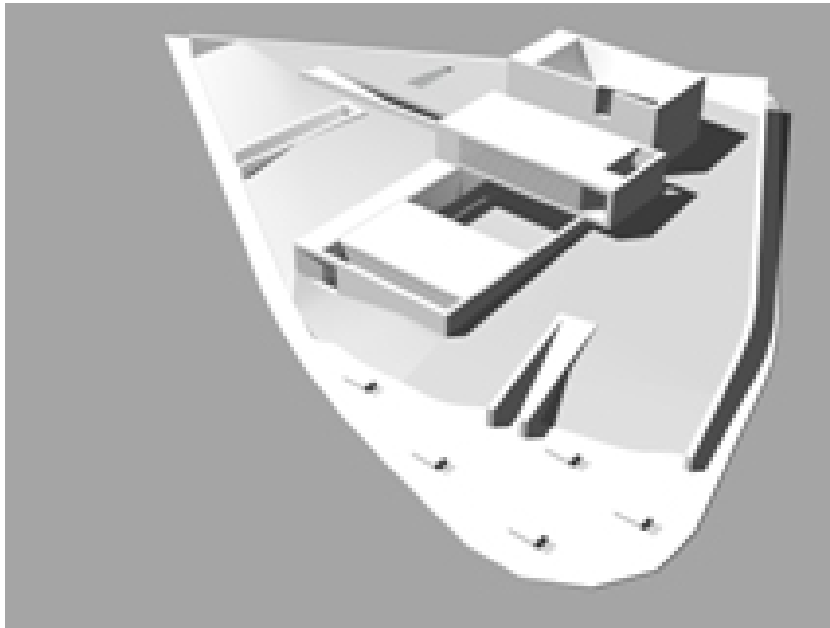


Figure 4 – AveiroDOMUS House of the Future

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.

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 Plan 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.

A rainwater collection system can save 50% of treated water (from the public mains system), with no loss of comfort or hygiene, within the consumption profile.

Rainwater can be used for flushing toilets, in washing machines, for cleaning the floor, washing cars, watering the garden, although pre-treatment may be needed 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).

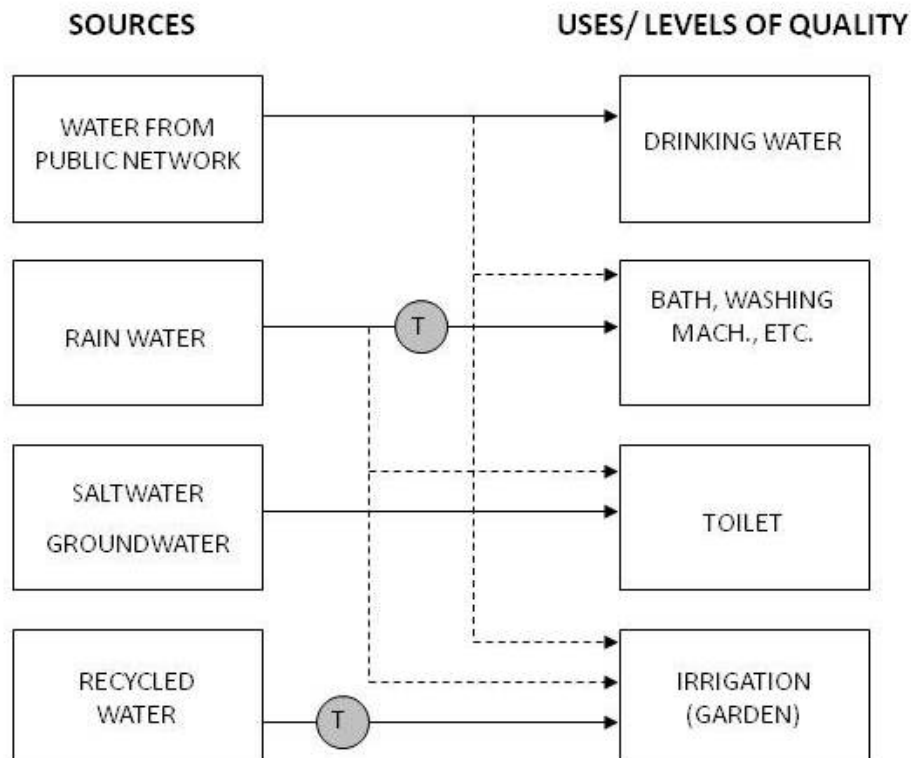


Figure 5 - Water use scheme

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 particular, some toilets in the House of the Future will use liquid/solid separation systems so that the waste can be treated separately for possible re-use.

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. 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 Plan 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. 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, as explained in the next point, and it matches the present energy certification system in compulsory use in Europe.

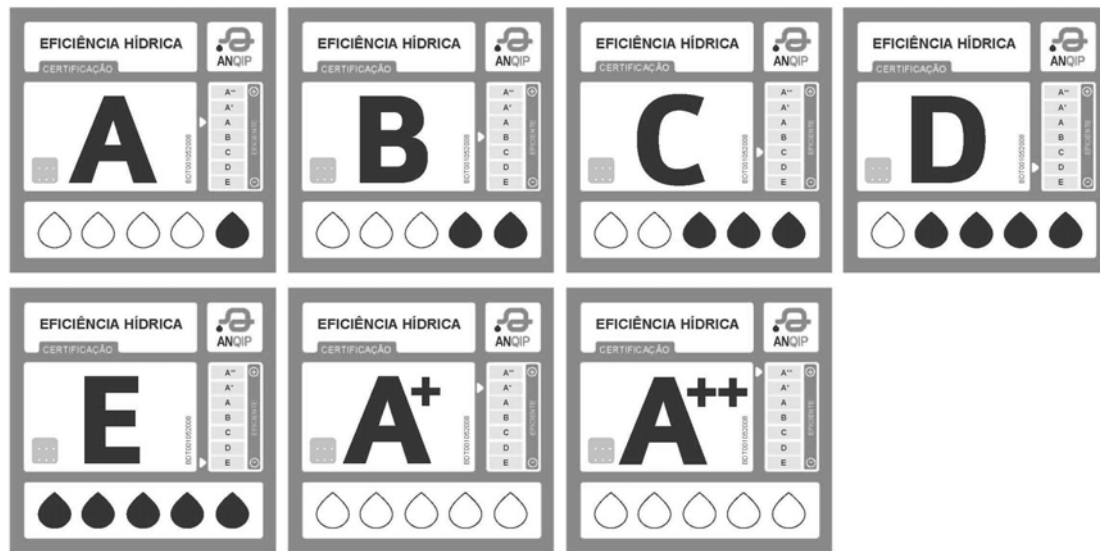


Figure 6 – Portuguese Water Efficiency labels

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. A conformity evaluation system analogous to that used in CE labelling (employed in Europe for building materials) will be used. 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 labels have a code with alphanumerical references for the firm and the product, and showing the date of the last conformity evaluation.

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.

Table 1 – Schedule for the introduction of water efficiency labelling of products in Portugal, by product

| Product | Date of labelling introduction |
|----------------------|--|
| Flushing cisterns | End of 3 rd quarter of 2008 |
| Showers | End of 4 th quarter of 2008 |
| Taps and flow meters | End of 1 st quarter of 2009 |
| Washing machines | End of 2 nd quarter of 2009 |
| Other | After July 2009 |

3.3. Labelling system for flushing cisterns

As mentioned earlier, cisterns were regarded as a priority, since toilet flushing systems are one of the biggest consumers of water in building in Portugal.

As there is a project for a European Standard for WC and urinal flushing cisterns (prEN 14055:2007) it was decided that the labels of water efficiency to be used in Portugal would comply with this Standard, where applicable.

So, not only can the label only be awarded to flushing cisterns that comply wholly with the European Standard, but the nominal and actual discharge volumes considered for the various label classes also comply with Table 3 of prEN 14055.

The following mechanisms are also regarded as water-saving devices, under this Standard:

1. Double-action mechanisms (interruptible)
 - one action initiates flushing and
 - a second action stops the flush
2. Double-control mechanisms (dual control)
 - one control releases the flush volume and
 - another control releases a reduce flush volume

The reduced volume cannot be greater than two-thirds of the maximum flush.

Table 2 shows the range of flush volumes considered in prEN 14055, and the tolerances for testing purposes.

Table 3 gives the water efficiency class proposed by ANQIP, which was still under review at the time this paper was being prepared.

The award of A+ and A++ is reserved for the combined use of toilets suitable for low-volume flush, since not all toilets on sale in Portugal work properly with low-volume flush cisterns. The water efficiency label to be used in these circumstances must mention this factor.

Table 2 – Flush volumes in compliance with prEN 14055:2007

| Nominal flush volumes (l) | Flush volumes (l) | | | |
|---------------------------|-----------------------|---------|----------------------------------|---------|
| | For complete flushing | | For water saving (dual) flushing | |
| | Minimum | Maximum | Minimum | Maximum |
| 9.0 | 8.5 | 9.0 | 3.0 | 4.5 |
| 7.0 | 7.0 | 7.5 | 3.0 | 4.0 |
| 6.0 | 6.0 | 6.5 | 3.0 | 4.0 |
| 5.0 | 4.5 | 5.5 | 3.0 | 4.0 |
| 4.0 | 4.0 | 4.5 | 2.0 | 3.0 |

The use of these letters will also depend on whether there is a drainage system (building and public) designed for such reduced volumes. It may be recalled, for example, that

European Standard EN 12056-2 (Gravity drainage systems inside buildings – Part 2: Sanitary pipework – Layout and calculation) does not allow the use of 4 litre flushing cisterns in drainage systems designed under System I of the Standard. Here, too, the label must mention this factor.

Table 3 – Proposed Rating for water efficiency labelling of flushing cisterns in Portugal

| Nominal flush volumes | Flushing | Water efficiency rating |
|-----------------------|--------------------|-------------------------|
| 9.0 | water-saving flush | C |
| 7.0 | water-saving flush | B |
| 6.0 | water-saving flush | A |
| 5.0 | water-saving flush | A+ |
| 4.0 | water-saving flush | A++ |
| 9.0 | complete | D |
| 7.0 | complete | C |
| 6.0 | complete | B |
| 5.0 | complete | A |
| 4.0 | complete | A+ |

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

Reducing hot water use will also reduce energy consumption. 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 building 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 European standard (or even worldwide), so as to facilitate the free trade in efficient products and stimulate habits leading to the sustainable use of water throughout the planet.

The CIB W062 forum could be very important indeed, in this context.

5. References

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6. Presentation of Authors

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