Water Energy
Enerwat
Nexus

Da água à energia

Caracterização, modelação e medidas para a diminuição dos consumos domésticos urbanos e rurais





O projeto

POCI-01-0145-FEDER-016730 (PTDC/AAG-REC/4700/2014)

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UTAD / C-MADE – Centre of Materials and Building Technologies

utad

C MADE
CENTRE OF MATERIALS & BUILDING TECHNOLOGIES

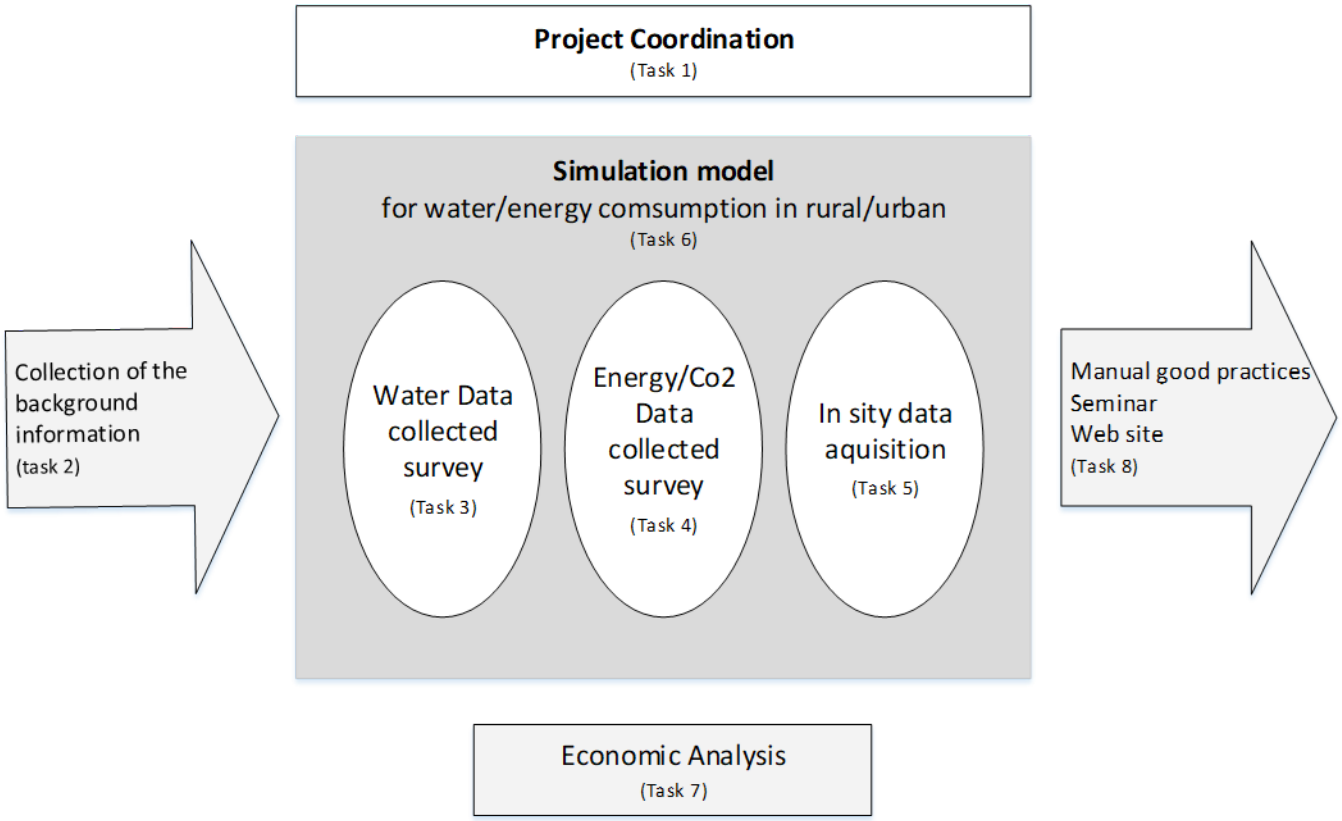
COMPETE 2020

PORTUGAL 2020

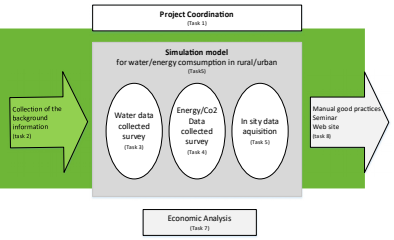
UNIÃO EUROPEIA
Fundo Europeu de Desenvolvimento Regional

FCT
Fundação para a Ciência e a Tecnologia
MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR

Project


Project Coordination
(Task 1)
Simulation model
for water/energy comsumption in rural/urban
(Task 6)
Collection of the background information
(task 2)
Water Data collected survey
(Task 3)
Energy/Co2 Data collected survey
(Task 4)
In sity data aquisition
(Task 5)
Manual good practices
Seminar
Web site
(Task 8)
Economic Analysis
(Task 7)

Task 2: Collection of the background information



Task 2
Cristina Matos
Ana Sá
Sandra Pereira
Isabel Bentes
Diana Faria
Elisabete Silva

Previous results:

- Matos, C., Silva Afonso, A., Moura, T., Bentes, I. 2012. **Evaluation of the consequences of the implementation of efficiency measures in water efficiency and CO2 emissions. Case study in a single family dwelling**, In CIB W062 2012 – Water Supply and Drainage for Buildings. Edimburgh, Scotland, 27 a 30 de September 2012.
- Cristina Matos, Carlos A. Teixeira, Duarte, A.A.L.S., Bentes, I. (2013). **Domestic water uses: characterization of daily cycles in the North Region of Portugal**. Science of the Total Environment doi:10.1016/j.scitotenv.2013.04.018
- Cristina, Matos; Briga Sá, Ana; Pereira, Sandra; Silva Afonso, A.. 2013. **Water and energy consumption in urban and rural households**, In 39th CIBW062 International Symposium Water Supply and Drainage for Buildings, Nagano.
- Matos, C.; Pereira, S.; Amorim, E.V.; Bentes, I.; Briga Sá, A.. 2014. **Wastewater and greywater reuse on irrigation in centralized and decentralized systems — An integrated approach on water quality, energy consumption and CO2 emissions**, Science of The Total Environment 493, x: 463 471. doi: 10.1016/j.scitotenv.2014.05.129

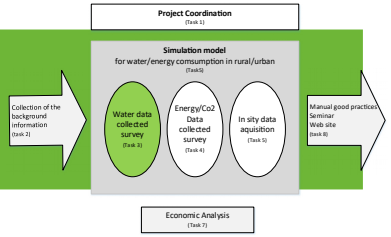
Objectives:

- Identification of the main differences to consider on the evaluation of water and energy consumption in rural and urban areas.
- Bibliographic review on the following topics:
  - water supply and consumption,
  - differences in urban and rural areas,
  - energy consumption associated with water supply and consumption

Deliverables:

- S. Pereira, C. Matos, A. Briga-Sá, A. Cunha, F. Pereira, I. Bentes, "**From water to energy: Methodology to characterize, measure and model urban and rural domestic consumptions**".
- It´s in production one paper with the updated state of the art.

Task 3: Quantitative and qualitative analysis of water consumption



Task 3
Isabel Bentes
Cristina Matos
Ana Sá
Sandra Pereira
Diana Faria
Elisabete Silva

Previous results:

There are several works with the concerns of water and energy saving, but the concern of water saving independent of energy saving. Only recently has the problem of related water and energy consumption started to be studied.

Output:

The collected data in this task with the collected in Tasks 4 and 5 will allow the mathematical modeling in task 6.

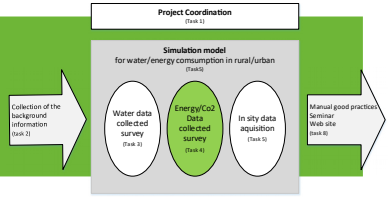
Objectives:

- Design of a survey to be applied, where the main factors that influence water consume will be researched, namely, type of water production (ground water or surface water pumping), end use distribution and volume of water per end use;
- Selection of at least two representative samples of Portuguese rural and urban environments, where the survey will be applied;
- Data compilation and analysis.

Deliverables:

- C.Matos, I.Bentes, S.Pereira, A.M.Gonçalves, D.Faria, A.Briga-Sá, **"Which are the factors that may explain the differences in water and energy consumptions in urban and rural environments?".**
- C. Matos, D. Faria, I. Bentes, A. Briga-Sá, S. Pereira,"**Energy to Water nexus: trying to understand the differences between urban and rural households consumptions**".
- Cristina Matos, A. Manuela Gonçalves, Ana Briga-Sá, Sandra Pereira, Isabel Bentes, Diana Faria, "**Metodologia estatística na caracterização do consumo doméstico de água**".
- A. Manuela Gonçalves, Cristina Matos, Ana Briga-Sá, Sandra Pereira, Isabel Bentes and Diana Faria, "**Determinants of Domestic Water Consumption: A Case Study in Northern Portugal**".

Task 4: Energy consumption in water production and use and greenhouse gas emission



Task 4
Ana Sá
Sandra Pereira
António Cunha
Francisco Pereira
Cristina Matos
Elisabete Silva
Diana Faria

Output:

- The collected data in this task with the collected in Tasks 3 and 5 will allow the mathematical modeling in task 6.
- It is expected to identify the main differences between rural and urban areas and provide the necessary data to perform the costs analysis in task 7.

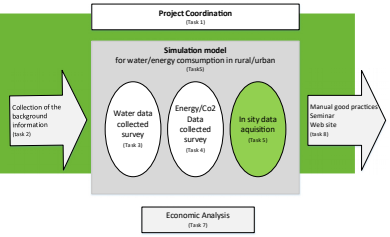
Objectives:

- Definition of the main factors and parameters related with energy consumption that should be included in the survey referred to in the task 3;
- Identification of the data water consumption obtained in task 3 that imply energy consumption;
- Comparison between water and energy consumption in rural and urban environment.

Deliverables:

The publications are the same as the previous task, because we wanted to observe the relations between the two types of consumption

Task 5: In situ experimentation and data acquisition



Task 5
António Cunha
Francisco Pereira
Isabel Bentes
Cristina Matos
Sandra Pereira
Elisabete Silva
Diana Faria
Filipe Marques
João Grácio

Previous results:

The work field carried out at the dwelling level is very scarce, maybe due to the level of intrusion in the houses and, to a certain extent, the invasion of the privacy of the consumers. Most of the works collects data from surveys and then proceeds to the modulation of water and energy consumptions and surveys.

Output:

- It is expected that the data acquisition resulting from this task will allow the validation of the results obtained in the surveys implemented in tasks 3 and 4.
- The collected data in this task with the collected in Tasks 3 and 4 will allow the mathematical modeling in task 6.

Objectives:

- In this task it is intended to measure the water and energy consumption related with water production and end use in rural and urban households submitted to the surveys conducted in tasks 3 and 4.

Deliverables:

- António Cunha, Elisabete Silva, Francisco Pereira, Ana Briga-Sá, Sandra Pereira, **From water to energy: low cost water & energy consumptions readings**.
- António Cunha, Francisco Pereira, João Grácio, Elisabete Silva, Cristina Matos and Sandra Pereira, "**WATERS: A system architecture for acquire dwellings water & energy consumptions**".

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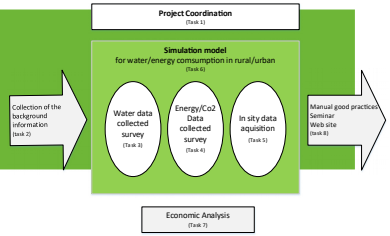
Task 6: Simulation of consumptions



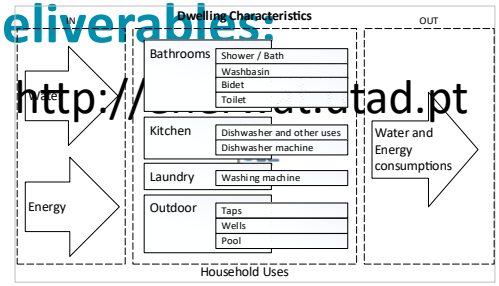
Task 6
Francisco Pereira
António Cunha
Sandra Pereira
Filipe Marques
João Grácio

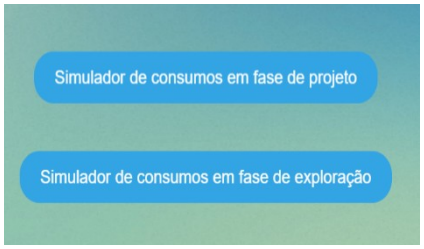
Objectives:

- The aim of this task is to develop and apply a model for water use, water related energy as well as related CO_2 emissions that is applicable to any dwelling as well as on an urban or rural scale. The model should take into account all relevant contributions to residential water use. It should provide a system understanding of water related household activities and should show what the most relevant contributions to water use are, water related energy use and greenhouse gas emissions in households, what are the key drivers of these flows and what possible measures could be applied to reduce these flows.
- In this task, will be used a mathematical model to quantify the household flows of water and energy.
- The collected data in Tasks 3 and 4 will allow the mathematical modeling in this task.
- It is expected that the data acquisition resulting from Task 5 will allow the validation of the results obtained by the mathematical model in this task. Will also permit the calibration of the model.
- Simulation including uncertainty analysis, sensitivity analysis and scenario calculations is also an objective of this task.

Deliverables:

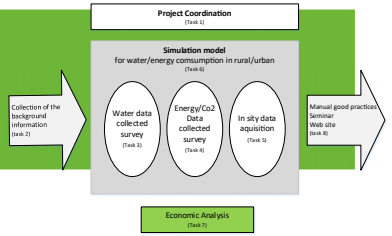
- http://[illegible]tad.pt





Poupança em àgua esperado:	120 €/mês
Poupança em energia associados esperado:	12 €/mês
Total:	132 €/mês

Task 7: Economic Analysis



Task 7
Sandra Pereira
João Grácio

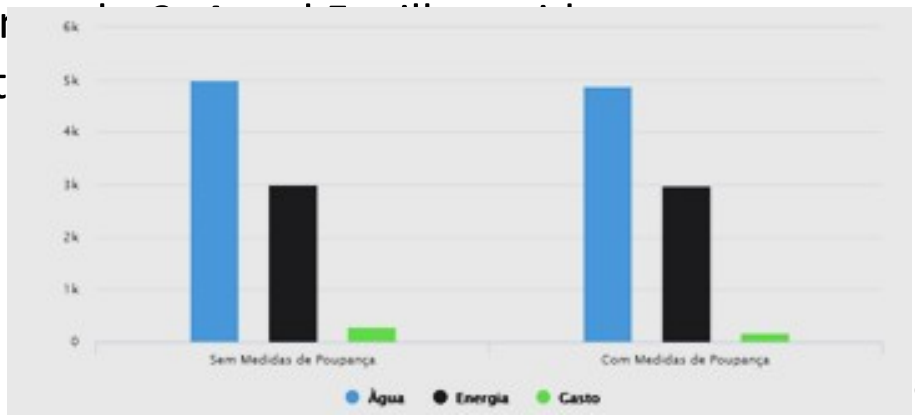
Output:

- It is expected to give valuable information about the costs with the different types of energy consumption in the analyzed water cycle stages depending on the rural and urban residential consumption.

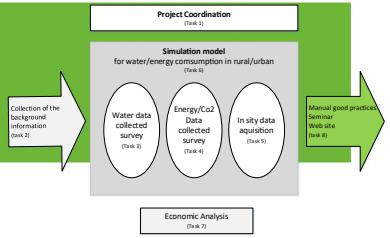
Objectives:

- This task will be focused in the analysis of the energy consumption costs for water in rural and urban residential scenarios.
- The similarities and the differences between these two environments will be also identified.
- The research work developed i
  the support for the energy cost

Investimento	1110 €
Período de retorno	0.70 anos



Task 8: Practical recommendation and results diffusion



Task 8
Isabel Bentes
António Cunha
Ana Sá
Cristina Matos
Francisco Pereira
Sandra Pereira
João Grácio
Rafael Faria

Output:

- The diffusion of the obtained results will be performed by the organizations of a seminar and completed by publishing the final report.

Objectives:

- The knowledge acquired in the previous tasks will be very important to characterize the residential water and energy consumption in rural and urban environment.
- With these results it is intended to warn for the resources scarcity problem and to encourage the stakeholders to adopt more sustainable policies, techniques and behaviors.
- The research team believes that the dissemination of the results will be a contribution to the development of strategies for water and energy efficiency in this sector.

Deliverables:

- Diana Filipa Gouveia de Matos Faria, **Estudo da relação entre o consumo de água e energia ao nível do utilizador final.**
- Matos, C.; Briga-Sá, A.; Bentes, I.; Faria, D.; Pereira, S., "**In situ evaluation of water and energy consumptions at the end use level: The influence of flow reducers and temperature in baths**".
- Matos, C, Bentes, I, Pereira, S, Faria, D, Briga-Sá, "**Energy to water nexus in domestic consumptions**".
- Briga-Sá, A, Faria, D, Silva, E, Pereira, S, Matos, C, "**Experimental analysis on energy and water consumptions at the domestic end use level: the particular case of baths**".
- Cristina Matos, Isabel Bentes, Sandra Pereira, Diana Faria, Ana Briga-Sá, "**Energy consumption, CO2 emissions and costs related to baths water consumption depending on the temperature and the use of flow reducing valves**".

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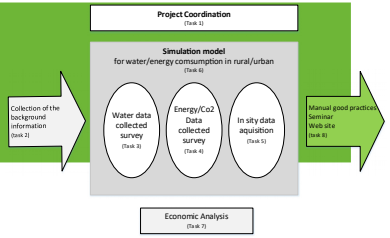
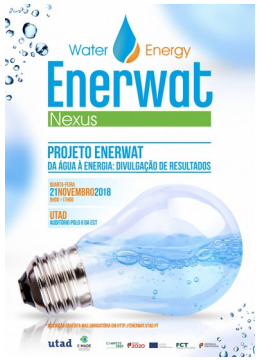
Task 8: Practical recommendation and results diffusion



Deliverables:



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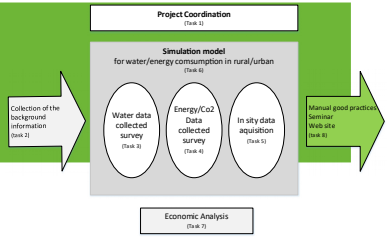

Deliverables:

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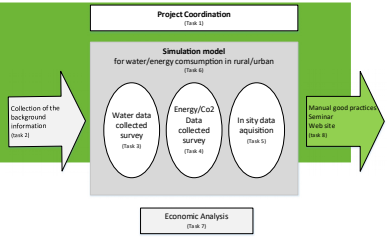
Task 8: Practical recommendation and results diffusion



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Questions

Thank you!