Programa Ambiente, Alterações Climáticas e Economia de Baixo Carbono

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A1 Report – Waste selection

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# 37_CALL#2 - Construção circular em edifícios modulares e energeticamente eficientes

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https://www.eeagrants.gov.pt/media/2993/guia-para-o-financiamento-projetos-eea-grants_programa-ambiente_28112019.pdf

## 1. Introduction

The present report describes the actions carried out concerning activity A1 - Selection of waste. The six wastes included in the project were defined by the research team during the preparation stage. All these wastes result from different industrial processes, namely from the production of wooden furniture, building insulation, municipal solid waste treatment, construction and demolition waste and, finally, different sources of glass and plastic production. The complete list of original wastes follows:

1. Expanded polystyrene (EPS, aka Styrofoam residue)
2. Wood residue (WR)
3. LIPOR slag (SL)
4. Ceramic waste (CW)
5. Glass waste (GW)
6. Plastic waste (PW)

The first five materials on the list are stored at the University of Trás-os-Montes and Alto Douro (UTAD), given the space availability. These will be transported to the remaining members of the consortium, in lower quantities, as the need arises. The last waste on the list is stored at the FCUP facilities.

Since the initial preparation of the project, the research team has decided to add three additional wastes, based on the experience accumulated and, also, on the subsequent knowledge of the properties of these materials:

7. Coal fly ash, from a Portuguese thermo-electric powerplant
8. Marble stone cut residue
9. Granite stone cut residue

## 2. Origin, collection, transport and storing conditions

The EPS was not supplied by a specific company. Instead, it was prepared from Styrofoam panels bought for this specific purpose. The panels were ground and the resulting material was submitted to characterisation analysis (i.e. no tests were performed on the original panels).

The WR was obtained from the Wood Laboratory of UTAD. It was fully dried and stored in plastic bags, to avoid contamination and moisture variations. No grinding was yet performed, as this residue has not yet been used by the research team, and some testing is required to understand how it can/should be used.

The SL was kindly supplied by the company LIPOR, which is responsible for the treatment of a great portion of the solid waste produced by the metropolitan area of the city of Porto. Approximately 1 ton of this slag was transported to the laboratory, where it was stored in a dry area, inside a 'big-bag'. This large quantity is justified by the expectation generated by this particular waste, regarding the required thermal properties of the panel's core.

The GW was obtained from two different sources, namely from the production of ophthalmic lenses (from the company POLO, located in Vila Real), and from the production of glass bottles (from a company located in Gaia).

The CW results from the treatment of construction and demolition waste, namely ceramic tiles and sanitary equipment. A large quantity of this waste was also obtained (approximately 1 ton), and stored in a dry area of the laboratory, inside a 'big-bag'.

The PW was obtained from a paraffin recycling company (Natural Life located in Maia) that has as sub-product plastic waste. A large bag of this waste was obtained and stored in a dry area of

the laboratory at FCUP. Grinding was performed on a small portion of the waste for characterization.

These original six wastes are presented in Figure 1, already dried and ground and, as such, prepared for the characterisation stage (Activity 2).

The coal fly ash (Figure 2) was supplied from the Portuguese thermo-electric company PEGOP, and, specifically, from the powerplant located in Pego Central. Although the company has stopped producing this waste, as these powerplants have been discontinued by the Portuguese government, there are still millions of tons landfilled, which could potentially be recycled, at a residual cost.

The marble and granite wastes were supplied by the Portuguese company 'Transgranitos'. These powders result from the industrial cutting of the respective stones and have been used in previous research projects with some success, especially given its performance as a filler. Both wastes were stored in wood boxes (Figure 2).

Transportation of the majority of these wastes to the laboratory has been made by external companies, after consultation of the prices and conditions. In general, the samples were delivered inside a 'big-bag', in quantities between 500 to 1000 kg.

Their origin was exclusively national, in sufficient quantities for future needs, resulting from the creation of the innovative materials of this project.

The selection of the reagents was mostly based on conservative solutions (in alkaline activation research) from the past 5 years, but alternative solutions have also been considered, given their potential.


*Figure 1 – Current state of the stored wastes - ceramic (a); slag (b); wood (c); EPS (d); glass (e); plastic (f).*


*Figure 2 – Storing of the wood waste (a), LIPOR slag (b) and ground EPS (c)*


*Figure 3 – Storing of the fly ash (a) marble (b) and granite wastes (c)*