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ECOGREENROOF – EGR: ECO-MATERIALS DEVELOPMENT FOR GREEN ROOFS

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ABSTRACT

The project EcoGreenRoofs - EGR aims to develop ecological substrates for application in green roofs, which include in their formulation industrial waste of organic and inorganic base. The substrates are tentatively produced exclusively from industrial waste and / or materials derived from waste treated, and tested at a facility to be studied, developed and built on pilot scale. The substrates produced will be tested under real conditions for their validation and inherent production process. This project aims also to evaluate the commercialization of substrates by analyzing the technical, economic and environmental components. The project is being carried out in co-promotion by two enterprises, one with know-how in the execution of green roofs (Neoturf) and the other with knowledge to implementation of industrial solutions aiming waste management (W2V), and by two SI & I entities with the knowledge and means to develop waste recovery studies (CVR) and roof solutions (Itecons).

Keywords: industrial wastes; organic and inorganic substrates; circular economy; green roofs

PROPOSITION

Considering the need to promote the sustainable application of green roofs in urban areas [1, 2], the EGR project aims to develop ecological and economic substrates, which are composed of organic and inorganic based wastes selected from different industrial sectors. The system to be developed is based on processes of transformation and recovery of wastes from different economic sectors and its main objectives are:

- Reuse and valorize resources: the wastes used comes from different origins and compositions;
- Develop value-added and eco-efficient products: taking into account the concept of circular economy, recycled materials from various industries may replace products conventionally used in this type of substrates;
- Enhance the green roofs sector economy: these alternative raw materials allow the substantial reduction of the substrates cost, which leads to a reduction of green roofs final price;
- Analyze the feasibility of using waste to other applications: the selected recycled materials can be used in the production of substrates for gardening or nurseries, thus increasing the range of potential customers for the solutions found;
- Reducing carbon emissions contributing to environmental improvement: the broad dissemination of this project results will potentiate more widely use of green roofs in urban infrastructures, promoting a better urban spaces environmental quality. To achieve this goal, the energetic benefits of the application of these substrates in green roofs will be quantified.

In order to obtain new products and substrates for green roofs based on the circular economy concept, fully validated and ready to be placed on the market, it is therefore necessary to:

- Evaluate the characteristics of the wastes relevant to the intended applications, namely: water absorption capacity, chemical stability, pH, mechanical strength, density, toxicity, among other less critical characteristics;
- Investigate the effect of waste properties when applied to substrates, namely in quantifying the energy benefits at the application level in green roofs;
- Test the use of recycled organic materials, such as compounds derived from the treatment of municipal solid waste, forest residues or agro-food waste;
- Determine the quality of inorganic waste with inert and non-hazardous characteristics that have interesting properties;
- Study the different interactions that occur in the substrates / microorganisms / plants system, through the analysis of the eukaryote biocenoses, associated with the rhizosphere of the plants used;
- Define and select formulations of interest for various green roof types (intensive, extensive and semi-intensive);
- Explore technological processes for waste pretreatment, and preparation of substrates, estimating processing costs;
- Validate at pilot scale the substrates produced by evaluating in detail, technical, economic and commercial difficulties;
- Solve technical difficulties and to find the best economic and market solutions;
- Apply the substrates produced on a pilot scale to real situations and monitor the development of green roofs over time.

The process proposed in the EGR project began with the selection of organic and inorganic residues and aimed the commercialization of validated eco-substrates (Fig. 1) by the assays to be performed.

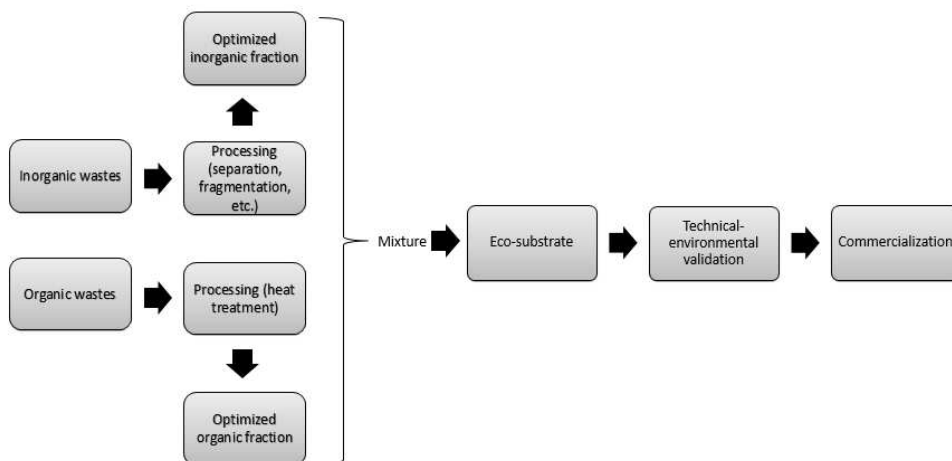


Fig. 1 - The EGR steps

EGR Project includes the following promoters: Neoturf - company with experience in the execution of green roofs; Waste to Value (W2V) - company dedicated to industrial solutions implementation in waste management field; two institutions of the National System of Research and Innovation (SI & I): Center for Waste Valorization (CVR) the Institute for Research and Technological Development in Construction, Energy, Environment and Sustainability (Itecons). The Universities of Minho (UMinho) and Trás-os-montes e Alto Douro (UTAD) are the main partners of this consortium.

WORK PLAN

The project includes eight activities: 1 - preliminary studies to identify and select wastes with potential for application in green roofs; 2 - development of a wide number of substrates containing organic and inorganic wastes selected in the previous activity and tested at laboratory scale assays; 3 - definition of the installation process of the pilot unit to produce the substrates; 4 - prototype construction and start-up tests; 5 - tests of semi-industrial production and validation; 6 - environmental and life cycle analysis of developed products; 7 - validation, on the basis of the European recommendations of technical requirements and certification of developed substrates [3]; 8 - promotion and dissemination of results - outputs.

Each activity includes several tasks led by different promoters. Activity 1 includes waste identification (W2V), physical, chemical and environmental characterization (CVR and UMinho), selection of inorganic wastes (W2V) and selection of the plants to be tested (Itecons and Neoturf). In activity 2, the substrates were characterized, and are being tested in vessels kept outside, to monitorization of plant growth and composition of rhizosphere biocenoses (CVR and UMinho); then, will be done assays in phytochemical chambers (Itecons). The technical, economic and environmental pre-assessment is carried out by Neoturf. The tasks of activity 3 and 4 will be led by W2V and include the equipment selection and the production line, technical design. Activity 4 tasks consists of pilot plant construction, startup testing, and licensing. In activity 5 substrates containing selected mixtures of wastes will be produced (W2V) and validated in real scale by Neoturf. Activity 6, led by the CVR, consists of assessing the environmental performance and product life cycle. The company Neoturf leads activity 7, to obtain the technical and economic substrates' evaluation, as well as the preparation of the products certification. Thus, the specifications of the technical guide FLL [4] and possibly its CE marking [3] will be considered.

OUTPUTS

This project is publicized by website (<http://www.ecogreenroof.pt/>), workshops and publicity actions with the market and the general public. Participation in trade fairs and in scientific congresses will be responsible for a more incisive disclosure, contributing to the publication of scientific articles and master's theses.

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