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REAP, a project for PET and can

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Abstract. In a moment of change, with an impulse from the pandemic that hit the world, the pursuit of the Sustainable Development Goals has become a clear necessity towards a more sustainable world, with less inequalities and a basis for the upbringing of future generations. SDG Goal 12 Sustainable Consumption and Production, 13 - Climate Action - and 14 - Life below water - are clearly linked to plastic and metal consumption and production. Also, Goal 10 - Reduced inequalities - plays its paper in this field. Not only does plastic and metal production, consumption and use need to be reformed, but also producers need to bridge inequalities and reuse, recycle and introduce circular economies in their own countries, not inducing mass imposition of waste in poorer economies. With this in mind, at the University of Aveiro, the REAP Project (Recycling of PET and Aluminium Packages) is being implemented, together with a Norwegian partner, with vast experience in the plastic waste sector. This project will help create the idea of PET and aluminium impact from a tax on these packages inside campi walls and a tax return after adequate deposition. Tracking these numbers and promoting research in the area of PET and aluminium reuse are a further input towards the implementation of SDGs. The paper will explain the project, its goals and ambitions.

Keyword:

PET, Can, SDG Goals, circular economy

1. Introduction



Figure 1. University Campus in Aveiro

The university of Aveiro is composed by 3 campi - the main campus in the city of Aveiro, incorporating Santiago Campus and Crasto Campus – Figure 1, a campus in Oliveira de Azemeis (School of Design, Management and Production Technologies Aveiro North-ESAN) and a campus in Águeda (Águeda School of Technology and Management – ESTGA). Over 17000 people constitute the university community that is composed of more than 15000 students, 1000 teaching staff, 700 administrative and managing staff and over 400 researchers. This community is spread over 3 campi that, altogether have circa 150 hectares and 45 buildings. The social services have a significant dimension as there are 5 canteens, 3 restaurants and 16 university residences. The 19 bars and coffee-shops are mostly privately explored.

Sustainability and its practice, sustained by defined aims, was greatly empowered by the clarity of the sustainable development goals (SDGs), established by the United Nations in 2015 (<https://sdgs.un.org/goals>). This group of goals provide a basis for the 2030 Agenda for Sustainable Development and have been impacted by the pandemic crisis that arose in the world from 2019 onwards. Regarding this last aspect, Shulla [1] reports that, besides the conclusion of a strong link between SDGs, this crisis situation also provides some positive results: „It is also important to seize the opportunity of a positive trend on behavior change, as a result of the pandemic, towards more sustainable lifestyles. Citizen’s awareness is raising regarding the importance of sustainability and of balanced ecosystems for health and wellbeing.”

It is in this context, the University of Aveiro, together with the Norwegian company Infinitum are implementing a project regarding the recycling of PET and aluminium packaging in the university’s campi. In this way, and clearly addressing SDG Goals - Goal 10 - Reduced inequalities 12-Sustainable Consumption and Production, 13 - Climate Action - and

14 - Life below water – the project REAP has the intention of creating are more sustainable practice in a community that seems to be more open to this aspect.

2. REAP aims and implementation

2.1. Project aims and SDGs

The basic principle of the project is the possibility that students and university (UA) staff can be reimbursed for each bottle or can be bought on campus and returned. This return will be made on dedicated equipment purchased under the project. The reimbursement amount must be credited to the UA Single Card, which is already associated with the institution's access and payment systems.

REAP project was built around three main aims:

1. It is expected that, with a dedicated separation, with a lower degree of contamination, the product resulting from the collection will have a higher quality and an increase in the selective collection of PET and aluminum will be seen. The environmental assessment of the pilot project will be carried out through a life cycle analysis.

The impact of this aim clearly interacts with SDG 12, as it directly promotes responsible consumption and production. The pandemic has somewhat increased inequality in the world, of which the plastic trade in third world countries is undoubtedly an issue that is of concern. Projects in the direction of REAP may be beneficial in terms of lowering plastic waste dumping to these countries, impacting health, among others, and thus affecting SDG 10.

2. Recycling for demonstration and innovation purposes. The intention is to acquire equipment that allows the transformation of PET into a suitable raw material for research projects in the area of 3D printing, incorporating new materials, producing new products (packaging) and assessing their quality, promoting and supporting the recycling sector and the secondary raw materials market.

Responsible production (SDG 12) is impacted by this aim and for this purpose, research will have a wide dissemination but also a link to production units. The inclusion of research in the project is also a step towards SDGs 13 and 14. Recycling plastic and aluminum, creating new products with used raw-materials and walking towards a circular economy are contributions to SDG 13 and 14, as plastic production, use and disposal affect both climate change and sea life.

3. Data collection that may be used as a basis for projects of a more substantial dimension.

Data is a fundamental basis for decision making and is the crucial element of this project.

2.2. Project implementation

For the pilot implementation, together with the Norwegian partner Infinitum, the physical "frontiers" for the project were set to enable the appropriate analysis of the pilot. At an initial point, the pilot study was defined , characterizing (through Master thesis), the packaging waste and determining the quantity of packages purchased at the university per year. This resulted in:

- characterization of aluminum and PET packaging waste;
- market research;
- 179230 PET packages
- 75957 aluminium packages

The purchase of reverse vending machines (RVM) was based on their characteristics and their location on an analysis of the consumption of cans and PET packages per bar/food unit (Figures 2 and 3).

The following distribution Of RVMs was decided:

- 1 small in the central technical zone (Santiago Campus);
- 1 large in a building for first year students (Santiago Campus);
- 1 small at the Student House (Craсто Campus);
- 1 small ISCA B (polytechnic school in building belonging to the university by Santiago Campus);
- 1 small ESTGA;
- 1 small ESAN.

The monitoring and evaluation of the implemented pilot will start with the arrival of the RVMs and will be constituted by the following:

- calculation of operating and performance indicators;
- comparison with the reference situation (current selective collection system);

This process suffered a setback with the covid pandemic as most of the canteens and bars remained closed. For this particular purpose we will need the university function to be stabilized.

Research through a PhD thesis focused on the following:

- PET recycling tests with the formulations developed in the project;
- Assessing the quality of recycled products in accordance to quality standards for food contact;

Work in progress is also being performed on two main areas:

- Environmental impacts assessed by LCA of the processes and products;
- Academy's awareness and communication



Figure 2. Sales of PET and aluminium (%)

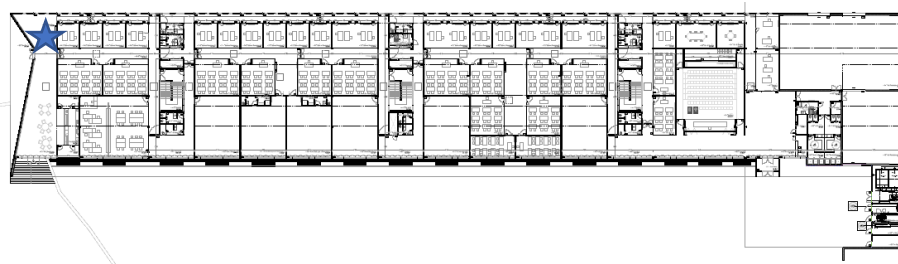


Figure 3. Equipment location at ESAN (blue star)

3. Summary/ Concluding Remarks

The REAP project is one of sustainability initiatives at the University of Aveiro, among an array of projects and actions brought about by its Sustainability Group, researchers and students. With quite a unique possibility of developing pilot studies parallel to relevant research in the areas of design and environment, UA is trading its way in terms of its impact as a sustainable university.



Figure 4. REAP image

REAP image (Figure 4) is the basis for dissemination of project results and for other dissemination actions within the project. Community involvement is key towards its success and the recent pandemic may have rendered these issues more visible and, hopefully, more participated. The interaction with local communities and industrial partners is envisaged and will bring the project towards a further level, in alignment with the Sustainable Development Goals.

References

1. Shulla, K., 2021. The COVID-19 pandemic and the achievement of the SDGs, Virtual Inter-agency Expert Group Meeting on Implementation of the Third United Nations Decade for the Eradication of Poverty (2018-2027), "Accelerating Global Actions for a World without Poverty" 24-27 May 2021