

# Awareness in Sustainability and Waste Recycling in Sintra: Participatory methods

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**ABSTRACT:** In Sintra, SMAS is the public service responsible for managing water distribution, wastewater drainage and treatment, and urban waste collection and transportation to an appropriate final destination (bulk service), serving 385,654 inhabitants across 320 km<sup>2</sup> area. Effective waste management is critical to maintaining a high quality of life, but it requires both individual and institutional responsibility. The high consumption of goods driven by economic and societal trends necessitates the adoption of new behavioral patterns that promote social, economic, and environmental development. Believing that "social responsibility and environmental preservation mean a commitment to life and the future", in this paper is proposed participatory strategies to awareness the citizens regarding conscious purchasing, prevention, recycling, proper waste disposal, the impacts of waste on public and environmental health. The aim is to increase participation, in an informed way and minimizing environmental and public health impacts of waste management system in Sintra.

## 1 INTRODUCTION

One of the major challenges faced by society and citizens in general is environmental preservation and safeguarding intergenerational equity based on a sustainable development paradigm (DGE 2023). The lifestyle model of urban-industrial societies has pressured the environmental degradation process, which became more evident since the 1970s. Public policies have intensified in the following decades, creating legislation, plans, and strategies aimed at protecting and mitigating environmental issues, seeking to raise citizens' awareness of sustainable development. According to UNESCO (2021), several international Conferences and Summits have contributed to the perception of the importance of Education for Sustainable Development, such as:

- The United Nations Conference on the Human Environment in Stockholm in 1972, which elects environmental education as a means of denouncing critical environmental situations;
- The intergovernmental conference on EA in Georgia in 1977 reflected on the importance of environmental education in preserving and improving the global environment, as well as in the solid development and balance of the world's communities;
- In 1987, the Brundtland Report defines "Sustainable Development" as that which "meets the needs of the present without compromising the ability of future generations to meet their own needs";

- In Japan, in 2014, the global action program proposes to expand to all “levels and areas of education and learning to accelerate progress towards sustainable development”.

Alves et al. (2012) argue that a culture of sustainability must understand both environmental and social issues, which can only be solved with "strong citizen participation in decision-making; it is not enough to mobilize; active participation is necessary." However, as the same authors reinforce, a change requires valuing informal education processes. In Portugal, the Environmental Education Framework for Sustainability developed by the General Directorate of Education (2018), in partnership with other entities, provides tools, "projects, and initiatives" that contribute to the "personal and social training of students." It was precisely in the field of sustainable development and environmental education, which is transversal to all age groups, that the aim of this study was established, with this starting question: To what extent will awareness motivate citizens' participation in waste recycling?

It is essential to clarify that in our daily lives, small gestures make a difference in the environmental, social, and economic spheres. "Promoting environmental education and awareness to ensure citizens' participation in environmental policies, namely, through the promotion of access to environmental information" is also one of the "essential domains" for "sustainable development, particularly in its environmental dimension" (ENDS, 2015).

To avoid and reduce these impacts, the waste policy focuses on preventing waste and using it as a resource, continuing the life cycle of materials and returning materials and energy to the economy. The waste policy also seeks to ensure the sustainable management of waste that cannot be prevented, ensuring efficient use of natural resources, and promoting the principles of circular economy. Waste management is based on a hierarchy that promotes prevention first, followed by (preparation for) re-use, recycling, other types of recovery and, finally, disposal (PERSU 2020+).

In order to define sustainable planning and management and innovation policies suitable for the Municipality, it is important to get to know the practices and behaviours of the citizens, both in terms of planned consumption that respects natural resources and the planet, and in terms of reuse habits, selective separation and correct disposal of waste.

The waste sector is very sensitive and dependent on public and stakeholders' co-operation to prevent, reduce, and recycle. In addition, the knowledge of the involved parts and the acceptance of innovative waste management practices are key factors. Recently, the waste sector opened to new approaches, namely stakeholders' engagement that is one of the most important drivers (Vasconcelos et al., 2021).

Participation has emerged as an appropriate approach for enhancing natural resources management and prevention, such as urban waste (Blengini et al., 2012; Newig, 2007), allowing for highlighting the innovative and sustainable opportunities that may come up (van den Hove, 2000) by defining coherent and transversal objectives for efficient waste policies (Coenen, 2009).

In this study, an action-research was developed to assess and increase the knowledge of the population residing in the Union of Parishes of Sintra, on sustainable values and practices, regarding waste valorization, involving, as much as possible, elected officials, entities, the local community, and other stakeholders to listen their sensitivities and proposals for improvement, thus optimizing active participation.

## 2 METHODS

This action-research is included in a case study type, which is defined by Yin (1989) as an empirical approach that investigates a current phenomenon in a real context. The general and specific objectives, supported by the literature review, allowed the elaboration of a text with critical spirit and theoretical consistency that supports research, that is, to find "the answer(s) to the problem under study" (Sousa & Batista, 2011), whose description, evaluation, and confirmation of hypotheses promote a methodology according to social sciences, with the capacity to test the formulated theories (Cruz et al., 2012).

The sample was defined by convenience, with representativeness extrapolated to the population under study, to obtain relevant information in relation to the study's objectives. The sample was randomized and stratified (by gender, age group, and professional/academic activity), which will allow for empirical generalization about the municipality, extrapolated to the munic-

ipality of Sintra. The choice of the Union of Parishes of Sintra, with a total area of 63.55 km<sup>2</sup>, for the focus of this study is since it integrates a rural area and an urban area in its territory, thus demonstrating a representativeness of the territorial structure and the municipality's population.

The Sintra area integrated the Sintra-Cascais Natural Park, seeking to protect its focal element, the Sintra Mountain Range, whose scenic value gives Sintra its mysticism and natural beauty, a fact that gives waste management a preponderant role in the maintenance and protection of this natural legacy; and for having been classified in 1995 by Unesco as a World Heritage Site with the classification of Cultural Landscape.

In this work we applied several instruments, such as Diagnostic questionnaires, Workshops, Evaluation of Workshops questionnaires and Another awareness-raising format developed was based on direct contacts at public events. Two workshops were carried out, one with an institutional format, held at the SMAS de Sintra auditorium and aimed at entities and the community in general in 20 of February of 2023. The other, aimed at the school community, was held in the Auditorium of the Secondary School of Santa Maria, Sintra in 16 of march of 2023. In these workshops, the roles of SMAS of Sintra were presented, along with the life cycle of waste, hierarchy and waste prevention, reuse and upcycling, recycling and downcycling, selective waste disposal (Textiles, Organics, and Composting), and illegal waste disposal, from the perspective of preserving natural resources and minimizing environmental damage, as it is vital for the resilience of urban areas, as pointed out by Pires et al. (2011).

### 3 RESULTS AND DISCUSSION

#### 3.1 Diagnostic questionnaires

A total of 161 respondents completed the diagnostic questionnaires and are residents of localities within the Union of the Parishes of Sintra. Of these respondents, the majority (63.4%) are female. The age group most represented is between 40 and 55 years old, and 41% of respondents have obtained a secondary education level.

As we can see in the results obtained in figure 1, the most expressive wrong answers were related to certain products to put in the selective waste bin for plastics and metals. But we can say that in general the population knows where to put their waste correctly.

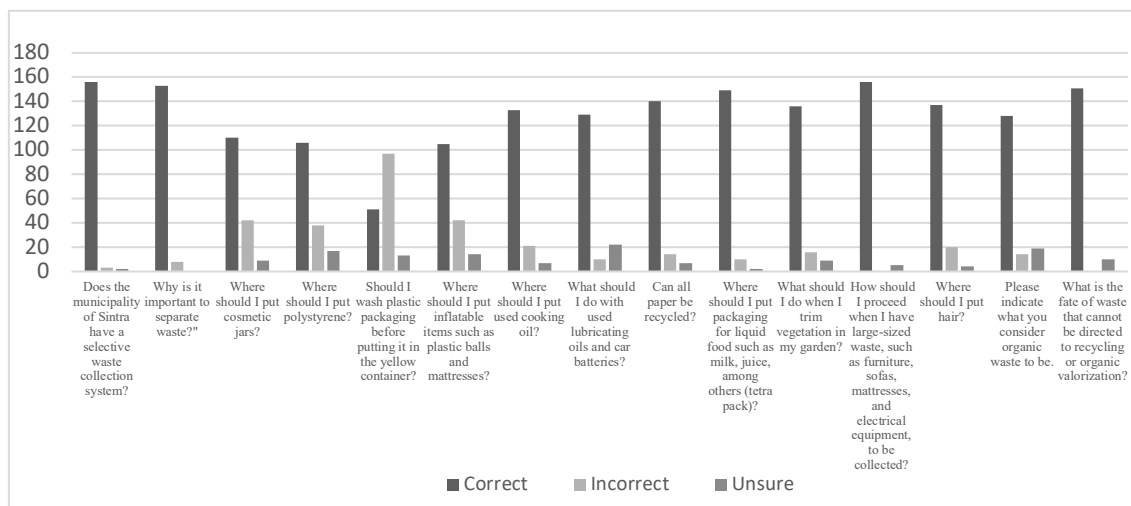


Figure 1. Assessment of the responses to the diagnostic questionnaire.

#### 3.2 Workshops

The workshops carry out in March 2023 at SMAS with around 25 stakeholders (Figure 1) and at school with around 100 participants with ages of 16 and 18 years hold (Figure 2).



Figure 2. Stakeholders view.



Figure 3. Students view.

In the SMAS was formed 8 working groups with 3 stakeholders per group. Conclusions of the Group Discussion in the Institutional Workshop was illegal dumping is the biggest concern expressed by the groups, who suggest increased monitoring and heavier penalties for offenders as possible solutions to this problem. An improvement proposal is the adaptation of container typologies to the areas where they are implemented, particularly in commercial areas, where the solution of round-mouthed containers makes deposition difficult, allowing cardboard to pile up near the containers. The selective collection of bio-waste was also commented on/observed, with the group considering it advantageous to have dedicated containerization, rather than SMAS investing in their own bags for this purpose. Awareness-raising actions, spanning different age groups, are also suggested to improve the performance of citizens in terms of selective separation and citizen participation.

From the analysis of the written comments on the worrying aspects in the school and suggestions for improvement in the 9 working groups with 12 stakeholders per group, it should be noted:

The need to reinforce waste containerization in the school, namely for selective collection and the placement of bins. It is also suggested to place ashtrays outside the school. They also point out that the students themselves do not show great concern in waste separation, however, they suggest that there should be more frequent collection and when this happens, the waste should not be mixed. They emphasize the importance of lectures and environmental initiatives to raise awareness and bring about a change in habits.

Regarding the Municipality of Sintra and waste management, the students consider it important to invest in awareness campaigns and recycling incentive programs. They suggest stricter enforcement of illegal waste disposal, with more frequent inspections and heavier fines. They propose the placement of more waste containers on the streets and greater availability of bins for organic waste. They suggest that collection and cleaning of containers should be more frequent and also refer to the importance of more intensive urban cleaning.

The action-research aimed, through workshops, to raise awareness about the importance of waste recycling, weaving in this context an environmental, civic and social perspective, creating dynamics of debate, participation and collaboration in an exchange of knowledge, concerns and solutions (Vasconcelos et al., 2021), whose collection constitutes an added value for the collection of comments, suggestions and concerns, which amplifies and fosters trust and collaboration, thus building "social capital", which aims to create new capacities, competencies, learning and knowledge, amplifying "human and intellectual capital", as well as leading to the creation of new services and infrastructure building "political capital" (Hassan, 2014).

### 3.3 Questionnaires

At the end of the presentations and group discussion/debate, participants were invited to fill out a knowledge assessment questionnaire. Here are the conclusions drawn from these questionnaires filled out on:

- SMAS, on the institutional Workshop  
A weekly number of undifferentiated waste disposals indicates a reduced selective separation.

Also, in this group, there is no direct correlation between disposals and the number of residents per household. It is up to the managing entity to invest in environmental awareness. In the second part of the questionnaire, which took place after the workshop and focused on waste separation and the reasons why it should be done, it is evident that the most relevant concepts regarding waste separation and its importance have been consolidated.

- The school Workshop

A high number of weekly disposals of undifferentiated waste were observed, indicating that there is no direct correlation between these disposals and the number of residents, demonstrating that in some households, the volume of selective separation is very reduced. This fact should be a concern for the waste management entity in the context of environmental awareness. This becomes clear when observing the answers given in the second part of the questionnaire, which occurred after the workshop, where the separation and the reasons why it should be performed were addressed. The choices reveal some ignorance/confusion, but essentially a disinterested selection and a random choice of options. However, it is evident that despite a certain indifference, the most relevant concepts about waste separation and its importance for a less harmful environmental management were achieved, thus demonstrating the importance of environmental education and awareness in waste management.

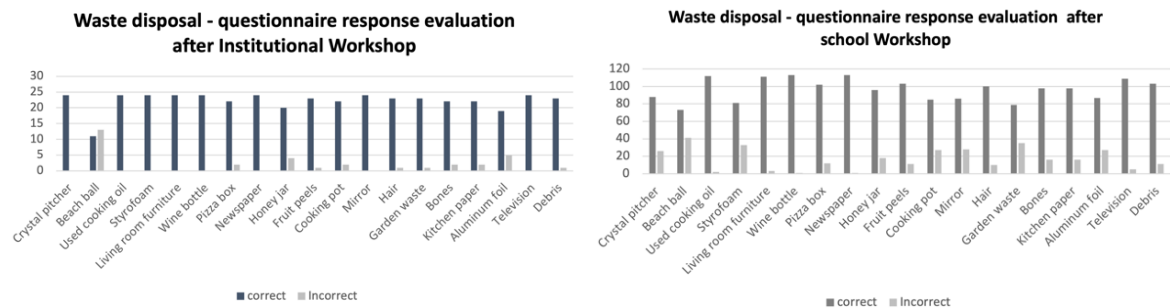


Figure 4. Waste deposition assessment respectively in the institutional questionnaire.

The awareness of the negative impacts of waste on the environment and human health constitutes an incentive for waste reduction, reuse and recycling of materials, as well as the adoption of sustainable practices. The dissemination of laws and regulations on this topic can deter illegal waste disposal, reducing the risk of pollution and damage to the environment.

### 3.5 Public events

Participative approach and the sessions format led to an effective engagement of involved stakeholders. The creation of such an inclusive and high participatory process (Gofen, 2015), in which equity among participants, resulted in stakeholders' capacity-building contributing to a more representative and holistic approach (Vasconcelos et al., 2021; Bengini et al., 2012; Coenen, 2009; van den Hove, 2020). Initially, the people approached displayed some distrust, assuming that the objective was to sell something. However, those who were willing to listen showed receptiveness and even welcomed the opportunity to "vent" and have their doubts clarified, mainly regarding waste separation.

Several criticisms arose, including:

- Insufficient number of wastes bins;
- Inadequate cleanliness of wastes bins;
- Inefficient waste collection;
- Lack of coordination between waste collection and sweeping around the wastes bins
- Absence of selective containers at popular events;
- Lack of knowledge about separation rules, indicating a need for awareness-raising;
- Insufficient availability of battery and electronics recycling points in easily accessible locations;
- Few containers for selective waste in rapidly growing rural areas, with the existing ones requiring more frequent collection;
- Delay in the delivery of composters for months, creating unmet expectations.

Regarding organic waste, the majority of those approached expressed satisfaction with the environmental concern and the provision of buckets, green bags, and a €1 discount on the water bill. However, they raised some questions, such as:

- Whether this project might be promoting the use of plastic bags (even if they are 100% recycled);
- The destination of the green bags collected;
- The financial sustainability of this project, considering that the SMAS intend to provide buckets and bags to all users in the municipality, and for how long;
- Distrust in the SMAS due to the lack of bag reinforcements in certain areas (e.g., Albarraque, Cabra Figa, etc.) after joining.

Based on this experience, I am pleased to conclude that it is urgent to raise awareness among citizens, and street events provide an excellent opportunity for that. It is extremely important for the SMAS of Sintra to communicate in a more transparent and effective manner, clarifying matters for the citizens and avoiding inappropriate conclusions and a loss of trust in the performance of the SMAS of Sintra. It is vital to discuss environmental issues and motivate attentive participation that will undoubtedly benefit everyone.

#### 4 CONCLUSION

These methodologies are very important to increase the trust of populations to be involved in these participatory processes and at the same time to learn good practices in waste management. Citizens need to play an active role on decision-making to co-construct action guidelines, aiming a higher implementation success for an effective and inclusive management of urban waste. The transition to a circular economy is one of the major challenges of our time, as it is necessary to ensure sustainable management of natural resources and reduce waste to achieve climate neutrality. In this regard, education and environmental awareness play a crucial role in promoting behavioral and attitudinal changes among the population towards the environment. Environmental education should start from childhood, with the introduction of sustainability-related content in schools and extend to professional training to foster a better understanding of the relationships between the environment, the economy, and society. Environmental awareness, on the other hand, should be directed towards the general population through information and awareness campaigns that highlight the importance of sustainable management of natural resources, waste reduction, and conscious consumption. Education and environmental awareness can stimulate behavioral and attitudinal changes, such as the adoption of more sustainable practices across all sectors of society. In the context of a circular economy, it is crucial to reduce the extraction of natural resources, extend product lifespan, avoid waste, and promote recycling and reuse. These practices have both economic and environmental benefits, as they reduce production costs and greenhouse gas emissions. Based on the objectives of this study, education and environmental awareness are prerequisites for the transition to a sustainable circular economy. It is essential to raise awareness among the population about the importance of sustainable management of natural resources and waste reduction, as well as to encourage behavioral and attitudinal changes. By doing so, we can build a more sustainable and climate-resilient society.

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