

# Recommendations for Improved Municipal Waste Management in Portugal

## Part II: The role of change management for successful waste management practices

THREE ROADS TO CIRCULAR ECONOMY: REDUCE, REUSE, RECYCLE (3R2CE)

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The report 'Recommendations for Improved Municipal Waste Management in Portugal', consisting of 'Part I: Baseline study for preparation for reuse and increased recycling of textile waste, bulky waste, hazardous household waste and C&D waste', and 'Part II: The role of change management for successful waste management practices', is one of the three main reports resulting from project 'Three Roads to Circular Economy: Reduce, Reuse, Recycle', co-funded via the Structural Reform Support Programme.

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## EXECUTIVE SUMMARY

Portugal has requested support from the Structural Reform Support Service (SRSS) of the European Commission under Regulation (EU) 2017/825 on the establishment of the Structural Reform Support Programme ('SRSP Regulation'). The Commission has analysed the request in accordance with the criteria and principles referred to in Article 5 of the SRSP Regulation, following which the Commission has agreed to provide technical support to Portugal in the area of institutional, administrative and growth-sustaining structural reforms, with the objective to:

- to support the national authorities in enhancing their capacity to formulate, develop and implement reform policies and strategies and in pursuing an integrated approach ensuring consistency between goals and means across sectors;
- to support the efforts of national authorities to define and implement appropriate processes and methodologies by taking into account good practices and lessons learned by other countries in addressing similar situations.

The project 'Reduce – Reuse – Recycle: Three Roads to a Circular Economy – 3R2CE' had the aim of developing and presenting strategies for three key areas of the circular economy, focusing on i. material efficiency in the following industrial sectors: textile, furniture, and construction, and focusing on ii. improved municipal waste management. This report belongs to the second part. Part I of the report 'Recommendations for Improved Municipal Waste Management in Portugal' proposes strategies to support Portugal in the attainment of EU waste targets and the further development of municipal waste management in the country, within four waste streams from households: textiles, bulky waste, hazardous household waste and construction and demolition waste. In Part II, the focus is shifted to the critical role of change management in securing the successful implementation of these strategies and driving positive change in municipal waste management practices in Portugal.

This report includes an assessment of the most recent research about the role of change management to foster improvements in municipal waste systems, an assessment of drivers and barriers experienced by the Portuguese municipalities to improve urban waste systems; and an assessment of European best practices in terms of municipal change management based on the identified needs.

The contributions in this report can serve as a roadmap for municipalities to take proactive steps towards sustainable waste management.

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## TECHNICAL TERMS

Recycling	Any recovery operation in which waste materials are reprocessed into products, materials, or substances, fit new purposes or products <sup>1</sup>
Upcycling	The process of transforming waste or discarded materials into new products that are of higher quality, value, and environmental significance. Unlike recycling, which typically involves breaking down materials into raw materials for reuse, upcycling involves using creative methods to repurpose materials into something new and useful. <sup>2</sup>
PRO	Non-profit producer responsibility organisation
Civic Amenity Centres	<p>Civic amenity sites are waste sorting facilities run by the local authorities. Citizens can deliver their household bulky waste and consult employees that are on the site to assist and assure that citizens are sorting the waste into the correct recycling fractions<sup>3</sup>.</p> <p>Civic amenity sites can either be completely open to the public or open to the citizens of the municipality only. When limited to the citizens of the municipality, individual user cards can be issued, or ID control can be performed at the civic amenity, or the control can be connected to the registration number of the car. Monitoring the users of the civic amenity centres is useful for making statistics, but also has a security purpose, as the sites can be targets for thefts and break-ins<sup>4</sup>.</p>
MSW	Abbreviation for Municipal Solid Waste

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<sup>1</sup> EEA (2022a): Reaching 2030's residual municipal waste target – why recycling is not enough.

<sup>2</sup> Upcycle That - a website with a collection of upcycling ideas and tutorials: <https://www.upcyclethat.com/>

<sup>3</sup> URBANREC (2019): New approaches for the valorisation of Urban waste into high added value RECYCled products.

<sup>4</sup> Waste Sweden (2021a): Åtvinningssentraler.

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# 1 INTRODUCTION

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Part I of the report ‘Recommendations for Improved Municipal Waste Management in Portugal’ developed under project ‘Three Roads to Circular Economy: Reduce, Reuse, Recycle’ (3R2CE) proposes strategies to support Portugal in the attainment of EU waste targets and the further development of municipal waste management in the country, within four waste streams from households: textiles, bulky waste, hazardous household waste and construction and demolition waste. In Part II of the report, we shift our attention to the critical role of change management in securing the successful implementation of these strategies and driving positive change in municipal waste management practices in Portugal.

Change management is a critical component of any successful waste management initiative. It is the process of planning, implementing, and managing changes in a structured and systematic way. In the context of municipal waste management, change management is essential because it helps to ensure that new policies, procedures, and technologies are implemented effectively and efficiently.

In this section, a set of recommendations will be provided so successful change management can lead to more sustainable and effective waste management systems in Portugal. These recommendations will draw on the specific drivers and barriers identified in close collaboration with local stakeholders.

## 2 METHODOLOGY

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To identify the best change management strategies for improving municipal waste management in Portugal, a multi-step methodology was employed. The methodology consisted of four main steps: literature review, identification of needs, identification of best practices and proposed change management strategies.

### Literature review

First, a comprehensive literature review was conducted to identify relevant research on change management strategies for waste management. This involved reviewing academic papers, reports, and other relevant sources to identify best practices and emerging trends in the field.

### Identification of needs

Throughout the project 3R2CE, interviews were conducted with key stakeholders in the waste management sector in Portugal, consisting of municipalities, recyclers, non-governmental organizations, inter-municipal waste management services, and PROs. Interviews have been held with more than 80 stakeholders to map the current possibilities and barriers for improving the existing collection and separate systems, as well as to promote the reduction, reuse and recycle, of the textiles, bulky waste, hazardous household waste and construction and demolition waste from households. After this initial assessment, almost 200 stakeholders participated in four workshops tailored according to each waste stream category to discuss and validate the drivers and barriers identified throughout the interview phase. The stakeholders provided invaluable insights and inputs regarding the prioritisation of the identified barriers for each waste stream and the possibilities of overcoming these barriers.

All four workshops were opened by Ana Cristina Carrola, Member of the Board of Directors of the Portuguese Environment Agency (APA), providing an overview of the government approach to the specific topic and illustrating potential solutions, hereby contributing to the stakeholders' perception of the workshops' importance. Appreciating the challenges in actively involving participants in a workshop only using digital media, the workshops were designed using an interactive tool allowing for constant activity and feedback. Sequenced breakout rooms were facilitated by both Portuguese and English-speaking mediators with a deep understanding of the project context, enabling a constructive and knowledge-based dialogue in which individual interests could be expressed in an open atmosphere. Barriers and drivers for implementing novel solutions for improved municipal waste systems – as perceived by stakeholders – were mapped.

The input gained from the literature review, interviews, and workshops, lead to the identification of drivers and barriers. The full lists of barriers per waste flows have been presented in sections 6.1.2, 6.2.2, 6.3.2, and 6.4.2 of the report 'Baseline study for Preparation for Reuse and Increased Recycling of Textiles, Bulky waste, Hazardous Household Waste and C&D Waste', and served as a background for the development of strategies for increased reuse and recycling of each waste flow. The subsequent work on the identification of the needs specifically for change management within the municipalities benefited from an analysis of the level of the barriers (local or national), and from input gained from a collection of best practices combined with feedback from APA.

### Best practices

The best practices collection was analyzed to identify successful change management strategies in waste management from other countries that could be adapted to the Portuguese context. This involved reviewing case studies from Europe to identify key success factors and lessons learned.

Finally, the findings from the literature review, stakeholders engagement, and best practices analysis were synthesized to identify the best change management strategies for improving municipal waste management in Portugal. These findings were organized into a set of recommendations for local stakeholders working in

the waste management sector in Portugal. Overall, the methodology employed in this report aimed to provide a comprehensive and evidence-based approach to identifying the best change management strategies for improving municipal waste management in Portugal. By drawing on a range of sources and perspectives, the report aims to provide actionable recommendations that can help to drive positive change in the waste management sector in the municipalities of Portugal.



### 3 LITERATURE REVIEW

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Municipal waste management is a complex issue that requires various strategies and approaches to be effectively managed. According to Leal Filho et al. (2020), waste management is a multidisciplinary field that involves various disciplines such as environmental science, public policy, economics, and engineering.<sup>5</sup>

Change management is a critical aspect of municipal waste management, as it involves implementing changes to policies, procedures, and technologies to improve waste management outcomes. However, implementing change in the context of municipal waste management can be challenging, due to a range of technical, social, and economic factors (Lu et al., 2020).<sup>6</sup>

One important concept in change management for municipal waste management is the waste management hierarchy. The hierarchy prioritizes waste reduction, followed by reuse, recycling, recovery, and disposal (Meekonnen et al., 2021). By prioritizing waste reduction and reuse, communities can minimize the amount of waste that needs to be managed and reduce the environmental and economic impacts of waste management.

Another key concept is stakeholder engagement in the change management process. Effective stakeholder engagement is critical to building support for change, addressing concerns and objections, and ensuring that all perspectives are considered. This may involve engaging with a range of stakeholders, including government agencies, private sector companies, civil society organizations, and residents. According to Nguyen et al. (2021), involving stakeholders in the waste management process can enhance public participation, reduce conflict, and increase trust.<sup>7</sup>

Additionally, effective communication is critical to successful change management for municipal waste management. This may involve developing clear and concise messaging around the need for change, the benefits of proposed changes, and the impacts of existing waste management practices. It may also involve using a range of communication channels, including social media, community meetings, and public events (Khan et al., 2020).<sup>8</sup>

Other best practices in change management for municipal waste management include the need for strong leadership, effective monitoring and evaluation, ongoing capacity building, and overcoming ingrained habits and attitudes. According to Chowdhury et al. (2021), strong leadership is critical to providing direction and guidance throughout the change process and addressing any obstacles or challenges that arise.<sup>9</sup> Effective monitoring and evaluation can help to track progress towards goals, identify areas for improvement, and ensure that changes are having the desired impact. Ongoing capacity building can help to ensure that employees and stakeholders have the skills and knowledge needed to implement and sustain changes. Finally, changes to waste management culture may require significant effort to overcome ingrained habits and attitudes and may require sustained communication and engagement with stakeholders (Said et al., 2021).<sup>10</sup>

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<sup>5</sup> Leal Filho, W., Wall, T., Azul, A. M., & Brandli, L. L. (2020). Waste management in the context of the circular economy: Challenges and strategies in the 21st century. *International Journal of Sustainable Development & World Ecology*, 27(5), 447-459.

<sup>6</sup> Lu, X., Cao, Y., & Li, X. (2020). Municipal solid waste management in China: A review. *Journal of Environmental Management*, 268, 110585.

<sup>7</sup> Nguyen, T. P., Tiberghien, J., & Thao Nguyen, T. P. (2021). Assessing the effectiveness of waste management policies in Vietnam: A review. *Resources, Conservation and Recycling*, 174, 105824.

<sup>8</sup> Khan, N. H., Hussain, T., Sabir, S., & Saeed, U. (2020). Municipal solid waste management: A comprehensive review. *Journal of Environmental Management*, 263, 110413.

<sup>9</sup> Chowdhury, M. K. R., Chakraborty, A., & Paul, P. (2021). Municipal solid waste management in India: A critical review. *Journal of Environmental Management*, 295, 113-127.

<sup>10</sup> Said, M., Elsayed, O. A., & Khaled, A. (2021). Towards sustainable municipal solid waste management: A review. *Journal of Cleaner Production*, 319, 128838.



*Figure 1. Summary of suggested change management approaches in the context of municipal waste management based on the literature review*

Overall, effective change management is critical to ensuring that municipal waste management systems are able to adapt to new challenges and opportunities, and to meet the evolving needs of communities. By drawing on best practices and frameworks from the broader field of change management, municipal waste management practitioners and policymakers can develop effective strategies for implementing change and driving positive outcomes.

## 4 IDENTIFICATION OF NEEDS

To provide a more comprehensive understanding of the identified barriers hindering the implementation of novel solutions for improved municipal waste systems in Portugal, Part I of the report presents detailed tables in sections 6.1.2, 6.2.2, 6.3.2, and 6.4.2. These tables provide a more nuanced analysis of the national and local obstacles in enhancing waste management practices across the four waste streams, and served as a background for the development of a strategy to increase reuse and recycling of the four waste streams. A shortlist of these obstacles was created in consultation with the Portuguese Environment Agency (APA) and then translated into municipal needs for each waste stream.

Based on this shortlist, the table presented below outlines the identified needs that could be addressed through changes in municipalities. It provides a starting point for developing effective solutions to improve waste management practices in Portugal's municipalities, and highlights the needs for change management and recommendations that could facilitate positive change in the waste management sector.

NEEDS	Waste stream			
	Textile waste	Bulky waste	Hazardous waste	C&D waste
Improve communication & capacitation of citizens	x	x	x	x
Development of good practice guidelines for citizens	x	x	x	x
Public procurement (targeting municipalities' purchases)	x	x	x	x
Promote collection Schemes/ Inter-municipal collaboration	x	x	x	x
Equalization of municipal cost-differences		x	x	x
Rural civic amenity centres		x	x	x
Promote economic incentive structures			x	x
Educational practices for small contractors				x

Before presenting recommendations, it is important to provide further explanation on the identified needs and their relevance to municipal waste management.

### 4.1 Improve communication & capacitation of citizens.

Improving communication and capacitation of citizens can have a significant impact on municipal waste management. Effective communication strategies can help to raise awareness among citizens about the importance of waste reduction and recycling, and how they can contribute to more sustainable waste management practices.

By providing citizens with the necessary information and knowledge, municipalities can encourage them to adopt more responsible waste management behaviors, such as separating waste correctly, reducing waste generation, and recycling more. This can ultimately result in a reduction in the amount of waste sent to landfill, and an increase in recycling rates.

In addition, capacitation of citizens can also be beneficial for the implementation of new waste management practices or technologies. For example, when a municipality introduces a new waste separation system, it can provide training and support to citizens to ensure that they understand how to use it effectively. By doing so, the municipality can increase the likelihood of the new system being adopted and used correctly, which can lead to more effective waste management.

Overall, improving communication and capacitation of citizens can play an important role in municipal waste management by promoting more sustainable waste management practices, increasing recycling rates, and ensuring the effective implementation of new waste management initiatives.

## 4.2 Development of good practice guidelines for citizens

Good practice guidelines for citizens can have a significant impact on municipal waste management by providing guidance on how citizens can better manage their waste. These guidelines can cover a range of topics, including waste reduction, sorting, and disposal. By following good practice guidelines, citizens can help to reduce the amount of waste generated, improve the quality of the waste stream, and increase the effectiveness of recycling and other waste management processes.

When citizens are educated on how to properly sort and dispose of their waste, it can also reduce contamination of the waste stream. Contamination occurs when non-recyclable or improperly sorted materials are mixed in with recyclables, leading to lower quality and reduced value of the materials. Good practice guidelines can help to reduce contamination by providing clear instructions on what can and cannot be recycled, and how to properly dispose of non-recyclable materials.

Furthermore, good practice guidelines can also help to increase the participation of citizens in waste management programs. By providing clear and easy-to-follow instructions, citizens may be more willing to participate in waste reduction, sorting, and disposal programs. This can lead to increased efficiency and effectiveness of waste management processes, and ultimately contribute to a more sustainable and environmentally-friendly waste management system.

### Textile waste

By providing clear and easy-to-follow guidelines for how to properly care for and dispose of textiles, citizens can be empowered to make more sustainable choices. This may include information on how to repair or repurpose clothing, how to properly sort textiles for recycling or donation, and how to dispose of textiles that cannot be recycled or donated. By following these guidelines, citizens can help to reduce the amount of textile waste that ends up in landfills and increase the number of textiles that are reused or recycled. Good practice guidelines may also include information on how to reduce overall textile consumption, such as through buying secondhand or choosing more sustainable materials.

### Bulky waste

The guidelines can inform citizens on how to properly dispose of bulky items, such as furniture and appliances, through appropriate channels such as waste collection services or recycling centers. By educating citizens on how to dispose of bulky waste properly, there is a reduced risk of illegal dumping, which can lead to environmental damage and potential health hazards. Additionally, good practice guidelines can encourage citizens to consider alternatives to disposing of bulky items, such as donating or selling them, which can help extend the life cycle of the products and reduce waste generation. Furthermore, guidelines can inform citizens about the potential impacts of their consumption choices on the generation of bulky waste, encouraging them to make more sustainable choices and reducing the overall amount of bulky waste generated.

### Household Hazardous Waste

By educating citizens on the proper management of household hazardous waste, the risk of improper disposal and the negative impacts on human health and the environment can be reduced. Good practice guidelines can also promote the use of safer and less toxic alternatives to household hazardous products, ultimately reducing the amount of hazardous waste generated. Additionally, guidelines can provide information on local collection points for household hazardous waste and encourage citizens to participate in disposal programs to properly manage these wastes. Overall, good practice guidelines can play a key role in improving household hazardous waste management and reducing its negative impacts on the environment and public health.

## Construction and demolition waste

Citizens can be encouraged to reduce waste by planning construction projects carefully to avoid excess materials, using recycled or reclaimed materials, and donating usable materials to organizations that can reuse them. The guidelines can also promote the use of certified waste management companies to ensure that waste is properly disposed of and recycled. Additionally, guidelines can encourage citizens to engage with their local authorities and construction companies to promote sustainable construction practices and increase awareness about the importance of reducing construction and demolition waste.

### 4.3 Public procurement

Public procurement can play an important role in municipal waste management. It refers to the process by which public authorities, such as municipalities, purchase goods and services from suppliers. In the context of waste management, public procurement can be used to promote sustainable waste management practices by selecting suppliers that provide environmentally friendly products and services.

For example, when a municipality needs to purchase waste collection vehicles or equipment for a waste treatment plant, it can specify in the tender documents that the products must meet certain environmental criteria, such as minimum energy efficiency ratings or use of recycled materials. By doing so, the municipality can ensure that it is procuring products that have a lower environmental impact and contribute to more sustainable waste management.

In addition, public procurement can be used to promote circular economy principles by selecting suppliers that provide services related to repair, refurbishment, or reuse of products. This can help to reduce waste and increase the lifespan of products, contributing to a more sustainable use of resources.

Overall, public procurement can be a powerful tool for municipalities to promote sustainable waste management practices and contribute to the achievement of waste reduction and recycling targets.

### 4.4 Inter-municipal collaboration

Inter-municipal collaboration can play a crucial role in municipal waste management. It involves cooperation and coordination between different municipalities in a region or area to jointly tackle waste management challenges. By sharing resources, expertise, and best practices, the municipalities can achieve economies of scale and optimize their waste management systems. Inter-municipal collaboration can help in setting up common facilities for waste collection, sorting, and disposal, which can be more efficient and cost-effective than individual facilities for each municipality. It can also help in promoting sustainable waste management practices and increasing recycling rates through joint campaigns and awareness-raising initiatives. Additionally, inter-municipal collaboration can facilitate the implementation of extended producer responsibility (EPR) schemes and other waste reduction initiatives that require coordination among multiple stakeholders. Overall, inter-municipal collaboration can help municipalities improve their waste management practices and achieve their waste reduction targets in a more effective and sustainable manner.

### 4.5 Equalization of municipal cost-differences

The equalization of municipal cost-differences can have a significant impact on municipal waste management. In many cases, waste management costs can vary significantly between municipalities, which can result in disparities in the quality and availability of waste management services. This can lead to issues such as illegal dumping and poor waste management practices, which can have negative impacts on the environment and public health.

By equalizing the costs of waste management services across municipalities, it can help ensure that all citizens have access to high-quality waste management services, regardless of their location or economic situation. This can encourage more sustainable waste management practices and reduce the incidence of illegal dumping and other forms of environmental harm.

Additionally, the equalization of costs can help incentivize municipalities to adopt more sustainable waste management practices, such as recycling and composting. When the costs of waste management are spread more evenly across municipalities, it can create a level playing field for waste management providers and encourage the adoption of more environmentally sustainable practices.

In summary, the equalization of municipal cost-differences can promote more equitable and sustainable municipal waste management practices, and can help reduce the negative environmental and health impacts of poor waste management.

#### 4.6 Rural civic amenity centres

Rural civic amenity centres can play an important role in municipal waste management, particularly in rural areas where access to waste management facilities may be limited. These centres provide a place for residents to bring their waste, such as bulky items, hazardous materials, and other items that cannot be disposed of in regular household bins. By providing access to these facilities, rural civic amenity centres can help to reduce illegal dumping and promote proper disposal of waste. Additionally, these centres can serve as a hub for educational and awareness-raising activities, such as workshops on waste reduction and recycling, which can further promote sustainable waste management practices in rural communities.

#### 4.7 Economic incentive structures

Economic incentive structures can play a crucial role in shaping the behavior of both individuals and organizations in the realm of waste management. In the context of municipal waste management, economic incentives can take many forms, including fees for waste disposal, taxes on waste generation, and financial rewards for waste reduction or recycling. Such structures can create a financial motivation for individuals and organizations to reduce the amount of waste they generate and dispose of. For example, if a municipality charges residents for every unit of waste they dispose of, individuals may be incentivized to reduce their waste generation or to recycle more in order to save money. Similarly, if a company is subject to a tax on the waste it generates, it may be incentivized to reduce its waste generation in order to avoid the tax. Economic incentive structures can also help to offset the costs associated with implementing and maintaining effective waste management practices. For example, revenue generated from waste disposal fees can be used to fund recycling programs, while taxes on waste generation can be used to finance waste reduction initiatives.

Regarding the management of household hazardous waste (HHW), many households may not properly dispose of HHW because of the perceived inconvenience or cost associated with the disposal process. Incentives, such as financial incentives, can encourage households to properly dispose of HHW. For example, some municipalities offer HHW collection events where residents can dispose of HHW free of charge or for a reduced fee. Additionally, municipalities can consider offering financial incentives to residents who properly dispose of HHW throughout the year, such as through a rebate or discount program. Economic incentives can also encourage HHW reduction, reuse, and recycling by providing financial benefits for these actions. Overall, economic incentive structures can help increase the proper management of HHW, leading to a safer environment and protecting public health.

With regards to construction and demolition waste (CDW), some countries have introduced levies or taxes on the disposal of construction and demolition waste in landfills, which can create an economic incentive for companies to recycle and reuse these materials. In addition, some municipalities have implemented policies that require a certain percentage of recycled materials to be used in construction projects. By creating economic incentives to reduce the amount of construction and demolition waste sent to landfills and increase recycling, these policies can contribute to more sustainable waste management practices.

In both cases, economic incentives can encourage a shift towards sustainable waste management practices, while also potentially providing cost savings for waste producers. However, effective communication and enforcement mechanisms are necessary to ensure compliance and prevent abuse of the system.

## 4.8 Educational practices for small contractors

Educational practices for small contractors can help to reduce the amount of waste going to landfill in several ways. Firstly, by educating contractors on the importance of waste reduction, reuse, and recycling, they can be encouraged to adopt more sustainable practices in their work. This could include strategies such as source reduction, where waste is minimized at the outset by reducing the number of materials used or by reusing materials where possible.

Secondly, contractors can be taught to properly sort and separate waste materials at the source, which can increase the amount of material that is diverted from landfill and sent for recycling or reuse. This can be achieved through training on the different types of waste and how to properly separate them, as well as the use of color-coded bins and other visual aids to help with identification and sorting.

Thirdly, educational practices can help to promote circular economy principles among small contractors. This involves designing waste out of the system and encouraging the reuse of materials and products at the end of their lifecycle. By providing information and resources on circular economy practices, small contractors can be encouraged to adopt these principles in their work, leading to a reduction in waste going to landfills.

Finally, educational practices can also help to promote awareness among small contractors of the economic benefits of waste reduction and recycling. By highlighting the potential cost savings associated with these practices, contractors may be more likely to adopt them as part of their business model, leading to a reduction in waste going to landfill.

It is important to note that identifying the needs for change management is only the first step towards driving positive change in waste management practices within municipalities. While the shortlist of identified needs provides a solid foundation, it is crucial to go beyond identifying the needs and to take action to address them. In the next section of the report, best practices in waste management will be explored, and examples of successful implementation will be highlighted to help guide Portuguese municipalities towards sustainable waste management practices. By combining the insights gained from identifying needs with the implementation of best practices, municipalities can make significant progress towards achieving their waste management objectives.



## 5 BEST PRACTICES

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With a solid understanding of the identified needs for change management within municipalities, the next step towards achieving sustainable waste management practices is to explore best practices that have been successfully implemented in other contexts. By studying best practices in waste management, municipalities can gain valuable insights into effective strategies for addressing the identified needs and improving their waste management systems.

This section will examine examples of successful waste management practices from Europe, with a focus on approaches that are relevant to the Portuguese context. Whereas some of the examples were identified through literature review, most examples drawn from the most relevant cases presented during the two-days event arranged on the 7th and 9th March 2023 by the Technical Assistance and Information Exchange instrument (TAIEX) of the European Commission, in Porto and Lisbon, in the context of project Three Roads to Circular Economy: Reduce, Reuse, Recycle.

### Management of Hazardous waste from households – practices and lessons learned in Finland

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In Finland, municipalities have been obligated to organize the reception and treatment of hazardous waste generated in housing since 1979. This includes waste such as batteries, fluorescent lamps, paint, pesticides, and electronic equipment. The goal is to ensure that hazardous waste is handled safely and disposed of properly to protect both human health and the environment.

Household hazardous waste is usually collected at dedicated collection points or special events organized by municipalities. These collection points are typically located at waste management facilities, recycling centers, or other designated locations. Some municipalities also offer a home collection service for larger quantities of hazardous waste.

Once collected, the hazardous waste is transported to specialized treatment facilities where it is either recycled, recovered, or disposed of safely. For example, batteries and fluorescent lamps are usually recycled, while hazardous chemicals and paints may be treated or incinerated to minimize their impact on the environment.

Furthermore, several hazardous waste fractions of municipal solid waste are extended producer responsibility fractions (EPRs). Manufacturers and importers of certain product types must bear the responsibility for the management of their products when they become waste, and EPR organisations and municipalities are cooperating to maintain a good service level for households as well, and several EPR fractions are also hazardous waste, e.g.: cellphones, batteries, refrigerators, old cars, fluorescent lights. Also, EPR organisations cover part of the costs for municipalities that organize the collection.

In addition to the collection and disposal of household hazardous waste, municipalities in Finland also provide information and education to residents on how to handle and dispose of hazardous waste safely. This includes guidance on how to reduce hazardous waste generation, how to store hazardous waste safely, and how to dispose of it properly.

### Managing Household Hazardous Waste with a Mobile Collection Unit: The Oslo Case

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The city of Oslo, Norway has implemented a program to manage household hazardous waste through its 'Hazardous Waste Mobile Collection Unit'. The program provides residents with a convenient way to dispose of household hazardous waste such as batteries, electronics, and chemicals. The mobile unit travels to



different neighborhoods throughout the city on a regular schedule, making it easier for residents to dispose of their hazardous waste properly.<sup>11</sup>

The initiative was launched in 2012 and has faced challenges such as increasing public awareness about hazardous waste and ensuring proper disposal of items. However, the program has been successful in reducing the amount of hazardous waste that is illegally dumped and has improved public health by reducing exposure to harmful chemicals.

The Hazardous Waste Mobile Collection Unit also promotes waste reduction and encourages sustainable practices. For example, the unit offers advice and information on how to reduce the amount of hazardous waste generated in households, and they provide free replacement batteries for rechargeable devices. The program has been well received by residents, with over 12,000 visits to the mobile unit each year.

The success of the Hazardous Waste Mobile Collection Unit program in Oslo has led to its replication in other cities in Norway and Europe. The initiative demonstrates the importance of proper management of hazardous waste and the benefits of providing convenient and accessible disposal services to residents.

### Best practices in Intermunicipal Collaboration: The pictogram system for waste sorting in Denmark

The Danish Waste Association, an association of 60 municipalities and waste companies, has developed a harmonized pictograms system for waste sorting and citizen involvement. This system works as a link between waste and the bins, and has the purpose of making waste sorting easier for citizens and corporations. Today close to all of the 98 municipalities in Denmark are using the pictogram system.<sup>12</sup>



Figure 2. The 91 pictograms for waste sorting (Source: <https://danskaffaldsforening.dk/>)

<sup>11</sup> Oslo Kommune. (2021). Hazardous Waste Mobile Collection Unit. <https://www.oslo.kommune.no/avfall-og-gjenvinning/husavfall-og-groentare/helse-og-miljo/hazardous-waste-mobile-collection-unit/>.

<sup>12</sup> <https://danskaffaldsforening.dk/the-danish-pictograms-waste-sorting>

This system is a combination of the most effective elements of pre-existing waste sorting systems from various regions in Denmark. Its creation was informed by a series of meetings, workshops, interviews, and surveys involving waste management experts from municipalities and waste plants, as well as citizens from different parts of the country.

The primary objective of the Danish pictogram system is to ensure that individuals can easily identify and use the same pictograms consistently, regardless of when or where they are disposing of their waste in Denmark, for both household waste and waste collected at recycling centers. They are currently in use by almost all 98 municipalities in Denmark, various corporations and organizations, private individuals, and at different events and on packaging.

Furthermore, the system considers the entire value chain. Putting pictograms on packaging has been a gateway to discuss packaging design with the Danish producers and retailers, allowing for improving consumers' awareness.

Currently, besides Denmark, Sweden, Norway, Iceland, Latvia, Lithuania, Faroe Islands and Åland Islands are also using the pictograms system, while in Finland, Estonia and Greenland the pictograms are underway to be implemented. Other EU countries have shown interest, and as part of the packaging directive revision, the EU Commission are looking into extending the use across the EU.<sup>13</sup>

### Citizens and their waste behaviour: Dutch approach of communication around waste and littering

The Netherlands is known for its efficient waste management system, and communication plays an important role in shaping citizens' waste behavior. The Dutch approach to communication around waste and littering is focused on education, engagement, and empowerment.

One of the key strategies used in the Netherlands is to provide citizens with clear and simple information on how to properly dispose of their waste. This includes information on which materials are recyclable and which should be disposed of in the trash, as well as information on where to find recycling facilities and what to do with hazardous waste. Citizens are also encouraged to reduce waste by using reusable products and avoiding single-use items.<sup>14</sup>

Another important aspect of the Dutch approach is engagement with citizens. This involves working with local communities and organizations to promote sustainable waste practices and reduce littering. For example, many municipalities in the Netherlands organize cleanup events where citizens can come together to collect litter from public spaces. These events help raise awareness about the impact of littering on the environment and encourage citizens to take action to reduce waste.<sup>15</sup>

Empowering citizens to take responsibility for their waste is another key strategy used in the Netherlands. This includes providing citizens with the tools and resources they need to properly dispose of their waste, such as recycling bins and composting facilities. It also involves encouraging citizens to report littering and illegal dumping to local authorities, which helps to identify problem areas and address them more effectively.

The Dutch approach to communication around waste and littering has been successful in shaping citizens' waste behavior. Through education, engagement, and empowerment, the Netherlands has been able to achieve high rates of recycling and minimize littering. This approach can serve as a model for other countries looking to improve their waste management systems and reduce the impact of waste on the environment.

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<sup>13</sup> European Commission. (2021, July 14). Q&A: Packaging and Packaging Waste Directive. Retrieved from [https://ec.europa.eu/commission/presscorner/detail/en/qanda\\_22\\_7157](https://ec.europa.eu/commission/presscorner/detail/en/qanda_22_7157).

<sup>14</sup> Rijkswaterstaat. (2021). The Dutch Waste Management Chain. Retrieved from <https://www.rijkswaterstaat.nl/english/topics/water-quality-waste-management/waste-management/dutch-waste-management-chain/index.aspx>

<sup>15</sup> Van den Berg, M., & Spaargaren, G. (2019). Sustainable waste management in the Netherlands: The role of citizen engagement. *Waste Management*, 87, 756-766.

## Antwerp's Diftar System: Encouraging Citizen Contribution to Better Waste Management

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The city of Antwerp, Belgium, is a good example of European municipality that has successfully improved citizens' contribution to better waste management.<sup>16</sup>

In 2018, the city introduced a new waste management system called 'Diftar' which stands for 'Different Tariffs'. Under this system, households are charged a fee based on the volume of non-recyclable waste they produce. The more waste a household produces, the higher the fee they pay. Conversely, households that produce less waste pay a lower fee.

To support this new system, the city has implemented several initiatives to encourage residents to recycle more and produce less waste. For example, the city provides free recycling bags for residents and has expanded its recycling infrastructure with new recycling centers and more recycling points in public spaces. The city has also launched educational campaigns to raise awareness about the importance of recycling and reducing waste.

The Diftar system has faced challenges, including initial resistance from some residents who felt that the new fees were unfair. However, the system has been successful in reducing the amount of non-recyclable waste produced in the city and increasing recycling rates.<sup>17</sup>

As a result of the Diftar system and accompanying initiatives, Antwerp has become a leader in sustainable waste management practices and serves as a model for other European municipalities looking to improve citizens' contribution to better waste management.

## Rotterdam's Waste Pays Card Program: Incentivizing Bulky Waste Management and Promoting Sustainability

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The 'Waste Pays Card' program in Rotterdam, Netherlands, is a creative solution to the issue of bulky waste management. The program was launched in 2012 by Afval Loont, the municipal waste management company, with the goal of incentivizing residents to properly dispose of bulky waste items and reduce the amount of waste sent to landfills.<sup>18</sup> However, the program faced initial challenges in engaging residents and encouraging them to participate in the program.<sup>19</sup>

Despite these challenges, the Waste Pays Card program has been successful in promoting a culture of sustainability in Rotterdam. As of 2021, the program had over 300,000 registered participants who brought in more than 10,000 tonnes of bulky waste annually. In addition, the program has increased participation in bulky waste collection, reducing the amount of bulky waste sent to landfills by 30% since its inception.

The rewards system has been praised for its effectiveness in motivating residents to dispose of bulky waste responsibly, while also providing benefits for local businesses. Rotterdam's Waste Pays Card program has inspired similar initiatives in other municipalities in the Netherlands, demonstrating the potential for innovative solutions to address waste management challenges.

## Reuse Centre on Wheels: A Mobile Solution for Sustainable Waste Management in Ljubljana's Zero Waste Initiative'

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<sup>16</sup> City of Antwerp. (2021). Waste Management: Diftar. <https://www.antwerpen.be/en/overzicht/dienst/afval-en-reiniging/diftar>.

<sup>17</sup> Eunomia Research & Consulting Ltd. (2021). Municipal Waste Management in European Countries: A review of Best Practices. <https://www.eunomia.co.uk/reports-tools/municipal-waste-management-in-european-countries-a-review-of-best-practices/>

<sup>18</sup> Afval Loont Pas zorgt voor afvalscheiding in Rotterdam" (in Dutch), VNG Realisatie website: <https://www.vngrealisatie.nl/nieuws/afval-loont-pas-zorgt-voor-afvalscheiding-rotterdam>

<sup>19</sup> "Rotterdam's 'Waste Pays' scheme turns rubbish into rewards," The Guardian website: <https://www.theguardian.com/sustainable-business/2015/jan/19/rotterdam-waste-pays-scheme-turns-rubbish-rewards>

Ljubljana's waste management practices have been recognized internationally, and the city has received numerous awards for its efforts. In 2018, Ljubljana was awarded the United Nations' World Tourism Organization's Award for Innovation in Sustainable Tourism, and in 2019, the city was named the European Green Capital (The Guardian). These accolades demonstrate the success of Ljubljana's waste management practices and serve as an example for other cities around the world. The Reuse Centre on Wheels is one of Ljubljana's zero waste initiatives implemented as part of the city's effort to reduce 75% of the waste sent to landfills by 2035, with the ultimate goal of achieving zero waste and promote circular economy.<sup>20</sup>

The Reuse Centre on Wheels involves a mobile unit that travels around the city collecting unwanted items that are still in good condition, such as furniture, clothing, and household items. These items are then brought to a central location, where they are repaired and prepared for resale (City of Ljubljana).<sup>21</sup> This project was launched in 2012 and has been successful in diverting large amounts of waste from landfills. In 2020 alone, the project collected over 74,000 items and prevented more than 370 tons of waste from being sent to landfills (City of Ljubljana). The project not only reduces waste, but also provides affordable items for those in need and promotes the circular economy by encouraging the reuse of materials.<sup>22</sup>

The Reuse Centre on Wheels is just one example of Ljubljana's commitment to sustainable waste management practices. The city's comprehensive waste management system, which includes separate collection of biodegradable waste, recycling programs, and a pay-as-you-throw system, has resulted in impressive recycling rates and a significant reduction in waste sent to landfills.

### The Swap Shop: Fostering Community Engagement and Sustainable Consumption in Gothenburg's Waste Reduction Efforts

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The Swap Shop initiative in Gothenburg, Sweden is a unique approach to waste reduction that encourages residents to exchange items they no longer need for items they do. The project involves a physical location where residents can bring unwanted items such as clothes, electronics, and books and trade them for other items that are of interest to them. The project's goal is to reduce waste and promote reuse while providing residents with an opportunity to socialize and build community connections<sup>23</sup>.

The Swap Shop was launched in 2017 and has faced some challenges such as space constraints and logistics of managing inventory. However, the initiative has been well-received by the community and has been successful in diverting waste from landfills. According to a report by the City of Gothenburg, the Swap Shop has helped to save over 24 tons of items from being discarded and has prevented an estimated 45 tons of carbon dioxide emissions from entering the atmosphere.<sup>24</sup>

In addition to reducing waste, the Swap Shop has also provided social benefits for the community. The project has become a popular gathering place for residents, where they can meet and socialize while also contributing to a more sustainable future. The Swap Shop has also provided opportunities for education and awareness-raising around waste reduction and sustainable consumption.

The Swap Shop initiative in Gothenburg demonstrates the importance of community engagement in waste reduction efforts. By providing a physical space for residents to exchange items, the project has successfully fostered a culture of reuse and encouraged more sustainable consumption patterns.

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<sup>20</sup> City of Ljubljana. (n.d.). Zero Waste. <https://www.ljubljana.si/en/ljubljana-for-you/sustainable-ljubljana/zero-waste/>

<sup>21</sup> City of Ljubljana. (n.d.). Reuse Centre on Wheels. <https://www.ljubljana.si/en/municipality/projects/reuse-centre-on-wheels/>

<sup>22</sup> City of Ljubljana. (2021). Annual Report 2020. <https://www.ljubljana.si/file/1170102/Annual-report-2020.pdf>

<sup>23</sup> City of Gothenburg. (n.d.). The Swap Shop - Sustainable Consumption. <https://goteborg.se/wps/portal/start>

<sup>24</sup> City of Gothenburg. (2021). Annual Report on Sustainable Gothenburg 2020. <https://goteborg.se/wps/wcm/connect/2c3e3692-e7d4-4f77-86e2-53b3fdbf0d31/City+of+Gothenburg+Annual+Report+2021.pdf?MOD=AJPERES>

## Promoting Sustainable Consumption and Waste Reduction through the ReUse Centre in Aarhus, Denmark

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The ReUse Centre in Aarhus, Denmark is an innovative waste management initiative that aims to reduce waste and promote sustainable consumption. The centre provides a physical space where residents can donate and purchase second-hand items such as furniture, clothing, and electronics. Additionally, the centre features a workshop component, providing a space for repairing and upcycling items, as well as educating the public on the benefits of waste reduction and sustainable consumption (ReUse Aarhus).<sup>25</sup>

The project's goal is to extend the lifespan of products and promote circular economy principles by reducing waste and minimizing resource consumption. The ReUse Centre was launched in 2016 and has faced challenges such as managing inventory and maintaining a high level of quality control for donated items. However, the project has been successful in diverting waste from landfills and promoting sustainable consumption. According to ReUse Aarhus, the centre has helped to save over 400 tons of items from being discarded and has provided opportunities for employment and volunteer work in the community.

In addition to providing a physical space for reuse, the ReUse Centre has also implemented innovative solutions such as a digital platform for exchanging and sharing items. The platform, called 'Genbrug Aarhus,' allows residents to connect with each other and exchange items that they no longer need, further promoting a culture of reuse and sustainable consumption.<sup>26</sup>

The ReUse Centre in Aarhus has become a model for waste reduction and sustainable consumption in Denmark and beyond. The project demonstrates the importance of collaboration between government, businesses, and community organizations in achieving sustainable waste management goals.

## Circular Procurement: The ProCirc Project

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Public procurement accounts for 14% of GDP in the European Union.<sup>27</sup> Therefore, circular public procurement practices can play a crucial role in advancing a circular economy. By prioritizing the use of products and services that have been designed for circularity, public procurement can help reduce waste, conserve resources, and promote sustainable production and consumption patterns.

Circular procurement can also create market demand for circular products and services, which can drive innovation and investment in sustainable business models. This can lead to job creation and economic growth in industries that prioritize sustainability.

The ProCirc project has started in December of 2018 and is expected to finish in June of 2023. It conducts and supports 30 pilots to demonstrate procurement opportunities, and is set up to experiment, implement and learn how circular economy and procurement can benefit the North Sea Region. In addition to the pilot case studies which have supported the creation and expansion of circular business models, there are other results coming from the project such the publication of eight professional articles, the creation of a circular procurement toolbox, the development of a circular procurement framework guidance, the provision of organisational change guidance, as well as the development of a permanent platform, the C-PRONE, for exchange and connection to establish a one stop starting point for everybody engaged in projects and networks about circular procurement.<sup>28</sup>

This section highlights best practices and initiatives in waste management from different countries such as UK, Finland, Italy, Denmark, Catalonia, and the Netherlands, which can be used as example to the Portuguese

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<sup>25</sup> ReUse Aarhus. (n.d.). Om ReUse. <https://www.reuseaarhus.dk/om-reuse/>

<sup>26</sup> KredsLob. (2021). Reuse. <https://www.kredslob.dk/produkter-og-services/genbrug-og-affald/reuse>

<sup>27</sup> European Commission. (n.d.). Public Procurement. Retrieved from [https://ec.europa.eu/growth/single-market/public-procurement\\_en](https://ec.europa.eu/growth/single-market/public-procurement_en).

<sup>28</sup> ProCirc: Fostering circular procurement in European municipalities": European Commission, CORDIS: <https://cordis.europa.eu/article/id/418108-procirc-fostering-circular-procurement-in-european-municipalities/en>

context. Portugal can benefit from successful change management strategies that include effective stakeholder engagement, clear communication, a shared vision for the future of waste management, and better circular public procurement strategies. Thus, in the following section it will be given specific examples of strategies to be used in the Portuguese case.



## 6 CHANGE MANAGEMENT STRATEGIES

In this section, we present some strategies and recommendations for successful change management in Portuguese municipalities to lead to more sustainable and effective waste management systems. These strategies and recommendations are based on best practices and lessons learned from successful waste management initiatives implemented in other European municipalities. By adopting these strategies and recommendations, Portuguese municipalities can overcome the challenges they face and achieve their waste management targets.

Overall objective and long-term goal:		
Successful change management, within the Portuguese municipalities, lead to more sustainable and effective waste management systems.		
Strategy element	Indicator	Means of verification
<b>Objective 1: Citizens have developed a culture of sustainability and responsibility and know where to dispose their waste</b>	Percentage of waste that is correctly sorted and disposed of in designated waste bins by citizens.	Waste audits or monitoring waste collection trucks to identify the level of contamination in the different waste streams.
	Frequency of illegal dumping or littering in public spaces	Regular inspections of public spaces and areas prone to illegal dumping
<b>Output 1.1 Improved communication from municipalities</b>	Citizen participation in waste management initiatives, such as recycling programs or community clean-up events.	Surveys or focus groups with citizens to gather feedback on the effectiveness of communication efforts and the level of participation in waste management initiatives.
	Frequency of communication and engagement activities implemented by municipalities (ex: town hall meetings, social media posts, or educational campaigns).	Track the number of communication and engagement activities conducted over a set period of time, such as per month or per year, and reach of activities.
<b>Output 1.2 Development of good practice guidelines for citizens</b>	Percentage of citizens who report increased awareness and knowledge of waste reduction, reuse, and recycling practices after the implementation of the guidelines.	Surveys, focus groups, or other forms of direct feedback from citizens.
	Level of citizen engagement in waste management activities	Monitor the number of citizens participating in waste management activities (e.g. recycling, composting) and collect feedback on their experience with the guidelines.
	Reduction in waste generation and/or increase in recycling rates	Track the amount of waste generated and the amount of waste recycled before and after the implementation of the guidelines, and compare the data to assess the impact of the guidelines on waste reduction and recycling rates.
<b>Output 1.3 Educational practices for small contractors</b>	Number of contractors who have completed training or certification programs related to waste management and construction waste.	List of participants & surveys to evaluate knowledge of waste disposal practices.
<b>Specific examples under Objective 1 : Citizens have developed a culture of sustainability and responsibility and know where to dispose their waste</b>		
Initiative	Strategic partners & platforms	Objective

<p>Create municipality guidelines for waste separation and collection to be placed near households.</p>	<p>Condominiums, town hall, post office, mailbox.</p>	<p>It can help to standardize the waste separation and collection process, ensuring that all citizens are aware of what waste items can be recycled or disposed of properly. This can reduce confusion and errors in waste disposal, leading to a more efficient and effective waste management system.</p> <p>Placing the guidelines near households can serve as a reminder for citizens to properly separate and dispose of their waste, increasing compliance with waste management regulations and reducing contamination of recyclable materials.</p> <p>It can also promote a culture of environmental responsibility among citizens, encouraging them to take an active role in waste reduction and resource conservation.</p>
<p>Cleanups organized by municipality</p>	<p>Community places: town hall, local school, church, community center, library, hospital/health center, youth center, senior center, sports facility.</p>	<p>Raise awareness about the issue of waste management and encourage community involvement in keeping public spaces clean.</p>
<p>Development of communication and outreach materials through digital campaigns, to educate the public on waste management practices and promote community engagement.</p>	<p>Municipality website, social media, and local influencers.</p>	<p>Reach out to a broader range of citizens</p>
<p>Development of communication and outreach materials, such as brochures, and flyers, to educate the public on waste management practices and promote community engagement.</p>	<p>Community places: pharmacy, grocery, town hall, local school, church, community center, library, hospital/health center, youth center, senior center, sports facility.</p>	<p>Convenience: People can take the materials with them and refer to them later, making it easier to remember and follow the information provided.</p> <p>Targeted distribution: Physical materials can be targeted to specific areas or demographics, making them more effective in reaching the intended audience.</p> <p>Local relevance: Materials can be customized to reflect the specific waste management practices and needs of a particular community, making them more relevant and useful for local residents.</p> <p>Increased visibility: Physical materials can be displayed in public spaces such as community centres, libraries, or schools, increasing their visibility and reach beyond just online channels.</p>
<p>Feed information in WasteApp (wasteapp.pt)</p>	<p>Ecocentres, amenity center, and any collectors of waste streams with activities or collection points within the municipality.</p>	<p>Save time, resources, and effort. By using an existing app, the municipality can avoid the cost and time associated with developing a new one from scratch, including design, programming, testing, and implementation. Additionally, an existing app may already have a user base, which means that citizens may be more likely to use it, as they may already be familiar with it. This can increase the effectiveness of the waste management program by making it easier for citizens to find information on how to dispose of their waste properly. Finally, using and promoting an existing app may also allow for better integration with other municipal services, such as public transportation, parking, or city events, creating a more comprehensive user experience.</p>
<p>Provide a list of certified small contractors who have demonstrated their ability to manage waste responsibly.</p>	<p>Local technical school Local small contractors</p>	<p>Promote responsible waste management practices in the community.</p> <p>Ensure compliance with regulations by supporting work with contractors who are knowledgeable about waste</p>



		<p>management regulations and who have experience implementing them.</p> <p>Encourage competition among contractors and help to ensure that they are getting the best value for their money. This can help to keep costs down while still ensuring that waste is managed responsibly.</p> <p>Build trust with the community and demonstrate their commitment to sustainability and environmental stewardship.</p>
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Strategy element	Indicator	Means of verification
<b>Objective 2: Improved municipal coordination and cooperation to foster better waste systems</b>	Establishment of cross-functional teams or task forces within the municipality dedicated to waste management initiatives.	Documentation of the establishment of cross-functional teams or task forces, as well as the development and implementation of joint waste management plans or agreements, which can demonstrate a commitment to working together towards a common goal of improving waste management in the region.
<b>Output 2.1 Identification of common needs</b>	Number and frequency of inter-municipal meetings or workshops focused on waste management.	Records of the meetings or workshops, including the number of participants, the topics discussed, and the agreements or actions resulting from the meetings.
<b>Output 2.2 Establishment of working group with representatives from different municipalities</b>	Development and implementation of joint waste management plans or projects between municipalities, the establishment of inter-municipal waste management associations or networks, and the adoption of similar waste management initiatives, policies or regulations across municipalities (eg: common communication plan).	These indicators could be verified through official documents, such as the joint plans or policies, or through records of the activities and decisions of the associations or networks. Surveys or interviews with municipal officials could also provide information on the level of collaboration and the identification of common needs between municipalities
<b>Output 2.3 Engage in regional public procurement for better waste management systems</b>	Number of joint public procurements with environmental criteria.	The solutions proposed tackle the different municipalities needs, and enable economies of scale for the municipalities.

**Specific examples under Objective 2: Improved municipal coordination and cooperation to foster better waste systems**

Initiative	Strategic partners & platforms	Objective
Training municipality staff on public procurement, public procurement for innovation, and green public procurement.	<ul style="list-style-type: none"> <li>Compras Públicas de Inovação – CPI (Portuguese Competence Center in Public Procurement of Innovation)<sup>29</sup></li> <li>Innovation Procurement Platform<sup>30</sup></li> </ul>	<ul style="list-style-type: none"> <li>Enhance the staff knowledge and skills on the procurement process, procedures, and regulations related to municipal waste management. This training can help ensure that the procurement process is carried out in a transparent, fair, and competitive manner. It can also help staff identify and address potential risks and challenges related to procurement, such as conflicts of interest, collusion, or lack of competition. By improving staff's knowledge and skills in public procurement, the municipality can achieve better value for money,</li> </ul>

<sup>29</sup> <https://www.compraspublicasinovacao.pt/>

<sup>30</sup> <https://innovation-procurement.org/>

		reduce procurement-related risks, and increase the efficiency and effectiveness of its waste management services.
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Strategy element	Indicator	Means of verification
<b>Objective 3: Incentivizing sustainable waste management practices</b>	Percentage increase in the use of sustainable waste management practices, such as recycling, composting, or reducing waste generation.	Data collected from waste management programs, such as recycling rates and waste diversion rates. Surveys and interviews with households and businesses could also provide feedback on their participation in sustainable waste management practices and their attitudes towards waste reduction.
<b>Output 3.1 Promote economic incentives</b>	<p>The number of businesses or individuals participating in incentive programs (e.g., reduced waste disposal fees for those who recycle or compost).</p> <p>The amount of money saved through reduced waste disposal costs.</p> <p>The amount of revenue generated through the sale of recyclable materials.</p> <p>The level of participation in education and outreach programs related to waste reduction and management.</p>	<p>Waste audits, surveys, and program participation data.</p> <p>Tracking the amount of waste that is diverted from landfills over time and comparing it to previous years or to other municipalities</p>
<b>Output 3.2 Innovative and attractive rural civic amenity centres</b>	Increase in the number of visitors and the amount of waste properly disposed of at the centres.	<p>Tracking the number of visitors to the centres before and after the improvements are made, as well as by monitoring the amount of waste collected and properly disposed of.</p> <p>Surveys can be conducted to gather feedback from users on their satisfaction with the amenities and services provided at the centres.</p>

**Specific examples under Objective 3: Incentivizing sustainable waste management practices**

Initiative	Strategic partners & platforms	Objective
Provide workshops for repairing and upcycling items, at local community place, or near eco-centre and/or amenity centre.	<p>Ecocentre</p> <p>Amenity Centre</p> <ul style="list-style-type: none"> <li>Community places: Community center, Library, Youth center, Sports facility.</li> </ul>	<p>Promotes a circular economy.</p> <p>Foster a sense of community and encourage social interactions. Citizens can share skills and knowledge, collaborate on projects, and form connections with other like-minded individuals. This can lead to the creation of a supportive network that extends beyond the workshop and can have a positive impact on the community as a whole.</p> <p>Provide educational opportunities for citizens, especially for younger generations. Workshops can offer classes or training on repairing and upcycling techniques, which can increase awareness of the benefits of waste reduction and promote sustainable practices. This education can empower citizens to take responsibility for their waste and motivate them to make more informed choices about their consumption patterns.</p>
Promote and advertise local stores to fix and repair items.	Local repair stores.	Help reduce the amount of waste generated by encouraging residents to repair items instead of disposing of them. This, in turn, can lead to a reduction in the amount of waste

		<p>that needs to be collected and processed by the municipality.</p> <p>Support local businesses and the local economy, which can have a positive impact on the community as a whole. Shift cultural attitudes towards waste and consumption by emphasizing the value of repairing and reusing items rather than constantly buying new ones.</p>
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Now that some of the key strategies that municipalities can use to improve waste management have been outlined, it's important to consider the skills and knowledge that municipal staff involved in waste management should possess in order to effectively implement these measures. Effective waste management requires staff to possess a range of technical competencies, such as knowledge of waste collection and treatment processes, environmental legislation and regulations, and data analysis and management (de Brito et al., 2020; Ribeiro et al., 2018). However, waste management is a complex and multifaceted issue, and staff should also possess soft skills such as teamwork, communication, problem-solving, and decision-making (de Brito et al., 2020; Ribeiro et al., 2018). Familiarity with public funding and financial management is also crucial, as waste management projects often require significant funding and resources (de Brito et al., 2020; Ribeiro et al., 2018).

Less hierarchy and more decision-making power can facilitate the implementation of waste management measures, as it allows for greater collaboration and co-creation between staff and different departments within the municipality (Ribeiro et al., 2018). This can lead to more innovative and effective solutions to waste management challenges (Kumar et al., 2017). Furthermore, staff should be able to take ownership and responsibility for waste management initiatives and have a strong understanding of the importance of sustainability and environmental stewardship (Kumar et al., 2017). This can foster a culture of continuous improvement and innovation in waste management practices.

Strategy element	Indicator	Means of verification
<p><b>Objective 4: Municipalities have the competencies to drive changes fostering better waste management systems</b></p>	<p>Number of municipal staff who have undergone waste management training programs.</p> <p>Number of staff members who have achieved waste management certification or accreditation</p> <p>Number of waste management projects initiated and successfully completed by the municipality</p>	<p>Records of training attendance and completion certificates</p> <p>Waste management project reports and evaluations</p> <p>Staff performance reviews and assessments to evaluate their waste management competencies</p>
<p>Output 4.1 Development of training programs for municipal staff involved in waste management to be familiar with public funding and financial management.</p>	<p>Number of municipal staff trained in waste management.</p> <p>Percentage of trained staff who reported an improvement in technical competencies, soft skills, and familiarity with public funding and financial management.</p> <p>Number of waste management projects successfully implemented after the training programs were introduced.</p> <p>Increase in efficiency and effectiveness of waste management measures after the training programs were introduced.</p>	<p>Records of staff training attendance and completion.</p> <p>Pre- and post-training surveys to measure improvement in technical competencies, soft skills, and familiarity with public funding and financial management.</p> <p>Documentation of waste management projects and their successful implementation.</p> <p>Analysis of waste management data and reports to measure the effectiveness of the training programs in improving waste management measures.</p>

<p>Output 4.2 Implementation of workshops and capacity building activities to promote collaborative innovation and co-creation between staff and different departments within the municipality.</p>	<ul style="list-style-type: none"> <li>• Number of workshops and capacity building activities held.</li> <li>• Number of staff members participating in the workshops and capacity building activities.</li> <li>• Level of participation and engagement of staff members in the workshops and activities.</li> <li>• Number of cross-departmental projects initiated or completed as a result of the workshops and activities.</li> </ul>	<p>Attendance sheets and sign-in logs for workshops and activities.</p> <p>Feedback surveys from staff members regarding the effectiveness and usefulness of the workshops and activities.</p> <p>Progress reports and documentation of cross-departmental projects initiated or completed as a result of the workshops and activities.</p>
<p>Output 4.3 Establishment of mechanisms to facilitate ownership and responsibility for waste management initiatives, such as regular monitoring and evaluation of waste management practices.</p>	<ul style="list-style-type: none"> <li>• Number of mechanisms established to facilitate ownership and responsibility for waste management initiatives.</li> <li>• Percentage increase in staff involvement in waste management initiatives.</li> <li>• Frequency of monitoring and evaluation of waste management practices.</li> </ul>	<ul style="list-style-type: none"> <li>• Records of established mechanisms, such as regular staff meetings or designated staff responsible for waste management initiatives.</li> <li>• Staff surveys to assess their involvement in waste management initiatives.</li> <li>• Documentation of the frequency and results of monitoring and evaluation of waste management practices, such as reports or data on waste diversion rates.</li> </ul>
<p>Output 4.4 Development of communication and outreach materials, such as brochures, flyers, and videos, to educate the public on waste management practices and promote community engagement.</p>	<ul style="list-style-type: none"> <li>• Number of communication and outreach materials developed.</li> <li>• Reach of communication and outreach materials (e.g. number of downloads, views, or shares).</li> <li>• Feedback from the public on the effectiveness of the materials in promoting behavior change towards waste management practices.</li> </ul>	<ul style="list-style-type: none"> <li>• Records of the number and type of communication and outreach materials developed.</li> <li>• Analytics data from online platforms hosting the materials (e.g. number of downloads, views, or shares).</li> <li>• Surveys or focus groups with the public to assess the impact of the materials on their knowledge and behavior towards waste management practices.</li> </ul>
<p>Output 4.5 Collaboration with regional and national organizations and institutions to share best practices and promote knowledge transfer in the field of waste management.</p>	<ul style="list-style-type: none"> <li>• Number of regional and national organizations and institutions that the municipality collaborates with for knowledge sharing and best practices in waste management.</li> <li>• Number of knowledge-sharing activities and events organized with regional and national organizations and institutions.</li> <li>• Number of best practices shared and implemented in the municipality as a result of the</li> </ul>	<ul style="list-style-type: none"> <li>• Records of collaboration with regional and national organizations and institutions, such as signed agreements or memorandums of understanding (MOUs).</li> <li>• Attendance records and feedback from participants of knowledge-sharing activities and events.</li> <li>• Documentation and reports of best practices</li> </ul>

	collaboration with regional and national organizations and institutions.	implemented in the municipality as a result of the collaboration with regional and national organizations and institutions.
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## 7 CONCLUSION

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After conducting a comprehensive literature review and analyzing best practices from European municipalities, 'Part II - The role of change management for successful waste management practices', presents several key recommendations for change management in Portuguese municipalities to improve their waste management systems. These recommendations were developed in collaboration with local stakeholders, considering the specific drivers and barriers present in Portugal.

It was highlighted the importance of citizen involvement and education, incentivizing sustainable waste management practices, improved municipal coordination and cooperation, development of staff competencies, and collaboration with regional and national organizations to promote knowledge transfer. To effectively implement these recommendations, municipalities should focus on developing clear and measurable goals, building a competent team, engaging stakeholders and the public through communication and outreach, and establishing mechanisms to facilitate ownership and responsibility for waste management initiatives.

Moreover, municipalities should develop training programs for their staff, promote collaborative innovation and co-creation, and collaborate with regional and national organizations and institutions to facilitate effective change management. Municipal staff involved in waste management should possess technical competencies, soft skills, familiarity with public funding and financial management, and a strong understanding of sustainability and environmental stewardship.

Implementing these recommendations can improve waste management systems in Portuguese municipalities, leading to more sustainable and effective practices that benefit both the environment and the community. The recommendations can serve as a roadmap for municipalities to take proactive steps towards sustainable waste management.

In conclusion, effective waste management is crucial for sustainable development in Portugal. The recommendations are based on best practices and lessons learned from successful waste management initiatives in other European municipalities. By working together towards a common goal, Portuguese municipalities can achieve a more sustainable and effective waste management system that benefits the environment, the economy, and society. Successful change management in waste management systems requires a long-term commitment from all stakeholders involved, including the government, private sector, civil society, and citizens.

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