
# Regional Strategy for the Management of Construction and Demolition Waste in Baixo Alentejo

Preliminary Report

Developed by: IrRADIARE Science for Evolution

# Datasheet

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Regional Strategy for the Management of Construction and Demolition Waste in Baixo Alentejo

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# Executive summary

Construction and Demolition Waste (CDW) is a major challenge in the circular economy. Its proper treatment and disposal are essential, even if it is not always a reality nowadays.

CDW is far from answering to the challenges of sustainability, particularly because a significant percentage of waste from construction and building sites does not receive proper treatment and disposal.

Construction and demolition waste represent more than one third of all waste produced in the European Union (EU), and it is estimated that there is a global annual production of 100 million tonnes of construction and demolition waste. In addition to the very significant quantities associated with it, the waste stream has other features that make it difficult to manage, including its heterogeneous composition, containing materials such as concrete, bricks, wood, glass, metals and plastic.

The uncontrolled consumption of natural resources and the large-scale production of waste resulting from construction and demolition affect the environment. Landfilling of CDW poses significant environmental risks.

Some components of CDW have a high resource value, while others may have a lower value but can still be easily reprocessed into new products or materials. The technology for the separation and recovery of construction and demolition waste is well established. When not separated at source, construction and demolition waste may contain small amounts of hazardous materials such as solvents and asbestos. These can pose particular risks to the environment and impede recycling.

The growth of increasingly diversified CDW emerges from the increasing technical and legal requirements that are implemented to improve the quality, comfort and safety of all those who use buildings. The specifications imposed by legislation are increasingly stricter, thus encouraging the application of new materials and new construction techniques, which in turn lead to the production of more and more diversified types of waste.

Currently the General Waste Management Regime is established in Decree-Law 102-D/2020, of 10 December. This law approves the general regime of waste management, the legal regime of waste disposal in landfills and amends the regime of management of specific waste flows, transposing the Directives (EU) 2018/849, 2018/850, 2018/851 and 2018/852.

Several countries have been taking measures to achieve a 70% rate for the recovery of non-hazardous construction waste by 2020, according to the Waste Directive (Directive 2008/98/EC of 19 November) and its updates, namely by Directive 2018/851/EC regarding the increase of the targets on preparing for reuse and recycling of waste.

Portugal has specific regulations for the management of CDW since 2008. However, the amount of recycled CDW is still very low and illegal deposits of this waste stream occur all over the country.

The reuse of CDW reduces costs and the use of raw materials, as well as decreases the environmental impact of the activities associated with construction.

In order to define a strategy and governance model for the implementation of a system of collection, storage, sorting, processing and marketing of Construction and Demolition Waste - CDW, Resialentejo developed this report, which defines the most appropriate system of collection, transportation, reception and treatment of CDW for the region and defines a governance model to support the technical solution adopted.

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# Glossary

**CDW producer** - any natural or legal person whose activity produces waste, i.e. an initial waste producer, or who carries out pre-processing, mixing, or other operations that change the nature or composition of this waste.

**Construction and Demolition Waste** - Waste resulting from construction, reconstruction, extension, alteration, conservation and demolition works, and from the collapse of buildings.

**Deposition -** The management operation that consists of conditioning and placing the waste in equipment designed for this purpose, preparing it for the collection operation.

**Landfill** - A facility for the disposal of waste by depositing it above or below the natural surface.

**Making available on the market** - Offering a product for distribution, consumption, or use on the market, in the national territory, as part of a commercial activity, whether in return for payment or free of charge.

**Placing on the market -** Making a product available on the market, in the national territory, as a professional activity.

**Recycling** - any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes, including the reprocessing of organic materials but excluding energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations.

**Resialentejo - RCD** - A complementary entity to the current waste operator Resialentejo that will exclusively manage construction and demolition waste, so logistics will be done according to the currently existing facilities.

**Reuse -** Any operation by which products or components that are not waste are used again for the same purpose for which they were conceived.

**Selective collection** - collection carried out in such a way as to keep the waste flow separated by type and nature, in order to facilitate specific treatment.

**Sorting** - installation where the waste is separated, through manual or mechanical processes, into different constituent materials destined for recovery or other management operations.

**Storage -** Controlled depositing of waste, before its treatment and for a determined period of time.

**Tariff income** - Level of income required to ensure coverage of the expenses projected for the activity. This global value is shared by the system users according to the flows effectively measured.

**Treatment -** Any operation for the recovery or disposal of waste, including preparation prior to recovery or disposal.

**Undifferentiated collection** - waste collection without prior selection.

**Waste -** Any substances or objects that the holder discards or intends or is required to discard.

**Waste management** - Designates the collection, transport, recovery and disposal of waste, including the supervision of these operations, the after-closure maintenance of disposal sites, and the measures taken as a dealer or broker.

**Waste production** - corresponds to the activity of waste production by any person, natural or legal, and pre-treatment, mixing or other operations that change the nature or composition of such waste.

**Waste reception center -** A waste reception and treatment facility where waste is stored and/or sorting, licensed under the terms of chapter viii of the General Waste Management Regime (RGGR), which integrates the collection network of the integrated or individual management systems for specific waste flows.

**Working capital** - The ability of an entity to ensure its activity with all normality and in the short term. It can be calculated as the surplus of assets over short-term liabilities.

# Acronyms and abbreviations

AMAGRA - *Associação de Municípios Alentejanos para a Gestão Regional do Ambiente* (Association of Alentejo Municipalities for Regional Environmental Management)

AMALGA - *Associação de Municípios Alentejanos para a Gestão do Ambiente* (Association of Alentejo Municipalities for Environmental Management)

ANR - *Agência Nacional de Resíduos* (National Waste Agency)

APA - *Agência Portuguesa de Ambiente* (Portuguese Environment Agency)

CCDR - *Comissão de Coordenação e Desenvolvimento Regional* (Regional Coordination and Development Commission)

CDW - Construction and Demolition Waste

CIMBAL - *Comunidade Intermunicipal do Baixo Alentejo* (Intermunicipal Community of Baixo Alentejo)

CIRVER - *Centros Integrados de Recuperação, Valorização e Eliminação de Resíduos Perigosos* (Integrated Centers for Recovery, Valorization and Disposal of Hazardous Waste)

e-GAR - *Guias de Acompanhamento de Resíduos Eletrónicas* (Electronic Waste Management Documents)

EU - European Union

Eurostat - European Union Statistics Office

EWL - European Waste List

GAR - *Guia de acompanhamento de resíduos* (Waste accompaniment guide)

GARCD - *Guia de acompanhamento de resíduos de construção e demolição* (Guide for tracking construction and demolition waste)

GVA - Gross Value Added

INE - *Instituto Nacional de Estatística* (National Institute of Statistics)

IUC – *Imposto Único de Circulação* (Single Circulation Tax)

LNEC - *Laboratório Nacional de Engenharia Civil* (National Civil Engineering Laboratory)

MIRR - *Mapa Integrado de Registo de Resíduos* (Integrated Waste Registration Map)

MW - Municipal Waste

PARP - *Plano Ambiental e de Recuperação Paisagística* (Environmental and Landscape Recovery Plan)

PCC - Public Contracts Code

PPGRCD - *Plano de Prevenção e Gestão de Resíduos de Construção e Demolição* (Prevention and Management Plan for Construction and Demolition Waste)

RGGR - *Regime Geral de Gestão de Resíduos* (General Waste Management Regime)

RJEU - *Regime Jurídico da Urbanização e Edificação* (Legal Regime of Urbanization and Building)

SIRER - *Sistema Integrado de Registo Eletrónico de Resíduos* (Integrated System for Electronic Registration of Waste)

SUMA - *Serviços Urbanos e Meio Ambiente, SA.* (Urban Services and Environment, SA.)

TGR - *Taxa de Gestão de Resíduos* (Waste Management Charge)

WP - Workpackage

# 1. Introduction

The (De)construct for the Circular Economy project was approved under the Notice - Projects for the promotion of Circular Economy in the Construction Sector, of the Program "Environment, Climate Change and Low Carbon Economy" of the *EEA Grants*.

*EEA Grants* is financed by the donor countries Iceland, *Liechtenstein*, and Norway, financially supporting the European Union Member States with the greatest deviations from the European average in GDP *per capita*, where Portugal is included.

The (De)construct for the Circular Economy project is the result of work initiated by the Alentejo Regional Coordination and Development Commission (CCDR) with the participation of the Intermunicipal Community of Baixo Alentejo (CIMBAL), the Baixo Alentejo Municipalities and a wide range of partners that includes private companies, a business association in the waste management and circular economy subsectors, entities from the national scientific and technological system, and three international partners.

The main goal of the (De)construct for the Circular Economy project is to promote a regional strategy for the reuse of construction products and components, as well as the recycling of Construction and Demolition Waste (CDW), thus reducing the environmental impact of construction and promoting its circularity.

The main results / objectives envisaged by the project are:

- The production of municipal building regulations that support the selective dismantling of buildings, the reuse of products and the recycling of materials, the development of a cadastre and other procedures to close loops in the sector, at the regional level;
- A procedure for pre-demolition audits and a materials passport model adjusted to the regional reality;
- A material and CDW management model to optimize (economically and environmentally) their recovery, reuse and recycling and the location of centers based on mathematical models;
- The establishment of a network of cooperation between local, regional, and national stakeholders to enable the creation of a network of processing, distribution, and marketing centers for CDW.

The strategy to be put in place will involve a social dimension, in that it will involve social economy organizations in the storage and processing of products and materials. It will also involve direct cooperation with the construction sector, which will incorporate some of the project's recommendations and solutions and bring in the private construction sector's perspective on the problem.

RESIALENTEJO is the lead partner of workpackage (WP) 6, namely regarding the definition of the strategy for the implementation of collection, storage, sorting and processing and commercialization of CDW for the CIMBAL coverage region, in order to maximize material, reuse as well as recycling.

RESIALENTEJO is an intermunicipal company (public company) created by AMALGA - Associação de Municípios para a Gestão Ambiental do Alentejo (Association of Alentejo Municipalities for Environmental Management) in May 2004 and since June of that year has been responsible for the management of municipal waste in eight municipalities in Baixo Alentejo (Almodôvar, Barrancos, Beja, Castro Verde, Mértola, Moura, Ourique and Serpa).

## 1.1. Scope of the project

CDW is defined as the waste resulting from construction, reconstruction, expansion, alteration, conservation and demolition works, and from the collapse of buildings.

Waste management is particularly important - and critical - in the construction industry, given the quantity, volume, and diversity of types of materials that are part of its activity.

In the national context, in March 2008 was published the first legislation exclusively dedicated to CDW, Decree-Law No. 46/2008 of March 12, which determined the rules for the management of this type of waste. Currently, the General Regime for Waste Management established in Decree-Law No. 102-D/2020, December 10, is in force.

The present work is consolidated in the preparation of a regional strategy for the management of construction and demolition waste of the thirteen municipalities that integrate CIMBAL (Aljustrel, Almodôvar, Alvito, Barrancos, Beja, Castro Verde, Cuba, Ferreira do Alentejo, Mértola, Moura, Ourique, Serpa and Vidigueira), for the implementation of a system of collection, storage, sorting, processing and marketing of CDW, with the aim of maximizing the reuse of materials and recycling. It is intended that the system is network-based (including parishes, municipalities, private charities and companies) and can be replicated throughout the Alentejo and preferably throughout the country.

The WP6, in which the present preliminary report is framed, should consider the results obtained through stakeholder consultation during the participatory actions of WP7 and include the definition of the institutional model that will support the implementation of the CDW management system (WP5).

## 1.2. Objectives

The regional strategy for the implementation of a collection, storage, sorting, processing and marketing system of Construction and Demolition Waste for the CIMBAL region has as main objectives:

- Definition of a system of collection, transport, reception and treatment of all types of CDW produced in the area covered by CIMBAL in an environment of economic and operational efficiency;
- Definition of a system to prepare for reuse and recycling of construction materials produced in the area covered by CIMBAL in an economically and operationally efficient environment;
- Involvement of the thirteen municipalities (with particular focus on the executives), the National Waste Authority (APA), the Regional Waste Authority (CCDR), associations from the construction sector, private charities, and companies (construction and waste management) in the definition and implementation of the system;
- Assessment of funding mechanisms (present and future) for proposed technical solutions for the reuse of construction materials and recycling of CDW;
- Minimization of the fees to be charged to the users of the system;
- Proposal of a governance model that supports the adopted technical solution, with the consensus of the stakeholders.

The regional strategy integrates the data/results obtained in the WP1 for CDW production, the estimate of its quantitative and qualitative evolution in temporal terms (based on the WP5) and the data from the WP7 reports (which include the survey of constraints, solutions and training needs, common regulation and regional strategy from the perspective of the municipalities' technicians and small construction companies).

## 1.3 Methodology

The methodology used is in line with a set of projects developed over the past few years, within the scope of this theme, with results in the provision of effective tools and properly aligned with the characteristics of the intervention to be developed.

This process was carried out in close articulation with the Municipalities, taking into consideration the main constraints currently observed and the areas of action considered to be priorities.

In order to meet the objectives defined for the regional strategy, the following methodological approach was followed:

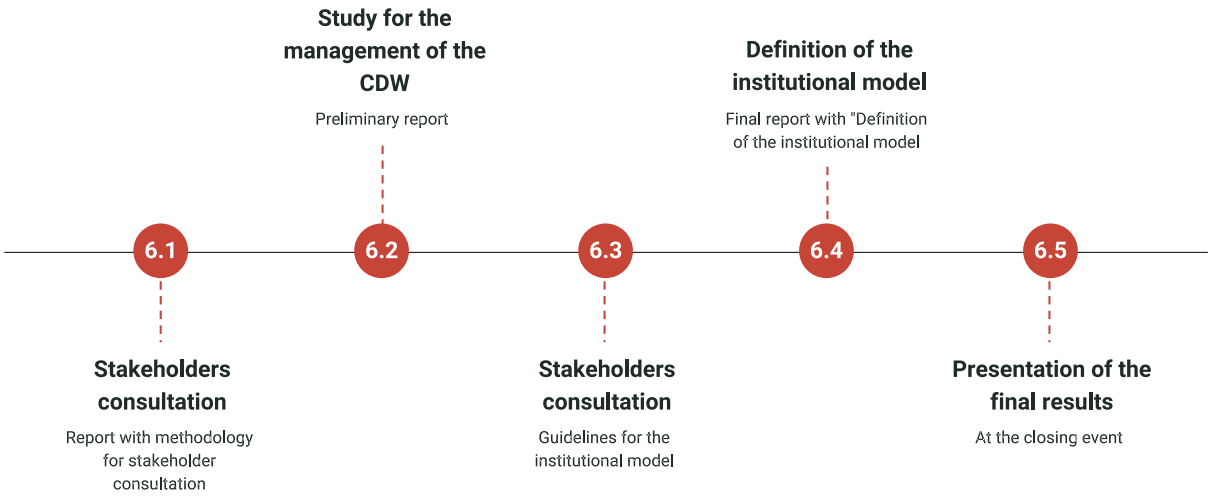



*Figure 1 - Methodological approach to regional strategy development*

### *1.3.1 Stakeholder Consultation*

At this stage, meetings were held to listen to stakeholders, in order to collect contributions regarding the collection, transport and storage system, constraints, available equipment, and solutions implemented to support the definition of the regional strategy.

The minutes of the stakeholder consultation meetings are attached.

### *1.3.2 Development of the study for CDW management*

The strategy is developed based on quantitative and qualitative data regarding the management and recovery of CDW, the estimation of existing environmental liabilities, best practices and successful examples in the region, as well as an analysis of the dynamics of the regional construction sector, including results obtained in WP1 of the project, data from the Portuguese Environment Agency, data from INE and data from Eurostat.

The strategy also took into account the results obtained during the participatory actions of WP7, which included the survey of constraints, solutions and training needs, common regulations and regional strategy from the perspective of the technicians of the municipalities and small construction companies, were included in the definition of the institutional model that supported the definition of the CDW management system in the Baixo Alentejo region.

### *1.3.3 Stakeholder consultation - workshops*

As part of the work for the Regional Strategy for the Management of Construction and Demolition Waste for the Municipalities of CIMBAL, Resialentejo organized a session included in the workshop, foreseen in activity 7.3. - Project partners capacitation, held in Prague in order to collect inputs and work on solutions with stakeholders in the value chains of construction materials and CDW, train national and international partners (Czech Republic, Norway and Romania), through access to the results of the Portuguese participatory actions and transmit knowledge about best practices in the management of CDW and regulatory framework, among other aspects.

The session organized by Resialentejo also aimed to hear and understand what the Baixo Alentejo Municipalities expect and want from the Regional Strategy for Construction and Demolition Waste Management.

# 2. Legal Framework

## 2.1. Classification of CDW

Waste policy has the priority objective of preventing and reducing risks to human health and the environment, ensuring that waste management is carried out using processes or methods that do not give rise to adverse effects on the environment, including pollution of water, air, soil, plants and animals, noise or scents, or damage to any places of interest and to the landscape.

Thus, it is essential that waste is properly separated and classified at its origin, so that its final destination is the most appropriate and least harmful to human health and the environment. In this context, waste is classified according to the European Waste List (EWL), published by Decision 2014/955/EU, of the Commission, December 18.

The EWL ensures the harmonization, identification, and classification of waste, and aims to make it easier for economic agents to know the legal regime to which they are subject.

The EWL classifies waste with a 6-digit code, which is grouped into 20 chapters, established by the first two digits of the code. Regarding CDW, these are represented by code 17 of the EWL where, in addition to construction and demolition waste, excavated soil from contaminated soil is included.

*Table 1 - EWL codes for CDW[1]*

| EWL Code | Designation |
|---|---|
| 17 | Construction and demolition wastes (including excavated soil from contaminated sites) |
| 17 01 | Concrete, bricks, tiles and ceramics |
| 17 02 | Wood, glass and plastic |
| 17 03 | Bituminous mixtures, coal tar and tarred products |
| 17 04 | Metals (including metal alloys) |
| 17 05 | Soil (including excavated soil from contaminated sites), rock and dredging spoil |
| 17 06 | Insulation materials and construction materials containing asbestos |
| 17 08 | Gypsum based construction materials |
| 17 09 | Other construction and demolition waste |

[1] Adapted from Commission Decision 2014/955/EU of December 18

Producers or holders of waste are obliged to classify the waste they generate or hold, according to the EWL. In order to ensure the correct classification of waste and to comply with the provisions of paragraph 4 of Article 7 of the RGGR producers must separate waste at source, prior to its classification, promoting, whenever possible, its recovery.

## 2.2. Legislation

CDW has been identified as a priority, and in recent years there has been some debate regarding the levels of CDW recycling to be applied. It is considered that there is great potential in recycling and reuse of this waste, namely because some of its components are valuable resources.

Although the general legislation for waste management can be applied to all waste, including CDW, due to the specificity of this waste stream it was necessary to create its own legal legislation. In Portugal, Decree Law No. 46/2008 of March 12 established the legislation for CDW management operations, as well as the responsibility for its management, which was repealed by Decree Law No. 102-D/2020.

The obligation to comply with the legislation on CDW is enshrined in the Legal Regime of Urbanization and Construction (RJUE), namely by Decree-Law No. 555/99 of December 16, as amended by Decree-Law No. 26/2010 of March 30, and its amendments, as well as in the Public Procurement Code (PPC) amended by Decree-Law No. 111-B/2017.

In June 2008 the European parliament and the EU council approved the waste targets. One of the goals of this directive is to promote a resource-efficient European recycling society. In particular, Article 11.2 stipulates that "Member states shall take the necessary measures to achieve by 2020 at least 70% by weight of CDW for the preparation for reuse, recycling and recovery of non-hazardous construction and demolition waste (excluding waste of EWL code 17 05 04) by 2020".

Noteworthy is the definition of material recovery, presented in Decree-Law 102-D/2020, which includes preparation for reuse, recycling and backfilling, as well as other forms of material recovery such as the reprocessing of waste into secondary raw materials for engineering purposes in road construction or other infrastructure.

Landfills for inert CDW waste are subject to compliance with technical requirements as stated in Decree-Law 183/2009 of August 10, subsequently repealed by Decree-Law 102-D/2020. Another possible disposal for inert CDW waste is the use for excavation fill, as described in Decree-Law No. 10/2010, February 4, as amended by Decree-Law No. 31/2013, February 22. In this document, the use of waste for this purpose can only take place within the scope of the Environmental and Landscape Recovery Plan (PARP) approved under the terms of Decree-Law 270/2001, of October 6, as amended by Decree-Law 340/2007, of October 12, and depends on verification of the technical conditions provided for in the legal legislation for landfill waste disposal.

In terms of economic-financial instruments, and with the aim of promoting the waste hierarchy, the Waste Management Fee (TGR), provided for in the general waste management legislation, is applied, among others, on CDW waste deposited in landfills and on hazardous waste landfills (Integrated Centers for Recovery, Valorization and Disposal of Hazardous Waste - CIRVER).

### 2.2.1 Transportation

In 2017, waste transportation became regulated by Ordinance No. 145/2017, of April 26[2] , which created the Electronic Waste Management Documents (e-GAR), issued in the Integrated System for Electronic Registration of Waste (SIRER). These became operational on May 26, 2017, allowing the dematerialization of the process, and replacing the construction and demolition waste tracking forms (GARCD).

The General Regime for Waste Management (RGGR) currently establishes the obligation for waste producers, waste holders, transporters, and waste recipients to keep a record of waste transportation by means of a Waste Accompanying Document (GAR).

### 2.2.2. Valorization

Regarding preparation for reuse and recycling, Directive (EU) 2018/851 states that Member States shall take measures to promote the selective demolition in order to:

- Enable the safe removal and handling of hazardous substances and facilitate high quality reuse and recycling through selective removal of materials;
- Ensure that sorting systems for CDW are in place for at least wood, mineral fractions (concrete, bricks, tiles and ceramics, stone), metal, glass, plastic, and gypsum.

The RGGR, in force through Decree-Law 102-D/2020, of December 10, establishes an increase in targets of 70% by weight regarding preparation for reuse, recycling and other forms of material recovery, including backfilling operations using waste as a substitute for other materials, non-hazardous construction and demolition waste, excluding natural materials defined in category 17 05 04 of the EWL.

In order to achieve this goal, the legislation also establishes the mandatory use of at least 10% of recycled materials or the incorporation of recycled materials in relation to the total amount of raw materials used in the construction work, when contracting construction and infrastructure maintenance contracts under the Public Contracts Code (PCC).

[2] Ordinance n.º 145/2017, April 26 of 2017. Republica's Diary No. 81/2017 - Series I. Internal Administration, Labor, Solidarity and Social Security, Health, Planning and Infrastructure and Environment. Lisbon

## 2.3 CDW management system

Decree-Law no. 46/2008 of March 12, revoked by Decree-Law 102-D/2020 of December 10, covers CDW management operations, namely, its prevention and reuse, and its collection, transportation, storage, sorting, treatment, recovery and disposal operations. The legislation introduced a new context for CDW management policies, until then disregarded.

This decree excludes uncontaminated soil and other natural materials resulting from excavations from construction activities, provided that they are used for construction in their natural state and on the site where they were excavated.

The CDW management system consists of an information flow materialized in the monitoring guides that must accompany the transport of CDW, published in Ordinance No. 417/2008 of June 11 and repealed by Ordinance No. 145/2017, as well as the obligation to register the quantities, types and destinations of CDW in the Integrated System for Electronic Registration of Waste (SIRER), supported by the Integrated Registration System of the Portuguese Environment Agency (SIRAPA).

### *2.3.1. Responsibility for CDW management*

Under the PCC, the construction project must be accompanied by various elements, including the Prevention and Management Plan for Construction and Demolition Waste (PPGRCD). At the time of the inspection, during the acceptance of the work, the way in which the PPGRCD was executed will be certified in the respective provisional acceptance document.

All those involved in the life cycle of CDW, from the original product to the waste produced, are responsible for the management of CDW, to the extent of their respective intervention, except in the case of private works exempt from license and not subject to prior notification, in which the responsibility for the management of CDW lies with the entity responsible for Municipal Waste (MW). If it is impossible to identify the producer of CDW, the responsibility lies with the holder.

Producers, holders, or municipalities that have the responsibility of CDW management can transfer this responsibility to duly licensed waste treatment operators or to managing entities responsible for the management of flows.

The responsibility for the management of waste generated at a construction site must be defined contractually between the parties (construction site owner, contractors, subcontractors). Whoever assumes the responsibility for waste management must verify the need for inscription and registration in SIRER (Integrated System for Electronic Registration of Waste), in accordance with the RGGR.

### 2.3.2. Reuse of CDW[3]

The CDW legislation provides for the reuse of uncontaminated soil and rock in the following operations:

- In other constructions subject to licensing or prior communication;
- In the environmental and landscape recovery of mining operations and quarries;
- In the covering of waste landfills;
- In places licensed by the city council for alteration of the natural topography.

The management of soil and rocks that are forwarded to the above destinations does not require the use of a waste tracking permit, nor its registration in the Integrated Waste Registration Map (MIRR).

### 2.3.3. Sorting

All CDW that cannot be reused shall be subject to on-site sorting in order to forward them, by material streams and lines, for recycling or other forms of recovery. In cases where this operation cannot be performed, the respective producer shall forward them to a management operator licensed for this purpose.

The disposal of CDW in landfill is only allowed after submission to sorting. Sorting plants and CDW cutting and/or crushing operations are subject to the minimum technical requirements contained in the general rules published on the ANR website.

### 2.3.4. Plan for prevention and management of CDW[4]

The CDW prevention and management plan is a mandatory document that comes with the execution project in public works contracts and concessions, and its compliance must be certified in the provisional acceptance report, in compliance with the Public Contracts Code. This is a dynamic document of shared responsibility that ensures compliance with the general principles of CDW management prepared at project level, having several essential functions, namely:

- Brief characterization of the work to be performed, with a description of the construction methods to be used;
- Definition of the methodology for incorporating recycled CDW;
- Definition of CDW prevention methodology, identifying and estimating the materials to be reused on site or at other destinations;
- Identification of methods for packaging and sorting CDW on site;
- Estimate of the CDW to be produced, the fraction to be recycled or subject to other forms of recovery, as well as the quantity to be disposed of, identifying the respective EWL code.

[3] Source: APA

## 2.4 Construction Legislation[4]

The obligation to comply with the legislation on CDW is established in the RJUE and in the PCC.

Management operations carried out on site and the use of soil and rocks that do not contain hazardous substances resulting from construction activity, in the environmental and landscape recovery of quarries or in covering waste landfills, are exempt from licensing.

The use of CDW on construction sites is made in accordance with the applicable national and EU technical standards. In the absence of applicable technical standards, the technical specifications defined by the National Laboratory for Civil Engineering (LNEC) and approved by the members of the government responsible for the environment and public works, regarding the use of CDW, are used.

In public works, and according to the PCC, the preparation of a Prevention and Management Plan for Construction and Demolition Waste (PPGRCD) is required, whose compliance, demonstrated through the inspection, is a condition for the reception of the construction work. In the design phase, the developer is responsible for the preparation of the PPGRCD, while its implementation is the responsibility of the contractor/concessionaire, which must ensure:

- Promoting the reuse of materials and the incorporation of recycled CDW in the construction site;
- The existence on site of an adequate conditioning system that allows the selective management of CDW;
- The application on site of a methodology for sorting CDW or, where this is not possible, its forwarding to a licensed management operator;
- The maintenance of CDW on site for the minimum possible time, which, in the case of hazardous waste, cannot exceed three months.

This plan must be available at the construction site, for the purposes of inspection by the competent authorities, and be known by all those involved in the execution of the construction work.

Regarding private works subject to licensing and prior control, the RJUE states that compliance with the CDW management regime is a condition to be observed in the execution of urbanization or construction works. According to the CDW Management Regime, the CDW producer is obliged to:

- Promote the reuse of materials and the incorporation of recycled CDW in the construction site;
- Ensure the existence on site of an adequate conditioning system that allows the selective management of CDW;
- Ensure the on-site application of a methodology for sorting CDW or, when this is not possible, its forwarding to a licensed management operator;
- Ensure that the CDW are kept on site as little as possible, and in the case of hazardous waste this period may not be longer than three months;
- Comply with the other technical standards respectively applicable;

[4] Source: Action Plan for Sustainable Management of CDW in AMP

- Make and keep, along with the electronic workbook, the CDW data record, according to the model published on the ANR website.

Construction sites that wish to dispose of CDW from private constructions that are exempt from previous licensing or control may choose one of the following ways:

- Contact the respective Municipality since it is the Municipality that, according to Article 3, is responsible for its management;
- Deliver the CDW directly to the Municipal Ecocenters, in compliance with the conditions in force.

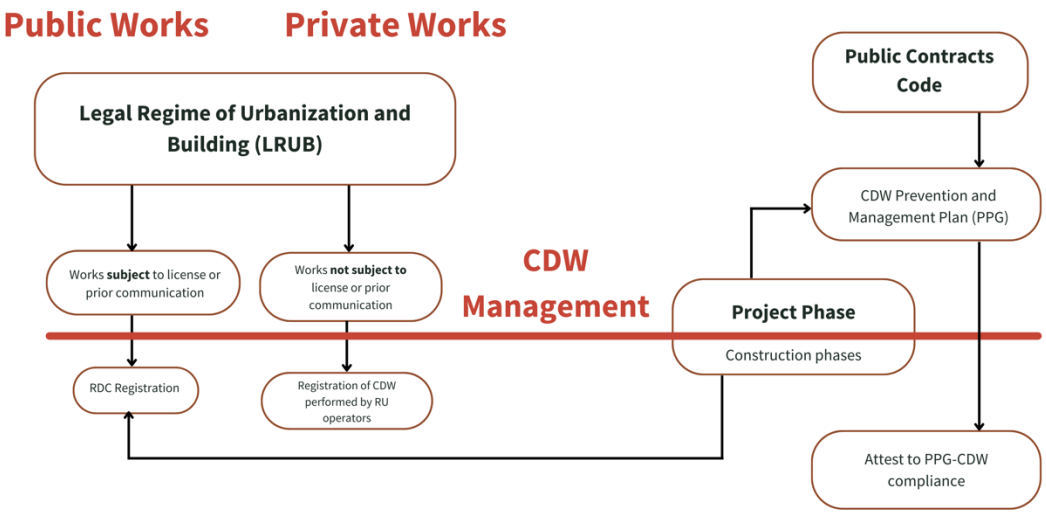



*Figure 2 - Legal framework for CDW management*

# 3. Characterization of the geographical area - Baixo Alentejo

## 3.1. Territory

The Intermunicipal Community of Baixo Alentejo (CIMBAL) has its headquarters in Beja, extends over an area of about 8,542.72 km$^2$, with 114,889 inhabitants (National Institute of Statistics - INE, 2021).

CIMBAL includes thirteen municipalities: Aljustrel, Almodôvar, Alvito, Barrancos, Beja, Castro Verde, Cuba, Ferreira do Alentejo, Mértola, Moura, Ourique, Serpa, and Vidigueira.

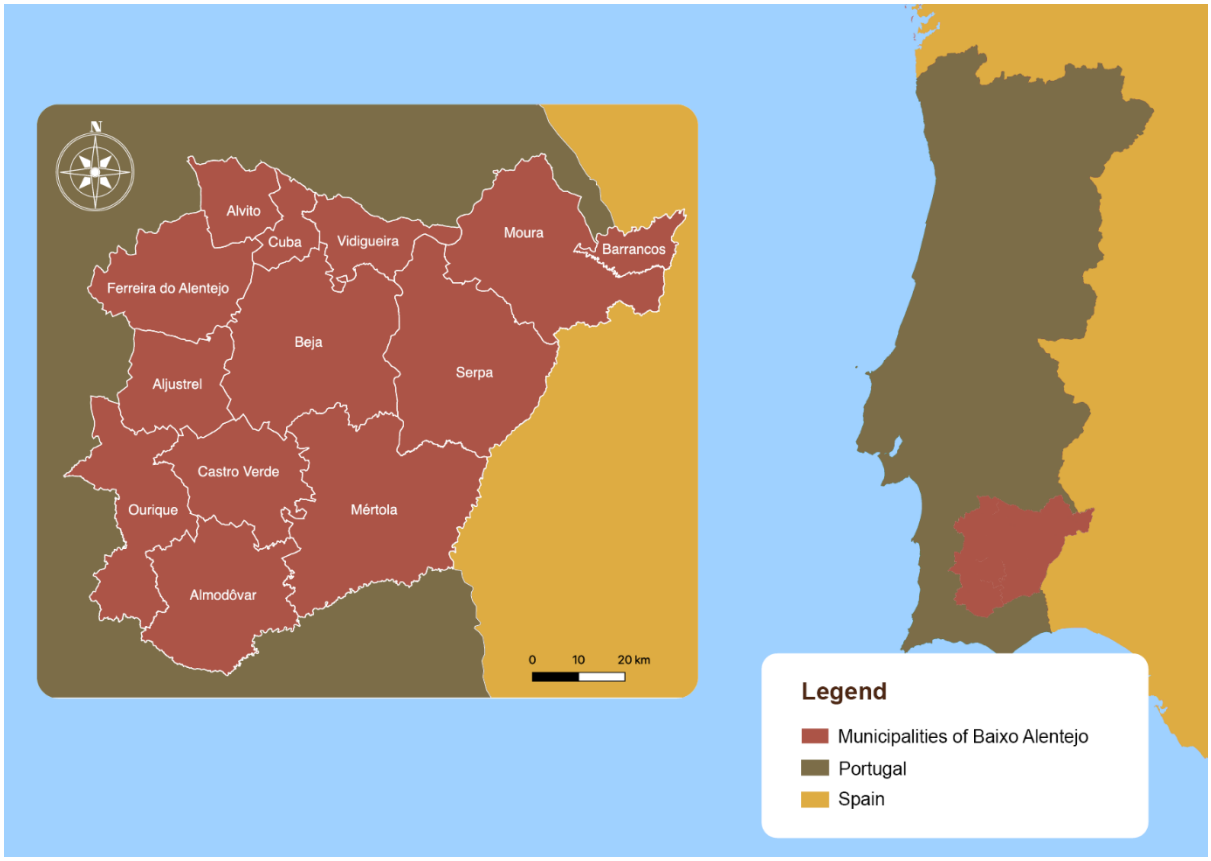



*Figure 3 - Geographic location of the CIMBAL Municipalities*

In the thirteen municipalities that integrate the region, there are currently three operators providing the service of management and treatment of CDW: Resialentejo, AMCAL and Ambilital.

We briefly describe each of the operators and their area of influence:

- **RESIALENTEJO - Tratamento e Valorização de Resíduos, E.I.M:** Resialentejo is an intermunicipal company created by AMALGA - Association of Alentejo Municipalities for Environment Management in May 2004 and since June of that year has been responsible for

the Treatment and Recovery System for Solid Municipal Waste (MW) in Baixo Alentejo. RESIALENTEJO gives a final destination to undifferentiated waste from municipal collection and recyclable urban waste from the eight municipalities of Almodôvar, Barrancos, Beja, Castro Verde, Mértola, Moura, Ourique and Serpa, which in total corresponds to a geographical area of 6.650 $Km^2$ and around 86.505 inhabitants (Census 2021).

The company's headquarters and the main infrastructures for waste treatment are located in the Montinho Environmental Park: the Landfill, the Sorting Center, and the Mechanical and Biological Treatment Center.

In the municipalities of Beja, Barrancos, Castro Verde, Mértola and Serpa, the company also has 5 Ecocenters and 5 Transfer Stations, and a network of 659 recycling bins and 107 recycling bins for oil.

- **AMCAL - The Association of Municipalities of Central Alentejo**: AMCAL was formed in 1991 and its main areas of activity are: environment and waste management; high water supply for human consumption (until July 2010); basic sanitation (cleaning of private cesspits and unblocking of sewage collectors); tourism, culture and heritage; metrology (checking scales and weights).

  AMCAL is composed of the Municipalities of Alvito, Cuba, Vidigueira (part of CIMBAL), Portel and Viana do Alentejo, serving a population of 22,895 inhabitants and a total area of 1,749 $km^2$. The AMCAL system includes a sanitary landfill (Vila Ruiva Intermunicipal Landfill); a sorting center (Vila Ruiva); a recyclable waste park (Vila Ruiva); five ecocenters (Alvito, Cuba, Portel, Viana do Alentejo and Vidigueira); three transfer stations (Vila Ruiva, Vidigueira and Portel); eighteen vehicles for waste collection and transportation; one hundred and twenty-nine municipal recycling bins for selective disposal of urban waste.

  AMCAL also holds a share in the Waste Mechanical and Biological Treatment plants in Évora and Beja, as well as in the Waste Derived Fuels (WDF) production plant in Évora.

- **Ambilital - Environmental Investments In The Alentejo Eim:** Founded in 2001, AMBILITAL is an intermunicipal company whose partners are AMAGRA - Associação de Municípios Alentejanos para a Gestão Regional do Ambiente, and SUMA - Serviços Urbanos e Meio Ambiente, SA., and its objective is to operate the integrated system for the collection and treatment of solid urban waste of the AMAGRA Intermunicipal System.

  Ambilital is composed of the Municipalities of Ferreira do Alentejo and Aljustrel, serving a population of 16,560 inhabitants and a total area of 1,107 $km^2$.

## 3.2. Population

The Baixo Alentejo region has about 114,889 inhabitants (2021). According to data released by the National Institute of Statistics - INE, the resident population in the region has decreased slightly over the last decade.

figure 4 illustrates the evolution of the resident population in the region for the period 2011 to 2021.

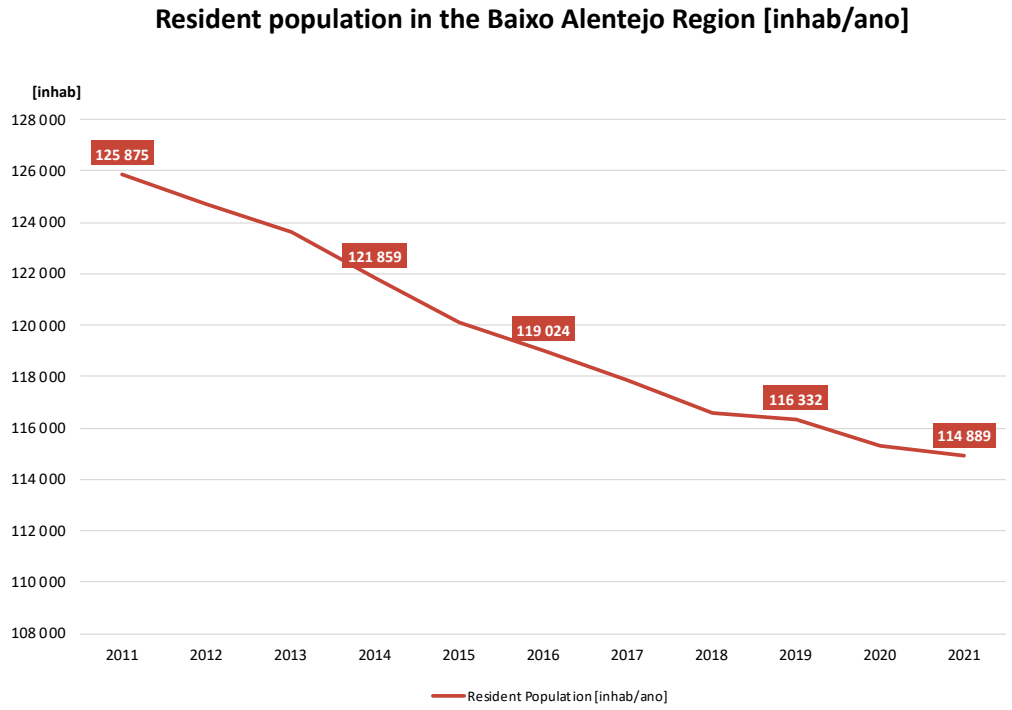



*Figure 4 - Evolution of the resident population from 2000 to 2021*[5]

CIMBAL has a lower population density (13.5 inhabitants/km$^2$, INE 2021) compared to the average population density of the country (112.2 inhabitants/km$^2$, INE 2021).

[5] Source: Adapted from INE, 2011 - 2021

## 3.3. Economy

The following figure shows the breakdown of Gross Value Added - GVA in Baixo Alentejo, in the year 2020.

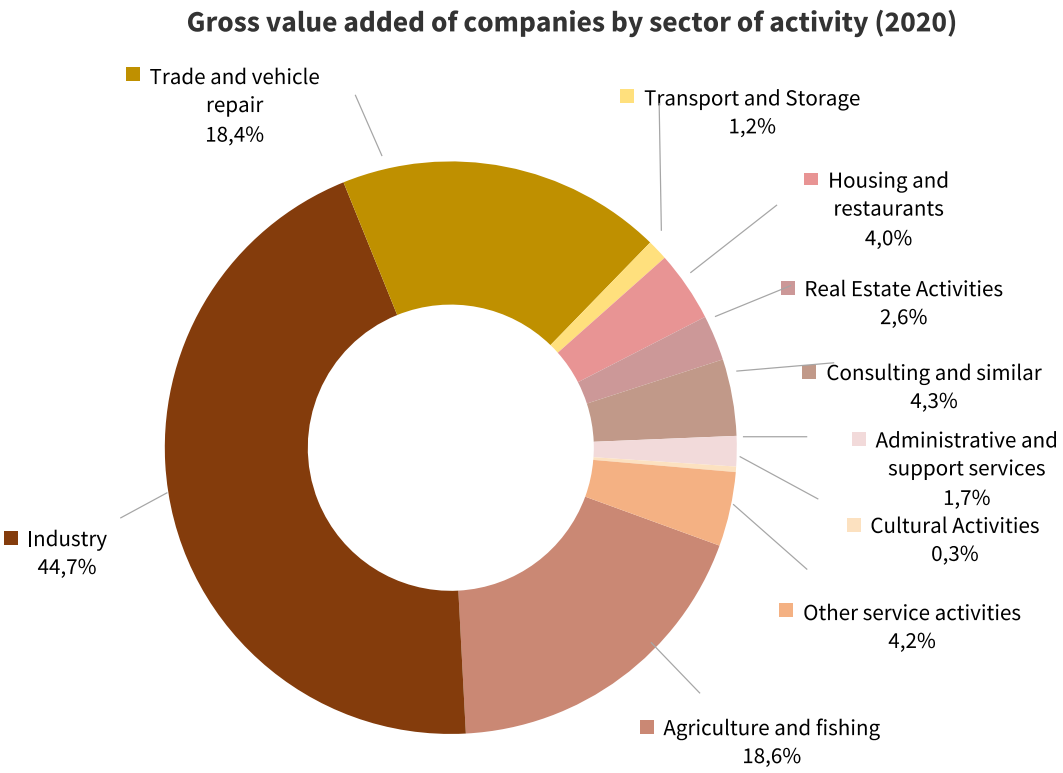



*Figure 5 - Gross Value Added of the companies located in Baixo Alentejo, by activity sector, in 2020*[6]

The economic activity of Baixo Alentejo (figure 5) is centered on the industrial sector, corresponding to 44.7% of the Gross Value Added of enterprises, by sector of activity in the region.

The agriculture and fishing sector and the commerce and repair of vehicles sector also present a relevant weight in the region's economy, corresponding to 18.6% and 18.4%, respectively.

[6] Source: Adapted from INE, 2020

# 4. Stakeholder Consultation

Given the territory in which the project is to be implemented, a prior understanding of the parties managing the process is necessary in order to formulate appropriate and effective solutions for the application context.

For this purpose, meetings were held with the various stakeholders, namely the thirteen municipalities of the Baixo Alentejo region, CDW management and treatment entities, and also entities responsible for implementing planning and management policies for this type of waste.

Following the meetings, data was collected regarding the current management systems, the issues and challenges encountered, and the future projections that may result from the project's implementation.

As far as current waste management solutions are concerned, there is a wide range of solutions implemented in the territory and a lack of standardization in the responses to this problem.

The challenges and constraints, are common to the whole territory and can be summarized in the following main points:

- Reduced availability of equipment, infrastructure and human resources essential to waste management;
- Long distances between the production and the waste disposal sites due to the dispersion of the territory;
- Lack of separation of CDW, which in turn leads to contamination of the CDW, increasing the costs of disposal and treatment;
- Existence of illegal dumping sites identified throughout the territory;
- Lack of standard regulations or more specific legislation for small repairs/constructions, who generate large amounts of waste, with little clarification in terms of responsibility for waste management.

The identification of the constraints and the differences that may exist between counties enables the definition of an adequate and effective solution based on the following conclusions:

- It is essential to have intermediate locations or transfer stations, in order to reduce the distances for the disposal of CDW, opting for the implementation of a proximity-based collection system;
- The inspection and awareness of the population on this issue is a priority for the entire region, especially for small producers that don’t require a license to carry out construction works;
- It is important to make an investment in infrastructure, equipment, materials, and human resources;
- The standardization of costs and of the system is fundamental for its better understanding and application in the territory.

# 5. Current characterization of CDW production and management

## 5.1 Current CDW production

Four sources of information were identified (APA, data from WP1 of the (De)Construct project, INE and Eurostat data) with different results regarding the amount of CDW produced in the Baixo Alentejo region.

Thus, the current CDW production of the region was calculated according to:

- APA data for the Municipalities of Baixo Alentejo region and also data collected from the Municipalities in the scope of WP1 development, namely Activity 1.5 - Estimate of CDW illegal *dumping*) and;
- the current production of CDW according to Eurostat data also taking into account data from INE regarding the total construction and demolition works for each of the Municipalities in the Baixo Alentejo region.

### *5.1.1 Current CDW production, according to APA and WP1 data*

According to the 2020 data provided by APA, the production of 7,409 tons of CDW was registered in the Baixo Alentejo Region. Regarding the data obtained in WP1 of the (De)Construct project, monitoring actions were carried out in the Municipalities, during a period of 12 months, in order to register the illegal CDW disposal sites, as well as the amount of waste resulting from such deposits.

The values obtained regarding the CDW production in the Municipalities of Baixo Alentejo are presented in the following table:

*Table 2 - Quantity of CDW (tons) produced in Baixo Alentejo*

| Municipality | Quantity of CDW registered (ton)[7] | Quantity of CDW from illegal deposits (ton)[8] | Total amount of CDW produced (ton) |
|---|---|---|---|
| Aljustrel | 146 | 204 | **350** |

[7] The data on non-municipal waste generated includes waste generated by individual or collective people producing hazardous waste, as well as waste generated by individual or collective people in charge of establishments employing more than ten workers and producing non-municipal waste. This set does not, therefore, cover the entire universe of waste produced. It should also be noted that whenever there are less than three CDW producers in a municipality, the information for that municipality cannot be provided and the figures presented do not include the figures for illegal landfills.

[8] Data from Activity 1.5 - *Estimate of CDW illegal dumping*, included in WP1 of the (De)Construct project, for the period March to September 2021.

| Municipality | Quantity of CDW registered (ton)[7] | Quantity of CDW from illegal deposits (ton)[8] | Total amount of CDW produced (ton) |
|---|---|---|---|
| Almodôvar | 1,900 | 10 | **1,910** |
| Alvito | 121 | 1,202 | **1,323** |
| Barrancos | - | 186 | **186** |
| Beja | 1,682 | 128 | **1,810** |
| Castro Verde | 2,061 | 160 | **2,221** |
| Cuba | - | - | **-** |
| Ferreira do Alentejo | 898 | 122 | **1,020** |
| Mértola | 242 | 1,284 | **1,526** |
| Moura | 88 | 206 | **294** |
| Ourique | 239 | 190 | **429** |
| Serpa | 32 | 718 | **750** |
| Vidigueira | - | 44 | **44** |
| **Total** | **7,409** | **4,454** | **11,863** |

From the analysis of the data presented, it appears that municipalities like Mértola, Castro Verde, Ferreira do Alentejo, Beja and Almodôvar have the highest values of CDW production.

The data collected results from the construction dynamics present in the territory, namely, the sum of the activities developed in the public and private spheres.

The following table shows the quantity of CDW estimated by municipality and waste typology.

*Table 3 - Quantity of CDW estimated by Municipality and EWL code*[9]

| Municipality | EWL Code | | Estimated CDW (%) |
|---|---|---|---|
| Aljustrel | 17 01 07 | Concrete mixtures, bricks, tiles and ceramics | **93.2 %** |
| | 17 06 05 | CDW with asbestos | **3.0 %** |
| | 17 09 04 | Mixed CDW | **3.0 %** |
| | 17 02 01 | Wood | **0.08 %** |
| | **Total** | | **100 %** |
| Almodôvar | 17 01 07 | Concrete mixtures, bricks, tiles and ceramics | **71.1 %** |
| | 17 03 02 | Bituminous mixtures | **22.2 %** |
| | 17 01 03 | Bricks and ceramics | **6.7 %** |
| | **Total** | | **100 %** |
| Alvito | 17 09 04 | Mixed CDW | **99.6 %** |
| | 17 01 01 | Concrete | **0.04 %** |
| | **Total** | | **100 %** |
| Barrancos | 17 05 04 | Soil and stones | **63.3 %** |
| | 17 01 07 | Concrete mixtures, bricks, tiles and ceramics | **20.2 %** |
| | 17 01 02 | Bricks | **9.8 %** |
| | 17 01 03 | Bricks and ceramics | **6.7 %** |
| | **Total** | | **100%** |
| Beja | 17 01 07 | Concrete mixtures, bricks, tiles and ceramics | **90.6 %** |
| | 17 05 04 | Soil and stones | **9.4 %** |
| | **Total** | | **100 %** |

[9] Data from Activity 1.5 - *Estimate of CDW illegal dumping*, included in WP1 of the (De)Construct project, for the period March to September 2021

| Municipality | EWL Code | | Estimated CDW (%) |
|---|---|---|---|
| Castro Verde | 17 01 07 | Concrete mixtures, bricks, tiles and ceramics | **32.8 %** |
| | 17 05 04 | Soil and stones | **31.4 %** |
| | 17 09 04 | Mixed CDW | **11.9 %** |
| | 17 01 03 | Bricks and ceramics | **11.2 %** |
| | 17 01 01 | Concrete | **8.3 %** |
| | 17 09 03 | Mixed CDW (with hazardous substances) | **2.8 %** |
| | 17 03 02 | Bituminous mixtures | **1.4 %** |
| | 17 06 05 | CDW with asbestos | **0.2 %** |
| | **Total** | | **100 %** |
| Ferreira do Alentejo | 17 01 07 | Concrete mixtures, bricks, tiles and ceramics | **38.7 %** |
| | 17 03 02 | Bituminous mixtures | **35.5 %** |
| | 17 05 04 | Soil and stones | **15.7 %** |
| | 17 01 01 | Concrete | **8.6 %** |
| | 17 03 03 | Coal tar and tarred products | **1.5 %** |
| | **Total** | | **100 %** |
| Mértola | 17 01 07 | Concrete mixtures, bricks, tiles and ceramics | **96.5 %** |
| | 17 05 04 | Soil and stones | **2.6 %** |
| | 17 02 01 | Wood | **0.9 %** |
| | **Total** | | **100 %** |
| Moura | 17 01 07 | Concrete mixtures, bricks, tiles and ceramics | **72.4 %** |
| | 17 05 04 | Soil and stones | **9.9 %** |
| | 17 01 03 | Bricks and ceramics | **7.0 %** |

| Municipality | EWL Code | | Estimated CDW (%) |
|---|---|---|---|
| | 17 01 01 | Concrete | **4.7 %** |
| | 17 09 03 | Mixed CDW (with hazardous substances) | **3.1 %** |
| | 17 09 04 | Mixed CDW | **2.0 %** |
| | 17 01 02 | Bricks | **0.09 %** |
| | 17 06 05 | CDW with asbestos | **0.01 %** |
| | **Total** | | **100 %** |
| Ourique | 17 01 07 | Concrete mixtures, bricks, tiles and ceramics | **78.5 %** |
| | 17 03 03 | Coal tar and tarred products | **9.2 %** |
| | 17 09 04 | Mixed CDW | **7.3 %** |
| | 17 01 01 | Concrete | **3.7 %** |
| | 17 06 05 | CDW with asbestos | **1.3 %** |
| | **Total** | | **100 %** |
| Serpa | 17 01 07 | Concrete mixtures, bricks, tiles and ceramics | **93.9 %** |
| | 17 01 01 | Concrete | **3.0 %** |
| | 17 03 03 | Coal tar and tarred products | **2.2 %** |
| | 17 02 01 | Wood | **1.0 %** |
| | **Total** | | **100 %** |
| Vidigueira | 17 05 04 | Soil and stones | **45.0 %** |
| | 17 01 07 | Concrete mixtures, bricks, tiles and ceramics | **33.3 %** |
| | 17 09 04 | Mixed CDW | **8.8 %** |
| | 17 01 02 | Bricks | **7.8 %** |
| | 17 03 02 | Bituminous mixtures | **5.1 %** |

| Municipality | EWL Code | Estimated CDW (%) |
|---|---|---|
| | **Total** | **100 %** |

In table 4 you can see the estimated quantity of CDW in the Baixo Alentejo region by waste type.

*Table 4 - Estimated quantity of CDW, in Baixo Alentejo region, by EWL code*[10]

| Region | EWL Code | | Estimated CDW (%) |
|---|---|---|---|
| Baixo Alentejo | 17 01 07 | Concrete mixtures, bricks, tiles and ceramics | 83 % |
| | 17 05 04 | Soil and stones | 6 % |
| | 17 09 04 | Mixed CDW | 4 % |
| | 17 03 02 | Bituminous mixtures | 4 % |
| | 17 01 01 | Concrete | 1 % |
| | 17 01 03 | Bricks and ceramics | 1 % |
| | 17 02 01 | Wood | 1 % |
| | 17 01 02 | Bricks | < 0.5 % |
| | 17 09 03* | Mixed CDW (with hazardous substances) | < 0.5 % |
| | 17 03 03* | Coal tar and tarred products | < 0.5 % |
| | 17 06 05* | CDW with asbestos | < 0.5 % |
| | **Total** | | **100 %** |

According to the results presented in table 3 and table 4 the most common type of CDW in the region is concrete mixtures, bricks, tiles and ceramics (LER 17 01 07), representing about 83% of the total CDW produced in the Baixo Alentejo region.

Taking into account that the regional strategy to be defined is based on the principle of Circular Economy of waste and, consequently, its recovery, it is important to demonstrate the potential of

[10] Data from Activity 1.5 - *Estimate of CDW illegal dumping*, included in WP1 of the (De) Construct project, for the period March to September 2021

recycling and reuse of CDW. The data considered in this report, result from the monitoring actions performed under WP1, and are summarized in the following table:

*Table 5 - Potential for recovery of CDW*[11]

| Treatment potential (per treatment type), according to EWL code | | | Estimated CDW (%) |
|---|---|---|---|
| **Baixo Alentejo Region** | | | **100 %** |
| Reuse (evaluate action case by case) | | 17 05 04 | **6 %** |
| Recovery | Recycling | 17 01 01<br>17 01 02<br>17 01 03<br>17 01 07<br>17 03 02 | **89 %** |
| Other (evaluate action case by case) | | 17 09 04<br>17 02 01 | **4 %** |
| Disposal | Landfill | 17 03 03<br>17 06 05<br>17 09 03 | **0.5 %** |

### *5.1.2 Current production of CDW, according to data from Eurostat*[12] *and INE*

Using the data made available by Eurostat for Portugal, an evaluation was made for the current CDW production of the thirteen municipalities of the Baixo Alentejo, based on data from INE relating to the total amount of building and demolition works for each of the municipalities

For the year 2020, the production of 29,837 tons of CDW was registered in the Baixo Alentejo Region. Table 6 shows the data regarding the total amount of CDW produced and the number of completed buildings by type of work.

[11] Data from Activity 1.5 - Estimate of CDW illegal dumping, included in WP1 of the (De)Construct project, for the period March to September 2021

[12] Eurostat is the Statistical Office of the European Union responsible for publishing high quality statistics and indicators at the European level that allows comparison between countries and regions.

*Table 6 - Total amount of CDW produced and number of buildings by type of work*[13]

| Municipality | Total amount of CDW produced (ton) | No. Building works | No. Demolition works | Total (building + demolition) |
|---|---|---|---|---|
| Aljustrel | 1,627 | 12 | 0 | **12** |
| Almodôvar | 2,848 | 20 | 1 | **21** |
| Alvito | 949 | 7 | 0 | **7** |
| Barrancos | 542 | 4 | 0 | **4** |
| Beja | 4,340 | 31 | 1 | **32** |
| Castro Verde | 2,848 | 20 | 1 | **21** |
| Cuba | 1,899 | 13 | 1 | **14** |
| Ferreira do Alentejo | 2,577 | 19 | 0 | **19** |
| Mértola | 4,747 | 29 | 6 | **35** |
| Moura | 2,170 | 13 | 3 | **16** |
| Ourique | 949 | 7 | 0 | **7** |
| Serpa | 4,069 | 26 | 4 | **30** |
| Vidigueira | 271 | 2 | 0 | **2** |
| **Total** | **29,837** | **203** | **17** | **220** |

From the analysis of the data in the table, we can conclude that there is a greater predominance of new construction (92%) compared to the number of demolitions (8%). However, demolitions, although fewer in number may imply a higher number of CDW produced and (eventually) sent to landfill.

According to these data, the Municipalities of Beja, Mértola and Serpa present the highest values, presenting a large production of CDW per each work, including construction and demolition.

[13] Source: Adapted from INE, 2020

# 5.2 CDW collection system solutions

## *5.2.1 Collection and transportation system for CDW*

In the Baixo Alentejo Region, which includes, as previously mentioned, the Municipalities of Aljustrel, Almodôvar, Alvito, Barrancos, Beja, Castro Verde, Cuba, Ferreira do Alentejo, Mértola, Moura, Ourique, Serpa and Vidigueira, there are several solutions implemented regarding the collection and transportation of CDW.

For this purpose, the various options of the Municipalities regarding the collection and transportation of CDW are described below:

- **Aljustrel:** The Municipality receives waste from small repairs or small works. It is the intention of the Municipality to implement a system of collection by *big bags*. The Municipality currently receives in its municipal storage only CDW from small repairs and small works.
- These residues are **collected at the construction site using big bags** provided by the Municipality, upon payment of a fee associated with the service. The collected waste, duly sorted, is later **deposited in the municipal storage**;
- **Almodôvar:** The Municipality currently has two **intermediate collection points** in two Parishes;
- **Alvito:** The Parishes receive the waste and forward it to the **temporary collection site**, without associated costs. Subsequently, the waste received at this location is forwarded to the Association of Municipalities of Central Alentejo - AMCAL;
- **Barrancos:** The municipality **does not currently provide a service or solution** for the management of CDW. The collection and delivery of this waste is the responsibility of the site managers or contractors;
- **Beja:** The municipality has an Ecocenter where it receives this type of waste. Two of the Parishes forward the CDW to this **Ecocenter**. Complementary to this management system, the Municipality has a **system of big bags,** at a cost for the producer, which is then **collected at the site of the construction**.
- **Castro Verde:** The municipality provides a **big bag system**, with a maximum of three big bags per construction site, and does not charge for this service.
- **Cuba:** The municipality currently collects CDW using its own vehicles, and then sends this waste to the AMCAL landfill. The municipality uses a **municipal storage** for the disposal of CDW from small works, and does not charge fees for this disposal;
- **Ferreira do Alentejo:** The Municipality's collection system includes only **one vehicle to transport** the collected waste;
- **Mértola:** The Municipality has a collection center and a free big bag system. This system works on request for private works;
- **Moura:** The collection and management of CDW in the municipality is contracted to a private company - Ambimoura;

- **Ourique:** The parishes of the municipality have **temporary sites for the disposal of CDW**, with the **auxiliary use of containers**. This service is not associated with any cost to producers. Subsequently, a contracted company collects the containers and sends the waste to its final destination;
- **Serpa:** The municipality has a **system of big bags**, provided by the parishes. The collected waste is then sent to landfill;
- **Vidigueira:** The municipality currently has a **reception point** for quantities up to 1m$^3$ and a **transfer station**. The Municipality charges fees associated with this service. If the producer is unable to go to the transfer station, the municipality provides a vehicle for **collection on site**. The fee charged varies depending on whether or not there is mixture of materials.

In order to synthesize the information of the current management systems, the following scheme is presented:

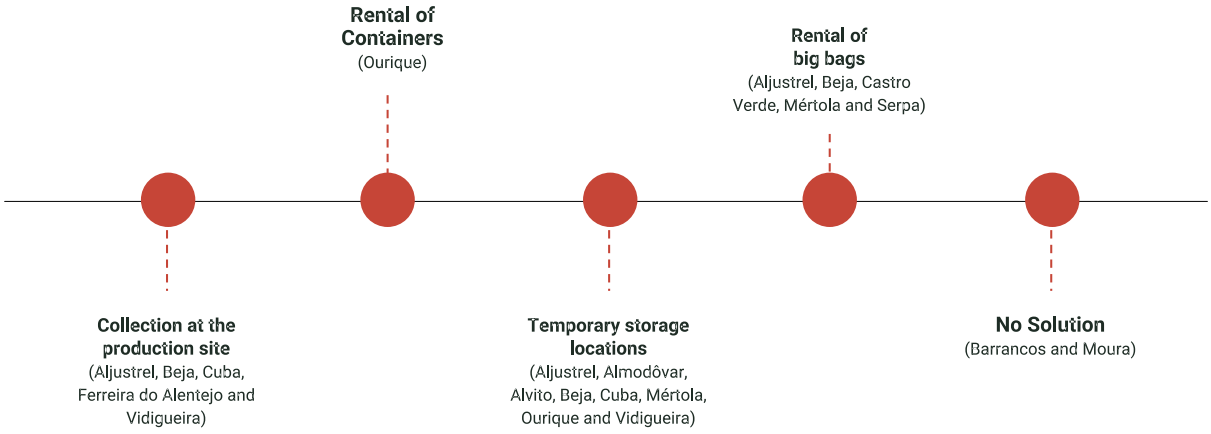



*Figure 6 - CDW management system in Baixo Alentejo region*

As illustrated in the scheme above, the current management of CDW in the Baixo Alentejo region is carried out using different equipment and, in some cases, there is no management system at the municipal level. The same is true for the costs associated with the operation. Since the responsibility for CDW management lies with the municipalities, the application of fees for this service also varies, and in some cases, there are no fees associated with the collection and transport operation, as illustrated in the following scheme:

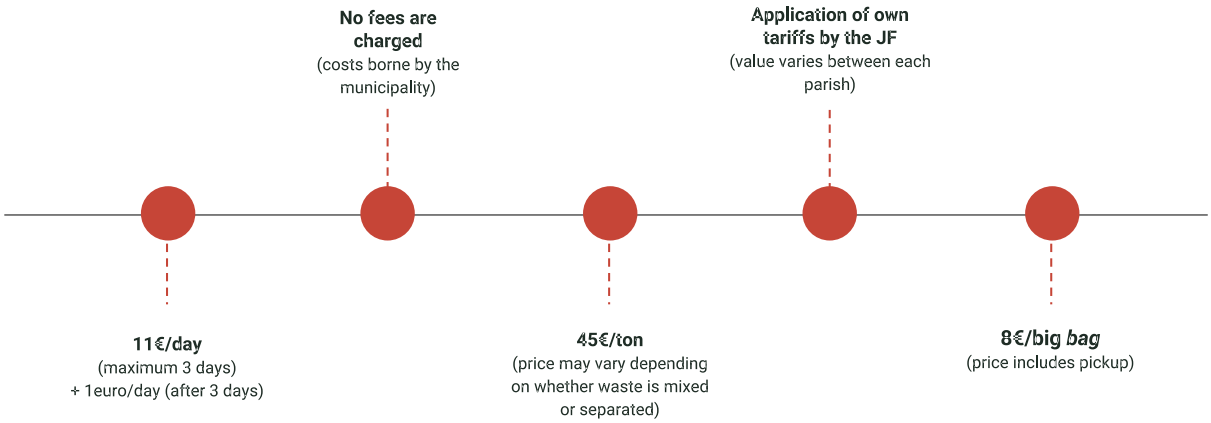



*Figure 7 - Fees for CDW management in Baixo Alentejo*

### 5.2.2 CDW reception system

In what concerns the reception system of CDW collected currently by the Municipalities, the following circuits are highlighted:

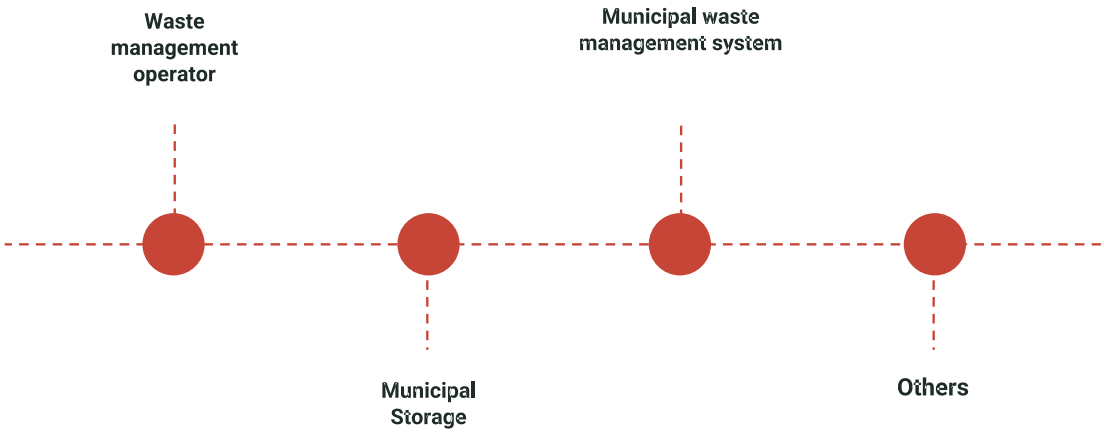



*Figure 8 - CDW reception system in Baixo Alentejo region*

Once again, the lack of standardization of the CDW management systems is demonstrated, as there is no regular circuit in the process of forwarding this type of waste. However, the lack of equipment and infrastructure is one of the biggest constraints identified in the territory, which also contributes to inefficiency in the management of collection, transportation and treatment of this type of waste.

In the Baixo Alentejo Region, only ten of the thirteen municipalities have Ecocenters. In figure 9, the geographic distribution of the Ecocenters present in the territory is featured.

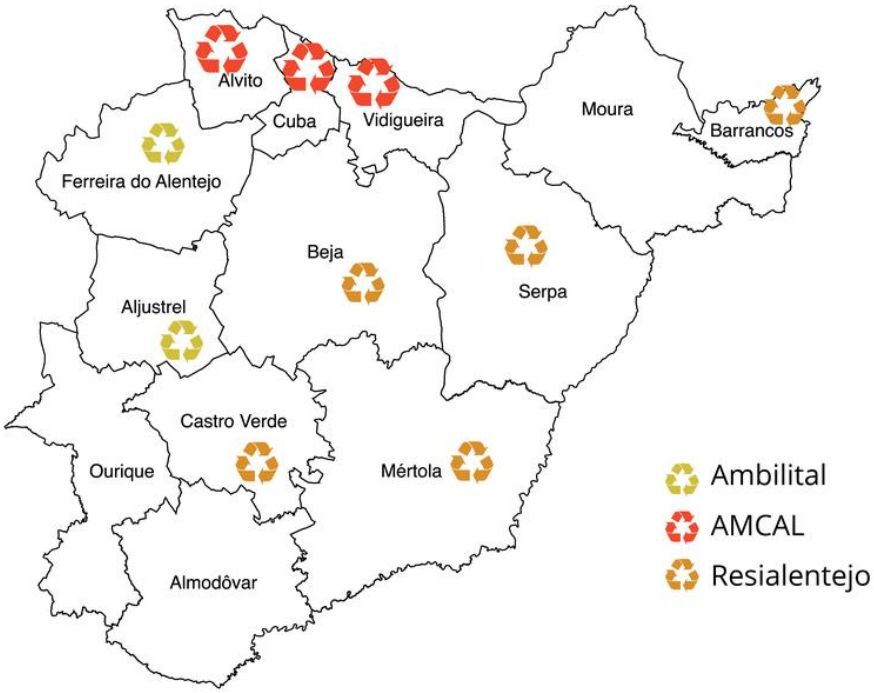



*Figure 9 - Location of the Ecocenters provided by the Municipalities of Baixo Alentejo*

The Ecocenters present in the territory are managed by three different operators, which, in turn, have different sizes and coverage. Resialentejo is the largest operator in the Baixo Alentejo, with about half of the Ecocenters in the region. Responsibility for the remaining Ecocenters is divided between AMCAL and Ambilital.

The strategy to be defined may consider the existing locations of the Ecocenters illustrated, ensuring an efficient articulation in the definition of solutions that may include the use of existing infrastructures.

### *5.2.3 CDW treatment system, including analysis of the most appropriate technological solutions*

Considering that one of the final destinations for CDW is waste management operators, it is important to assess how these operators are distributed in the Baixo Alentejo Region, and what their area of coverage is.

As previously mentioned, the Baixo Alentejo region includes three different operators that manage and treat waste: Resialentejo, AMCAL and Ambilital.

figure 10 illustrates the coverage area in the considered territory.

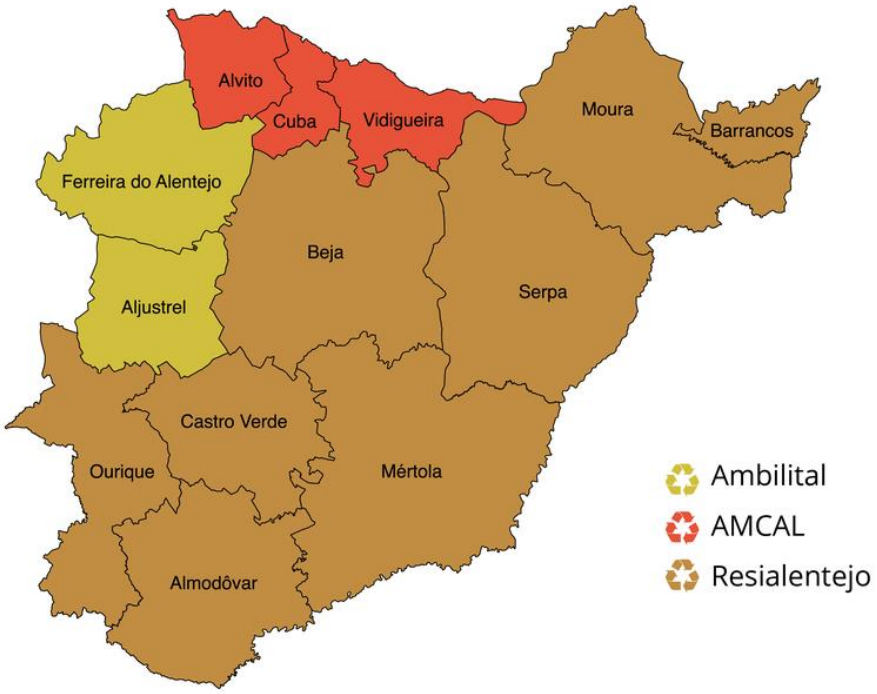



*Figure 10 - Coverage area of the Baixo Alentejo waste operators*

Resialentejo covers a larger area than other operators, covering most municipalities in the Baixo Alentejo region. Nevertheless, CDW management can be articulated between the different operators, verifying the opportunity for the creation of synergies between companies, municipalities and waste management entities.

### *5.2.4 Intermunicipal system for promoting the reuse of construction materials*

Regarding the reuse of materials, currently none of the Municipalities in the Baixo Alentejo Region has a materials bank or repository. The Municipality of Beja has experience in this context, since it had a materials bank in operation in the Municipality.

This bank of materials had the objective of valorizing remnant materials and components from construction or from demolition/rehabilitation works with potential for reuse. The materials in this bank were available for sale/exchange. This experience confirms the possibility of developing initiatives and partnerships that promote the reuse of CDW, eventually supported by digital tools for the management of these resources.

The materials bank may be an essential element of the strategy to be implemented as it allows the valorization of materials. It also opens up opportunities in the scope of the social economy, allowing the creation of articulation opportunities between several entities, namely private charitable institutions.

# 6. Reference Projects

In the scope of Construction and Demolition Waste (CDW) Management several works have been developed nationally and internationally, with potential for replication.

In this sense, a collection of the good practices found, with potential for use in the region, is presented.

The good practices will be presented in different sections, taking into account the various phases of CDW management:

- **Waste collection/reuse systems** - this section concerns the waste management system, namely the articulation of the various players in the collection and transportation operation, through the definition of CDW management strategies and municipal guides for practical application in the territory, as well as tools for managing the materials and waste collected;
- **Reuse of materials** - the chapter on reuse will refer to the good practices for the reuse of materials on construction sites, promoting the creation of a value chain of CDW and its respective recovery;
- **Materials from waste** - this section will illustrate examples of good practices resulting from the incorporation of materials resulting from the recycling of construction and demolition materials, through processes to transform this waste.

The presentation of Good Practices is intended to help municipalities improve the management of this waste stream and effectively meet their legal obligations. It is also intended that the introduction of these examples enables the integration of innovative solutions in order to obtain a greater recovery of CDW and an extension of its life cycle.

# CDW Management System in the Municipality of Sibiu, Romania

**Intervention Area:** Efficient management of CDW, through sorting, reuse, and recycling, reducing the amount of CDW transported to landfills.

**Objective:** Reduce the amount of CDW sent to landfill; reuse and recycle materials; reduce the environmental impact of the intervention.

**Project description**: The project was the first approach of the Municipality of Sibiu to develop a strategy for the management of CDW, funded by the *EEA Grants* program. It included the implementation of a recycling plant and the development of a Construction and Demolition Guide, in order to raise awareness of the whole construction sector and the general population, including the legal framework and the obligations and responsibilities regarding the management of CDW.

Within the project, the strategy consisted of the following points:

I. The producers of CDW requested from the local waste operators a specific container for the collection of this waste;

II. The container was later transported to the Recycling Center;

III. The CDW was then classified and separated. In the case of non-hazardous waste, it could be directly or indirectly reused as construction materials or sent for recycling;

IV. Inert CDW was processed mechanically (by shredding and separation).

# CDW management system in the Municipality of Buzau, Romania

**Intervention area:** Efficient management of CDW, through sorting, reuse, and recycling, reducing the amount of CDW transported to landfills.

**Objective:** To know the current situation regarding the management and treatment of CDW in the municipality; to develop a standard system with clear definitions of the responsibility of all involved; to develop a procedure for end-of-life materials; to promote the reuse of CDW, meeting the legal requirements.

**Project description:** The project, developed in a partnership between public and private entities, aimed to develop an efficient CDW management system for the Municipality of Buzau:

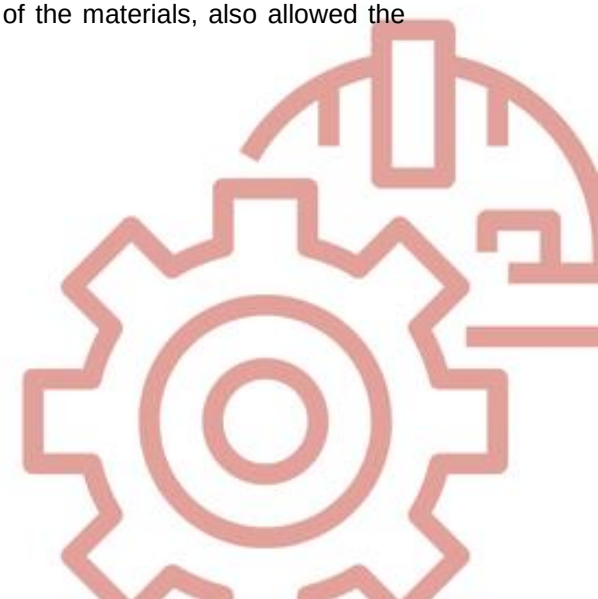
I. Development of a Best Practices Guide for the selective collection of CDW on site, applicable to public and/or private buildings;

II. Definition of a methodology for end-of-life waste;

III. Implementation of a pilot plant for the mechanical treatment of inert materials;

IV. Development of a mobile application aimed at promoting recovery and recycling techniques.

The implemented pilot station, besides increasing the valorization of the materials, also allowed the creation of new jobs in the territory.



# CDW Management System: *Smart Waste*, Portugal

**Intervention area:** Promotion of a competitiveness model in the construction sector, including universities, companies, research institutes, public and private organizations, municipal technicians, construction sector contractors, and the general population.

**Objective:** Involve all stakeholders in the sector, promoting the social and economic valorization of CDW, through the valorization of the entire value chain, creating conditions for greater competitiveness, resulting from a collaborative and innovative approach.

**Project description:** Under the project, entities responsible for the construction and demolition value chain were brought together in order to promote an elaborate characterization study of the sector. This study identified the main obstacles, consolidating the material obtained in a set of results and recommendations for the respective valorization of CDW. The general activities of the project are:

I. Research and compilation of Best Practices in the context of circularity in the construction sector;
II. Development of a CDW and recycled aggregates catalogue;
III. Organization of e-learning courses "CDW: Prevention and Valorization";
IV. Support in the development of Action Plans, namely for the Sustainable Management of CDW and for the Circular Economy of the Construction and Demolition Sector.

# *Upcycle Studios, Lendager Group*, Copenhagen

**Intervention area:** Recycling and reuse of materials on site, promoting waste circularity.

**Objective:** The goal of the project was to build a set of twenty housing units using materials and waste from other construction and/or demolition sites, using new materials for the building as much as possible.

**Project description:** Under the project, the wood used to construct the facades and floors of the houses was obtained from a local timber industry, which would otherwise be discarded or incinerated. The windows installed - about 75% - were originally from other buildings, old or abandoned.

As for the concrete needed for the execution of the project, was originally from waste from the expansion works of the subway line in the city of Copenhagen, representing about 50% of the concrete reused in the project.

The construction methods used in the project were considered according to regenerative methodologies, based on the principle of circularity of materials and waste, in order to reduce environmental impacts.

The project not only reduced the impact from the production of construction materials and their transportation, but also allowed to avoid sending waste from other construction sites to landfills, also reducing the costs of treating this type of waste.

# City Material Bank
# *Varvsstaden*, Sweden

**Intervention area:** Selective deconstruction of abandoned buildings.

**Objective:** The deconstruction initiative aimed at reusing materials from the existing abandoned buildings in the old port area of the city.

**Project description:** The operation, promoted by two construction companies that own the buildings, aimed at the transformation of the intervention area, taking into account the principles of circularity of materials. For the transformation a deconstruction process was chosen, as opposed to the usual demolition process.

The materials resulting from this process were therefore considered active materials rather than waste. This methodology promoted the use of these materials in the transformation of the new space. For this, during construction, the materials were restored, collected and stored in a space - Materials Bank, awaiting future uses. In order to facilitate the accessibility of the materials bank, all materials were catalogued, resulting in a more effective management of them.

As part of the project, a Materials Guide (*Material Compass*) was also developed with instructions and suggestions on how the restored material can be used. This guide provides information about the most common material fractions in the city's construction and demolition processes (concrete, steel, bricks, glass and wood), including information about the material's main characteristics and its environmental impact.

Examples are also provided of how the recovered material can be reused in new projects.

# Waste Recovery Tools and Circular Economy Promotion, Sweden

**Intervention area:** Digital tools that facilitate reuse and promote a market for construction materials and recycled materials, contributing to the creation of a circular flow and materials in the sector.

**Objective: To** create conditions for the recycling of construction products on an industrial scale, contributing to a change in the circular material flow, turning waste into new resources.

**Project description:** The project consists in the implementation of the Circular Construction Center (*CCBuild*), enabling the meeting and interaction of the various stakeholders in the sector, in order to find material circuits during the demolition and construction processes.

This digital platform, in addition to offering a vast network of digital knowledge and services, strengthening the market for waste and circular materials, brings together a wide range of stakeholders in the construction industry, namely: industries, owners, architects, contractors, public stakeholders, and research institutes.

The tool is focused on developing user-friendly digital support and promoting industry collaboration so that circular construction methods are widely implemented.

The platform, among other things, shows examples of recycling, provides information on how to reuse materials, and offers a marketplace for buying and/or selling reusable building products.

# Renovation of Ruseløkka School, Oslo, Norway

**Intervention area:** Rehabilitation and reuse of materials.

**Goal:** Inclusion of construction methods that have little or no environmental impact, through the reuse of materials from the building's renovation work.

**Project description:** The School of Ruseløkka, is a primary and secondary school, accommodating 690 students. The previously existing building on the site was demolished and the new school was built, as a pilot project within the framework of sustainable rehabilitation and circularity of materials.

As part of the project, materials from the original building were reused in the new building. For this purpose, around 4.500 bricks, wooden beams, and granite blocks were stored for later use. The collected bricks were used for the interior walls of the main entrance hall, while the granite blocks were made into benches for outdoor use. A few doors were also extracted and stored for reuse in new spaces.

The technical elements, namely ventilation ducts, pillars and beams, were dismantled and reused in housing buildings in the city.

This project presents an articulated management reflecting the current needs of the building, with the added concern of integrating consumption systems with low environmental impact (installation of solar panels).

It identifies a set of interventions with impact at the social level: the stored materials, resulting from the demolition of the previous building, were also used in other buildings in the city.

# Road Surface Recycling, Czech Republic

**Intervention area:** Recycling and reuse of materials.

**Objective:** Reconstruction of a road, using recycled materials.

**Project description:** The project consisted of reconstructing a roadway, using recycling technologies for further use of the materials.

Reconstruction was carried out over 12km. At a nearby site equipment was installed for crushing around 50.000 tons of concrete obtained from demolition works.

After crushing, this material was used for the production of new concrete, applied in the base layer of the road to be reconstructed.

This intervention allowed the use of a new material made from an existing one, reducing the energy consumption associated with the transformation process and, consequently, reducing the environmental impact that would be associated with its original production.

# Use of recycled materials in the playground in Cukrkandl, Czech Republic

**Intervention area:** Recycling and reuse of materials.

**Objective:** To build a public park, using recycled materials.

**Project description:** As part of the project a new technology for producing recycled concrete - "*rebetong*" - was developed and patented.

This production method stands out by using 100% waste from construction sites. This method can also be adapted for the production of precast concrete blocks.

This production method was selected for the construction of a playground, in a pilot project perspective, and can be replicated in other scopes and geographical areas.

# 7. CDW management system solutions

In the scope of this strategy and considering the characteristics of the territory and the current CDW management system, several CDW management solutions were analyzed with the intention of optimizing solutions and promoting better integration with the existing system and resources.

The results presented below take into consideration the comparison of four different CDW management scenarios, considering technical, economic-financial and environmental indicators that support the comparative analysis between alternative scenarios, taking into account data and information to characterize the current situation.

Associated with the CDW management solutions proposed in each scenario, it is proposed to carry out regular awareness and communication campaigns, as well as inspection and monitoring programs throughout the project's implementation period.

## 7.1. Scenario 1 - Characterization of the scenario resulting from the non-implementation of the operation (Business as Usual Scenario)

To implement a circular model in the context of construction and demolition, a new approach involving all stakeholders of the value chain is needed. From a CDW management perspective, the circular economy can have profound effects on waste management and the achievement of relevant waste targets and objectives.

This scenario considers the current situation of the thirteen municipalities of Baixo Alentejo and the consequences of the lack of a consistent CDW management system in the territory. The thirteen municipalities of Baixo Alentejo do not have enough resources or equipment for an efficient management of CDW. Due to the dispersion of the territory the distances between production sites and disposal sites are very high, which causes constraints that have emphasis mainly at the level of transport costs.

Another constraint identified is the existence of large amounts of illegal disposal throughout the territory and the non-separation of CDW leading to contamination. It should be noted that the reduced or non-existent supervision and awareness of the population contribute to the worsening of this situation, and result in high costs of disposal and treatment.

The non-implementation of a centralized management system for CDW may represent constraints in the future, particularly with regard to the increase in illegal deposits of this type of waste, especially in

rural areas of the Baixo Alentejo region and, subsequently, increased costs of waste treatment. This situation may also lead to the worsening of different types of pollution (water, soil, among others).

The CDW produced in the Baixo Alentejo Region, as well as those found in illegal dump sites, are not being subject to adequate management and proper recovery. With the introduction of a system for the collection of CDW arises the opportunity to review the current operating system

The actions to be implemented must include a strong component of awareness and promotion of more sustainable environmental practices, contributing to the environmental performance of the territory.

## 7.2. Scenario 2 - Articulated management model

The **articulated management model** considers that the high level and low level treatment is different, i.e. the low level treatment is carried out by the operators (Resialentejo/AMCAL/AMBILITAL) and the high level treatment will be the responsibility of operators and/or private companies licensed to treat CDW.

This scenario considers the existing infrastructures in the territory, thus minimizing the investment values necessary for the implementation of a CDW management system in the Baixo Alentejo region, opting for the definition of an entity constituted for this purpose and complementary to Resialentejo, whose management focuses specifically on the collection, transportation and treatment of CDW produced in the thirteen municipalities of Baixo Alentejo.

This scenario includes the use of the ecocenters currently in operation. In case of non-existence of recycling centers, locations that meet the regulated conditions for the reception of CDW will be defined, in order to cover all municipalities.

The complementary infrastructure, Resialentejo - RCD, would be the entity responsible for all logistics. The application of this scenario implies:

- a phased investment in collection and treatment equipment, namely the acquisition of 5 vehicles and 100 containers (the acquisition of these containers would be phased in over a period of two years) taking into account the data from APA for the region's municipalities and also the data collected from the municipalities in the scope of WP1 development;
- a phased investment in collection and treatment equipment, namely the acquisition of 12 vehicles and 110 containers (the acquisition of these containers would be phased over a two-year period) taking into account the current production of CDW according to Eurostat data and INE data on total construction and demolition work for each of the Municipalities.

This investment will be reflected, later, in municipal costs and tariffs that vary according to the distances traveled, in the case of collection and transport, and the contamination of the materials, according to their specific treatment.

In this scenario there is articulation between local entities: entities that perform the collection (Resialentejo/AMCAL/AMBILITAL) and entities that perform the treatment (operators and/or private companies).

## 7.3. Scenario 3 - Centralized management model

The **centralized management model** is an internalized system. Logistics (collection and transport) and treatment are the responsibility of the complementary entity, Resialentejo - RCD. This approach implies an additional investment at the equipment level for the treatment of CDW. This equipment includes an excavator, a mobile crusher, a screen, a loader, among other. The acquisition of a mobile crusher will allow this treatment system to be relocated to the various Ecocenters as the need arises.

Presenting similarities with scenario 2, this scenario also considers the existing infrastructures in the territory, namely the use of ecocenters currently in operation.

The application of this scenario thus implies:

- a phased investment in collection and treatment equipment, namely the acquisition of 5 vehicles, 1300 *big bags* and 100 containers (the acquisition of these containers would be phased in over a period of two years) taking into account the APA data for the region's municipalities and also the data collected from the municipalities in the scope of WP1 development;
- a phased investment in collection and treatment equipment, namely the acquisition of 12 vehicles, 3,270 *big bags* and 110 containers (the acquisition of these containers would be phased over a two-year period) taking into account the current production of CDW according to Eurostat data and INE data on total construction and demolition works for each of the Municipalities.

This investment will be reflected, later, in municipal costs and tariffs that vary according to the distances traveled, in the case of collection and transport, and the contamination of the materials, according to their specific treatment.

Scenario 2 and 3 seek, therefore, to establish an integrated system that involves all the municipalities in the Baixo Alentejo Region, opposed to the current trend of disarticulation present in the territory.

## 7.4. Scenario 4 - Private Management Model

For this scenario, a **private management** model was considered, through the creation of a new entity. The collection and transportation of CDW would, thus, be in charge of this new entity. The amounts of CDW collected would be directed to the nearest local treatment and recovery companies, considering the limits and physical distances between the locations where this type of waste is received. This scenario implies greater investment in the creation/acquisition of equipment, particularly in terms of investment in infrastructure (administrative and social buildings).

This scenario additionally implies licensing costs for the implementation of spaces to receive construction and demolition waste.

The model proposed consists of the provision of a common service to all municipalities, including:

- Collection and transportation of the different types of waste from the construction sites;
- Sorting, treatment, and temporary storage of waste;
- Lead the waste to the appropriate final destination;
- Consulting, auditing and training.

# 8. Preliminary Financial Economic Analysis

In the long term it is intended that the solutions presented are self-sufficient in economic terms, however the municipalities and, consequently, the producers whose responsibility for CDW management falls on municipal entities, will have to pay for the management and treatment services provided, in order to ensure the viability of the model or until the means for the respective waste management are ensured.

The value of these services will, as far as possible, be calculated on the basis of the cost of operation, the main goal being to benefit the users of these services by ensuring, objectively and as a matter of priority, that the total costs (whether countable or not) are lower than the costs currently incurred.

It should also be recognized that a large part of the current costs associated with CDW management are "invisible" costs for the current small producers, i.e., expenses such as working hours for collection, transportation and storage, as well as maintenance of vehicles and equipment, possible accidents, employee's income, and waste materials going to landfills are not accounted for.

Management entities may also provide information on the quantities of CDW produced. This information will allow a better management of waste in the long term, as well as a better accounting of the types of materials produced and, consequently, of the materials that can be recycled and/or reused, taking into account their recovery potential.

Considering the environmental benefits that the implementation of a CDW management solution will bring to the Baixo Alentejo region, financial support to entities can be considered, especially for the installation of infrastructure, equipment acquisition and operational support in the first phase of operations. In this way, the costs of services could have a significantly lower value. Consequently, a considerable step would be taken towards the financial autonomy of the project and towards the transition to a more circular economy in the construction and demolition sector, which is one of the main objectives of the project.

# 8.1. Evaluation of the economic and financial analysis

For the present study the following assumptions were considered:

- Period of analysis **-** 10 years, including the construction/equipment acquisition period and a period of full operation**.**
- Price base **-** Constant prices for the year 2022;
- Amortizations **-** Amortizations are not considered;
- Update Rate **-** The update rate used in this financial analysis was 4%, as recommended by European Commission guidelines;
- Analysis framework **-** This analysis was based on the adoption of best estimates for the period under analysis.

In preparing this study and as identified above, 4 scenarios were considered:

- **Scenario 1 -** No investment is considered;
- **Scenario 2 -** Considers the existing infrastructures in the territory and the creation of Resialentejo - RCD (covering the thirteen municipalities in the region) with the goal of using the existing ecocenters and define new locations where there are no ecocenters .

  In this scenario the high level treatment (collection and transport) is performed through private operators that already exist in the territory (Ambigroup/private companies).
- **Scenario 3 -** Similarly to scenario 2, this scenario considers the existing infrastructures in the territory and the creation of Resialentejo - RCD (covering thirteen municipalities). The goal is to use the existing ecocenters and define new locations where there are no ecocenters.

  In this scenario the logistics and treatment will be the responsibility of Resialentejo-RCD.
- **Scenario 4 - This scenario considers the** creation of a new entity with logistics and treatment being assigned to it. In addition to the investments considered in logistics and treatment, it is also necessary to consider investments in infrastructure.

### *12.1.1 Total Investment*

For the present study, the following investments were considered for each of the scenarios considered:

- **Scenario 1 - Scenario resulting from not implementing the operation (Business as usual scenario)**

In this scenario no investment is considered.

- **Scenario 2 - Articulated management model**

Considering the APA data for the Municipalities of Baixo Alentejo region and also the data collected from the Municipalities within the development of WP1, the investments related to scenario 2 are presented below. It is foreseen, in this scenario, the need to acquire 5 vehicles and 100 containers (with the purchase of 50 containers in the first year and 50 containers in the second year).

*Table 7 - Value of Investment, per year - Scenario 2 - articulated management model (according to data from APA and WP1)*

| Years (reference period) | 2023 | 2024 | Total |
|---|---|---|---|
| **1. (Investment Component)** | | | |
| 5 vehicles | 819,500.00 € | | 819,500.00 € |
| 100 containers | 215,000.00 € | 215,000.00 € | 430,000.00 € |
| **Total Investment** | **1,034,500.00 €** | **215,000.00 €** | **1,249,500.00 €** |

Considering the current production of CDW according to Eurostat data and also taking into account INE data regarding the total amount of construction and demolition works for each of the Municipalities in the region, the investments regarding scenario 2 are presented below.

It is foreseen, in this case, the need to acquire 12 vehicles (with the acquisition of 6 vehicles in the first year and 6 vehicles in the second year) and also 110 containers (with the purchase of 50 containers in the first year and 60 containers in the second year).

*Table 8 - Value of Investment, per year - Scenario 2 - Articulated Management Model (according to Eurostat and INE data)*

| Years (reference period) | 2023 | 2024 | Total |
|---|---|---|---|
| **1. (Investment Component)** | | | |
| 12 vehicles | 983,400.00 € | 983,400.00 € | 1,966,800.00 € |
| 110 containers | 215,000.00 € | 258,000.00 € | 473,000.00 € |
| **Total Investment** | **1,198,400.00 €** | **1,241,400.00 €** | **2,439,800.00 €** |

- **Scenario 3 - Centralized management model**

Considering the APA data for the Municipalities of Baixo Alentejo region and also the data collected from the Municipalities within the development of WP1, the investments regarding scenario 3 are presented below.

It is foreseen, also for this scenario, the need to acquire 5 vehicles and 100 containers (with the purchase of 50 containers in the first year and 50 containers in the second year).

*Table 9 - Value of Investment, per year - Scenario 3 - Articulated centralized management model (according to APA and WP1 data)*

| Years (reference period) | 2023 | 2024 | Total |
|---|---|---|---|
| **1. (Investment Component)** | | | |
| 5 vehicles | 819,500.00 € | | 819,500.00 € |
| 100 containers | 215,000.00 € | 215,000.00 € | 430,000.00 € |
| Equipment | 570,000.00 € | | 570,000.00 € |
| Big Bags | 9,100.00 € | | 9,100.00 € |
| **Total Investment** | **1,613,600.00 €** | **215,000.00 €** | **1,828,600.00 €** |

Considering the current production of CDW according to Eurostat data and also taking into account INE data regarding the total amount of construction and demolition works for each of the Municipalities in the region, the investments regarding for scenario 3 are presented below.

It is also foreseen, in this scenario, the need to acquire 12 vehicles (with the acquisition of 6 vehicles in the first year and 6 vehicles in the second year) and also 110 containers (with the purchase of 50 containers in the first year and 60 containers in the second year).

*Table 10 - Value of Investment, per year - Scenario 3 - Articulated Centralized Management Model (according to Eurostat and INE data)*

| Years (reference period) | 2023 | 2024 | Total |
|---|---|---|---|
| **1. (Investment Component)** | | | |
| 12 vehicles | 983,400.00 € | 983,400.00 € | 1,966,800.00 € |
| 110 containers | 215,000.00 € | 258,000.00 € | 473,000.00 € |
| Equipment | 570,000.00 € | | 570,000.00 € |
| Big Bags | 9,100.00 € | 13,787.69 € | 22,887.69 € |
| **Total Investment** | **1,777,500.00 €** | **1,255,187.69 €** | **3,032,687.69 €** |

- **Scenario 4 - Private Management Model**

Considering the APA data for the Municipalities of Baixo Alentejo region and also the data collected from the Municipalities within the development of WP1, the investments regarding scenario 4 are presented below.

*Table 11 - Value of Investment, per year - Scenario 4 - Articulated centralized management model (according to APA and WP1 data)*

| Years (reference period) | 2023 | 2024 | Total |
|---|---|---|---|
| **1. (Investment Component)** | | | |
| 5 vehicles | 819,500.00 € | | 819,500.00 € |
| 100 containers | 215,000.00 € | 215,000.00 € | 430,000.00 € |
| Infrastructure of the storage and treatment central offices | 2,500,000.00 € | | 2,500,000.00 € |
| Equipment | 570,000.00 € | | 570,000.00 € |
| Big Bags | 9,100.00 € | | 9,100.00 € |
| **Total Investment** | **4,113,600.00 €** | **215,000.00 €** | **4,328,600.00 €** |

Considering the current production of CDW according to Eurostat data and also taking into account INE data regarding the total amount of construction and demolition works for each of the Municipalities in the region, the investments regarding scenario 4 are presented below.

*Table 12 - Value of Investment, per year - Scenario 4 - Articulated Centralized Management Model (according to Eurostat and INE data)*

| Years (reference period) | 2023 | 2024 | Total |
|---|---|---|---|
| **1. (Investment Component)** | | | |
| 12 vehicles | 983,400.00 € | 983,400.00 € | 1,966,800.00 € |
| 110 containers | 215,000.00 € | 258,000.00 € | 473,000.00 € |
| Infrastructure of the storage and treatment central offices | 2,500,000.00 € | | 2,500,000.00 € |
| Equipment | 570,000.00 € | | 570,000.00 € |
| Big Bags | 9,100.00 € | 13,787.69 € | 22,887.69 € |
| **Total Investment** | **4,277,500.00 €** | **1,255,187.69 €** | **5,532,687.69 €** |

### *8.1.2. financing*

In the preparation of this study, it was considered that the financing will be done through own capital. However, there is the possibility of this financing being covered through community funds and bank financing.

### 8.1.3 Operating Costs

For the preparation of this feasibility study, the following assumptions were considered for the projection of operating costs with the development of the project:

- **Fuel -** Fuel was calculated based on the routes taken and the frequency with which they occur. The price of the liter of diesel considered was 1.39€.
- **Maintenance and washing of vehicles -** A value of 1,500€/year was considered for the maintenance and washing of each vehicle acquired**.**
- **Maintenance and washing of containers -** A unit cost of 75€ was considered for the maintenance and washing of containers.
- **Insurance + IUC + Vehicle inspections -** A value of 1,000€/year was considered for the payment of insurance, IUC and inspections, per vehicle.
- **Personnel -** The hiring of two people per vehicle was considered (1 driver + 1 operational assistant). The annual costs per employee are as follows:
    - **Driver**: 19,238.07
    - **Operational Assistant:** 17,835.05
- **Storage:**

  Considering the APA data for the Municipalities of the Baixo Alentejo region and also the data collected from the Municipalities within the development of WP1, the storage costs of table 13 were consider.

*Table 13 - Storage cost (according to APA and WP1 data)*

| Storage | Quantity | Price/ton | Total Cost |
|---|---|---|---|
| Concrete mixtures, bricks, tiles and ceramics | 9,846 | 14.00 € | 137,848.06 € |
| Soil and stones | 712 | 2.00 € | 1,423.56 € |
| Mixed CDW | 475 | 14.00 € | 6,643.28 € |
| Bituminous mixtures | 475 | 14.00 € | 6,643.28 € |
| Concrete | 119 | 14.00 € | 1,660.82 € |
| Other (wood, glass, plastic, insulation, etc) | 237 | 98.00 € | 23,251.48 € |
| **TOTAL** | | | **177,470.48 €** |

Considering the current production of CDW according to Eurostat data and also taking into account INE data regarding the total amount of building and demolition works for each of the Municipalities in the region, the storage costs of table 14 were considered.

*Table 14 - Storage cost (according to Eurostat and INE data)*

| Storage | Quantity | Price/ton | Total Cost |
|---|---|---|---|
| Concrete mixtures, bricks, tiles and ceramics | 24,765 | 14.00 € | 346,705.94 € |
| Soil and stones | 1,790 | 2.00 € | 3,580.44 € |
| Mixed CDW | 1,193 | 14.00 € | 16,708.72 € |
| Bituminous mixtures | 1,193 | 14.00 € | 16,708.72 € |
| Concrete | 298 | 14.00 € | 4,177.18 € |
| Other (wood, glass, plastic, insulation, etc) | 597 | 98.00 € | 58,480.52 € |
| **TOTAL** | | | **446,361.52 €** |

Based on the tables presented, the following operating costs are presented:

- **Operating Costs - Scenario 2**

Considering the data resulting from APA and also the data collected within the development of WP1, the operating costs presented in table 15 were considered.

*Table 15 - Operating costs - Scenario 2 (according to APA and WP1 data)*

| Project Costs - Scenario 2 | | | | | | |
|---|---|---|---|---|---|---|
| **EUROS at constant prices** | **TOTAL** | **2023** | **2024** | **2025** | **2026** | **2027-2033** |
| **INCREMENTAL COSTS** | | | | | | |
| **FSE** | **1,325,631 €** | **63,125 €** | **126,251 €** | **126,251 €** | **126,251 €** | **883,754 €** |
| Maintenance and washing of vehicles | 78,750 € | 3,750 € | 7,500 € | 7,500 € | 7,500 € | 52,500 € |
| Maintenance and washing of containers | 78,750 € | 3,750 € | 7,500 € | 7,500 € | 7,500 € | 52,500 € |
| Fuels | 1,168,131 € | 55,625 € | 111,251 € | 111,251 € | 111,251 € | 778,754 € |
| Quantity (liters) | | 40,018 | 80,036 | 80,036 | 80,036 | 560,255 |
| Average cost per liter | | 1.39 € | 1.39 € | 1.39 € | 1.39 € | 1.39 € |
| **OTHER EXPENSES** | **55,000 €** | **5,000 €** | **5,000 €** | **5,000 €** | **5,000 €** | **35,000 €** |
| Insurance + IUC + Vehicle inspections | 55,000 € | 5,000 € | 5,000 € | 5,000 € | 5,000 € | 35,000 € |
| **PERSONNEL COSTS** | **3,892,678 €** | **185,366 €** | **370,731 €** | **370,731 €** | **370,731 €** | **2,595,118 €** |
| Number of employees | | 10 | 10 | 10 | 10 | 10 |
| Average Cost | | 18,537 € | 37,073 € | 37,073 € | 37,073 € | 259,512 € |
| **STORAGE** | **1,863,440 €** | **88,735 €** | **177,470 €** | **177,470 €** | **177,470 €** | **1,242,293 €** |
| **INCREMENTAL COSTS** | **17,563,934 €** | **342,226 €** | **679,452 €** | **679,452 €** | **679,452 €** | **4,756,166 €** |
| Update Factor | | 1.00 | 0.96 | 0.92 | 0.89 | --- |

| | | | | | | |
|---|---|---|---|---|---|---|
| **INCREMENTAL COSTS - UPDATED VALUE** | **5,853,193 €** | **342,226 €** | **653,320 €** | **628,192 €** | **604,031 €** | **3,625,425 €** |

Considering the current production of CDW according to Eurostat and INE data, the following operating costs were considered and are presented in the following table.

*Table 16 - Operating costs - Scenario 2 (according to Eurostat and INE data)*

| **Project Costs - Scenario 2** | | | | | | |
|---|---|---|---|---|---|---|
| **EUROS at constant prices** | **TOTAL** | **2023** | **2024** | **2025** | **2026** | **2027-2033** |
| **INCREMENTAL COSTS** | | | | | | |
| **FSE** | **3,052,066 €** | **145,336 €** | **290,673 €** | **290,673 €** | **290,673 €** | **2,034,711 €** |
| Maintenance and washing of vehicles | 36,750 € | 1,750 € | 3,500 € | 3,500 € | 3,500 € | 24,500 € |
| Maintenance and washing of containers | 78,750 € | 3,750 € | 7,500 € | 7,500 € | 7,500 € | 52,500 € |
| Fuels | 2,936,566 € | 139,836 € | 279,673 € | 279,673 € | 279,673 € | 1,957,711 € |
| Quantity (liters) | | 100,602 | 201,204 | 201,204 | 201,204 | 1,408,425 |
| Average cost per liter | | 1.39 € | 1.39 € | 1.39 € | 1.39 € | 1.39 € |
| **OTHER EXPENSES** | **126,000 €** | **6,000 €** | **12,000 €** | **12,000 €** | **12,000 €** | **84,000 €** |
| Insurance + IUC + Vehicle inspections | 126,000 € | 6,000 € | 12,000 € | 12,000 € | 12,000 € | 84,000 € |
| **PERSONNEL COSTS** | **9,119,988 €** | **222,439 €** | **889,755 €** | **889,755 €** | **889,755 €** | **6,228,284 €** |
| Number of employees | | 12 | 24 | 24 | 24 | 24 |
| Average Cost | | 18,537 € | 37,073 € | 37,073 € | 37,073 € | 259,512 € |
| **STORAGE** | **4,686,796 €** | **223,181 €** | **446,362 €** | **446,362 €** | **446,362 €** | **3,124,531 €** |
| **INCREMENTAL COSTS** | **16,984,850 €** | **596,956 €** | **1,638,789 €** | **1,638,789 €** | **1,638,789 €** | **11,471,526 €** |

| | | | | | | |
|---|---|---|---|---|---|---|
| Update Factor | | 1.00 | 0.96 | 0.92 | 0.89 | --- |
| **INCREMENTAL COSTS - UPDATED VALUE** | **13,889,006 €** | **596,956 €** | **1,575,759 €** | **1,515,153 €** | **1,456,878 €** | **8,744,260 €** |

In this scenario, it was considered that the activity starts in the second half of 2023, which is why some costs were estimated in this proportion.

- **Operating Costs - Scenario 3**

Considering the data resulting from APA and also the data collected within the development of WP1, the operating costs presented in table 17 were considered.

*Table 17 - Operating costs - Scenario 3 (according to APA and WP1 data)*

| **Project Costs - Scenario 2** | | | | | | |
|---|---|---|---|---|---|---|
| **EUROS at constant prices** | **TOTAL** | **2023** | **2024** | **2025** | **2026** | **2027-2033** |
| **INCREMENTAL COSTS** | | | | | | |
| **FSE** | **1,325,631 €** | **63,125 €** | **126,251 €** | **126,251 €** | **126,251 €** | **883,754 €** |
| Maintenance and washing of vehicles | 78,750 € | 3,750 € | 7,500 € | 7,500 € | 7,500 € | 52,500 € |
| Maintenance and washing of containers | 78,750 € | 3,750 € | 7,500 € | 7,500 € | 7,500 € | 52,500 € |
| Fuels | 1,168,131 € | 55,625 € | 111,251 € | 111,251 € | 111,251 € | 778,754 € |
| Quantity (liters) | | 40,018 | 80,036 | 80,036 | 80,036 | 560,255 |
| Average cost per liter | | 1.39 € | 1.39 € | 1.39 € | 1.39 € | 1.39 € |
| **OTHER EXPENSES** | **55,000 €** | **5,000 €** | **5,000 €** | **5,000 €** | **5,000 €** | **35,000 €** |
| Insurance + IUC + Vehicle inspections | 55,000 € | 5,000 € | 5,000 € | 5,000 € | 5,000 € | 35,000 € |
| **PERSONNEL COSTS** | **3,892,678 €** | **185,366 €** | **370,731 €** | **370,731 €** | **370,731 €** | **2,595,118 €** |

| | | | | | | |
|---|---|---|---|---|---|---|
| Number of employees | | 10 | 10 | 10 | 10 | 10 |
| Average Cost | | 18,537 € | 37,073 € | 37,073 € | 37,073 € | 259,512 € |
| **STORAGE** | **1,863,440 €** | **88,735 €** | **177,470 €** | **177,470 €** | **177,470 €** | **1,242,293 €** |
| **INCREMENTAL COSTS** | **17,563,934 €** | **342,226 €** | **679,452 €** | **679,452 €** | **679,452 €** | **4,756,166 €** |
| Update Factor | | 1.00 | 0.96 | 0.92 | 0.89 | --- |
| **INCREMENTAL COSTS - UPDATED VALUE** | **5,853,193 €** | **342,226 €** | **653,320 €** | **628,192 €** | **604,031 €** | **3,625,425 €** |

Considering the current production of CDW according to Eurostat and INE data, the following operating costs were considered and are presented in table 18.

*Table 18 - Operating costs - Scenario 3 (according to Eurostat and INE data)*

| **Project Costs - Scenario 2** | | | | | | |
|---|---|---|---|---|---|---|
| **EUROS at constant prices** | **TOTAL** | **2023** | **2024** | **2025** | **2026** | **2027-2033** |
| **INCREMENTAL COSTS** | | | | | | |
| **FSE** | **3,052,066 €** | **145,336 €** | **290,673 €** | **290,673 €** | **290,673 €** | **2,034,711 €** |
| Maintenance and washing of vehicles | 36,750 € | 1,750 € | 3,500 € | 3,500 € | 3,500 € | 24,500 € |
| Maintenance and washing of containers | 78,750 € | 3,750 € | 7,500 € | 7,500 € | 7,500 € | 52,500 € |
| Fuels | 2,936,566 € | 139,836 € | 279,673 € | 279,673 € | 279,673 € | 1,957,711 € |
| Quantity (liters) | | 100,602 | 201,204 | 201,204 | 201,204 | 1,408,425 |
| Average cost per liter | | 1.39 € | 1.39 € | 1.39 € | 1.39 € | 1.39 € |
| **OTHER EXPENSES** | **126,000 €** | **6,000 €** | **12,000 €** | **12,000 €** | **12,000 €** | **84,000 €** |
| Insurance + IUC + Vehicle inspections | 126,000 € | 6,000 € | 12,000 € | 12,000 € | 12,000 € | 84,000 € |
| **PERSONNEL COSTS** | **9,119,988 €** | **222,439 €** | **889,755 €** | **889,755 €** | **889,755 €** | **6,228,284 €** |

| | | | | | | |
|---|---|---|---|---|---|---|
| Number of employees | | 12 | 24 | 24 | 24 | 24 |
| Average Cost | | 18,537 € | 37,073 € | 37,073 € | 37,073 € | 259,512 € |
| **STORAGE** | **4,686,796 €** | **223,181 €** | **446,362 €** | **446,362 €** | **446,362 €** | **3,124,531 €** |
| **INCREMENTAL COSTS** | **16,984,850 €** | **596,956 €** | **1,638,789 €** | **1,638,789 €** | **1,638,789 €** | **11,471,526 €** |
| Update Factor | | 1.00 | 0.96 | 0.92 | 0.89 | --- |
| **INCREMENTAL COSTS - UPDATED VALUE** | **13,889,006 €** | **596,956 €** | **1,575,759 €** | **1,515,153 €** | **1,456,878 €** | **8,744,260 €** |

In this scenario, it was considered that the activity starts in the second half of 2023, which is why some costs were estimated in this proportion.

- **Operating Costs - Scenario 4**

Considering the data resulting from APA and also the data collected within the development of WP1, the operating costs presented in table 19 were considered.

*Table 19 - Exploration Costs - Scenario 4 (according to APA and WP1 data)*

| **Project Costs - Scenario 4** | | | | | | |
|---|---|---|---|---|---|---|
| **EUROS at constant prices** | **TOTAL** | **2023** | **2024** | **2025** | **2026** | **2027-2033** |
| **INCREMENTAL COSTS** | | | | | | |
| **FSE** | **1,262,506 €** | **- €** | **126,251 €** | **126,251 €** | **126,251 €** | **883,754 €** |
| Maintenance and washing of vehicles | 75,000 € | | 7,500 € | 7,500 € | 7,500 € | 52,500 € |
| Maintenance and washing of containers | 75,000 € | | 7,500 € | 7,500 € | 7,500 € | 52,500 € |
| Fuels | 1,112,506 € | | 111,251 € | 111,251 € | 111,251 € | 778,754 € |
| Quantity (liters) | | | 80,036 | 80,036 | 80,036 | 560,255 |
| Average cost per liter | | | 1.39 € | 1.39 € | 1.39 € | 1.39 € |

| Project Costs - Scenario 4 | | | | | | |
|---|---|---|---|---|---|---|
| **EUROS at constant prices** | **TOTAL** | **2023** | **2024** | **2025** | **2026** | **2027-2033** |
| **OTHER EXPENSES** | **50,000 €** | | **5,000 €** | **5,000 €** | **5,000 €** | **35,000 €** |
| Insurance + IUC + Vehicle inspections | 50,000 € | | 5,000 € | 5,000 € | 5,000 € | 35,000 € |
| **PERSONNEL COSTS** | **3,707,312 €** | | **370,731 €** | **370,731 €** | **370,731 €** | **2,595,118 €** |
| Number of employees | | | 10 | 10 | 10 | 10 |
| Average Cost | | | 37,073 € | 37,073 € | 37,073 € | 259,512 € |
| **STORAGE** | **1,774,705 €** | | **177,470 €** | **177,470 €** | **177,470 €** | **1,242,293 €** |
| **INCREMENTAL COSTS** | **6,794,523 €** | | **679,452 €** | **679,452 €** | **679,452 €** | **4,756,166 €** |
| Update Factor | | | 0.96 | 0.92 | 0.89 | --- |
| **INCREMENTAL COSTS - UPDATED VALUE** | **5,510,967 €** | **0.00 €** | **653,320 €** | **628,192 €** | **604,031 €** | **3,625,425 €** |

Considering the current production of CDW according to Eurostat and INE data, the following operating costs were considered and are presented in table 20.

*Table 20 - Operating costs - Scenario 4 (according to Eurostat and INE data)*

| Project Costs - Scenario 4 | | | | | | |
|---|---|---|---|---|---|---|
| **EUROS at constant prices** | **TOTAL** | **2023** | **2024** | **2025** | **2026** | **2027-2033** |
| **INCREMENTAL COSTS** | | | | | | |
| **FSE** | **2,946,730 €** | **- €** | **294,673 €** | **294,673 €** | **294,673 €** | **2,062,711 €** |
| Maintenance and washing of vehicles | 75,000 € | | 7,500 € | 7,500 € | 7,500 € | 52,500 € |
| Maintenance and washing of containers | 75,000 € | | 7,500 € | 7,500 € | 7,500 € | 52,500 € |
| Fuels | 2,796,730 € | | 279,673 € | 279,673 € | 279,673 € | 1,957,711 € |
| Quantity (liters) | | | 201,204 | 201,204 | 201,204 | 1,408,425 |

| Project Costs - Scenario 4 | | | | | | |
|---|---|---|---|---|---|---|
| **EUROS at constant prices** | **TOTAL** | **2023** | **2024** | **2025** | **2026** | **2027-2033** |
| Average cost per liter | | | 1.39 € | 1.39 € | 1.39 € | 1.39 € |
| **OTHER EXPENSES** | **120,000 €** | | **12,000 €** | **12,000 €** | **12,000 €** | **84,000 €** |
| Insurance + IUC + Vehicle inspections | 120,000 € | | 12,000 € | 12,000 € | 12,000 € | 84,000 € |
| **PERSONNEL COSTS** | **8,897,549 €** | | **889,755 €** | **889,755 €** | **889,755 €** | **6,228,284 €** |
| Number of employees | | | 24 | 24 | 24 | 24 |
| Average Cost | | | 37,073 € | 37,073 € | 37,073 € | 259,512 € |
| **STORAGE** | **4,463,615 €** | | **446,362 €** | **446,362 €** | **446,362 €** | **3,124,531 €** |
| **INCREMENTAL COSTS** | **16,427,894 €** | **0.00 €** | **1,642,789 €** | **1,642,789 €** | **1,642,789 €** | **11,499,526 €** |
| Update Factor | | | 0.96 | 0.92 | 0.89 | --- |
| **INCREMENTAL COSTS - UPDATED VALUE** | **13,324,493 €** | **0.00 €** | **1,579,605 €** | **1,518,851 €** | **1,460,434 €** | **8,765,603 €** |

Since this scenario presents a higher investment and infrastructure implementation is planned, it was considered that the activity starts in 2024, which is why no costs are presented for 2023.

### 8.1.4. operating revenues

For the present study, no operating revenues were presented. However, it is important to make an analysis regarding the cost benefit of the investment.

It is therefore important to mention the following aspects to be considered:

- Positive externalities related to job creation;
- Environmental improvement and alignment with EU directives;
- Contribution to meeting national recycling targets;
- Contribution to the reduction of waste in landfills;
- Promoting an improvement in Public Health.

## 8.2. Preliminary Comparative Analysis

In a circular economy, raw materials remain in the economic cycle, through the application of an efficient and intelligent use model, and their value is preserved by optimizing their reuse and/or recycling.

The circular economy involves much more than just recycling. It requires a fundamental rethinking of value chains and business models, product *design*, and the economics of the systems in which they are applied in order to achieve the lowest environmental impact. In order to achieve a circular model in the context of construction and demolition, it is necessary a new approach involving all actors in the value chain and with various sectors working together. From a CDW management perspective, the circular economy can have profound effects on waste management and the achievement of relevant waste policy targets and goals. In a circular economy, CDW management is not seen as a single sector, but through a systems perspective, where the analysis of interventions takes the whole system into account.

### 8.2.1 Scenario 1

The non-implementation of a CDW management system may represent future constraints, particularly with regard to the increase of illegal deposits of this type of waste, especially in rural areas of the Baixo Alentejo region and, subsequently, increased costs of waste treatment. This situation may also lead to the worsening of different types of pollution (water and soil pollution, among others).

The CDW produced in the Baixo Alentejo Region, as well as those registered in illegal dumps, are not currently being subject to adequate management and proper recovery. With the introduction of a CDW collection system, the opportunity arises to review the current operating system, as there is an urgent need to address this issue, common to all municipalities of the Baixo Alentejo.

Taking into account the territory in which the project is to be implemented, it is necessary to have a prior understanding by the entities managing the process, in order to identify and implement adequate and effective solutions.

With this purpose in mind, meetings were held with the various stakeholders, namely the thirteen municipalities in the Baixo Alentejo region, CDW management and treatment entities, and also entities responsible for implementing planning and management policies for this type of waste.

Following these meetings, data was collected regarding the current management systems, the issues and challenges faced by these management entities, and the future projections that may result from the project's implementation.

As far as the current waste management solutions are concerned, there is a wide range of solutions applied in the territory, and a lack of standardization in the responses to this problem is visible.

The challenges and constraints, in turn, are common to the entire territory and can be summarized into the following:

- Lack of availability of equipment, infrastructure and human resources essential to waste management;
- Long distances between the production sites and the waste disposal sites due to the size of the territory;
- Failure to separate CDW, which in turn leads to the contamination of CDW, thus increasing the costs of disposal and treatment;
- Existence of illegal dumping sites recorded throughout the territory covered by the project;
- Lack of standard regulations or more specific legislation for small repairs/constructions, who generate large amounts of waste, with little clarification in terms of responsibility for waste management.

The definition of the identified constraints allows the identification of commonalities among the various stakeholders, as well as the transversal lines that differ within each municipality, enabling the definition of an adequate and effective solution based on the following conclusions:

- It is essential to have intermediate locations or transfer stations in order to reduce the distances for the disposal of CDW, opting for the implementation of a proximity collection system;
- The inspection and awareness-raising of the population on this issue is a priority for the entire region, especially for small producers that don’t require licensing to carry out works;
- It is important to invest in infrastructure, equipment, materials, and human resources;
- The standardization of costs and the system is fundamental for a better understanding and application in the territory.

### 8.2.2 Scenario 2 and Scenario 3

This scenario considered the existing infrastructures in the territory and the creation of Resialentejo - RCD (covering the thirteen Municipalities).

In terms of costs, the two scenarios present the same value. It was considered that the activity starts in the second half of 2023.

The difference between Scenario 2 and Scenario 3 is in terms of the necessary investment, considering that Scenario 2 only includes the purchase of vehicles and containers, and Scenario 3 includes the purchase of big bags and other equipment.

### 8.2.3 Scenario 4

In this scenario it is planned to create an entirely new entity that covers logistics and treatment.

Scenario 4 is consequently the one that presents the highest investment, since besides vehicles, containers, big bags and other equipment, it will also be necessary to invest in infrastructure.

In terms of cost calculation, in this scenario it was considered that the activity starts in 2024 (and not in the second half of 2023 as considered in scenarios 2 and 3), and for this reason, only costs starting in that year are presented.

*Table 21 - Summary of the CDW management systems considered for the Baixo Alentejo Region.*

| Scenarios | Description | Equipment | Investment |
|---|---|---|---|
| **Scenario 1** | | | |
| Characterization of the scenario resulting from the non-implementation of the operation | This scenario considers the current situation of the thirteen municipalities of Baixo Alentejo and the consequences of not having a standard CDW management system in the territory.<br>The non-implementation of a centralized management system for CDW may represent constraints in the future, particularly with regard to the increase in illegal deposits of this type of waste, especially in rural areas of the Baixo Alentejo region and, subsequently, increased costs related to their treatment. | In scenario 1 the purchase of any equipment was not considered. | - |
| **Scenario 2** | | | |
| Articulated management model | This scenario considers that the collection of CDW is done by the operators (Resialentejo / AMCAL / AMBILITAL).<br>Ambigroup treats and disposes of the CDW received.<br>In this scenario there is articulation between local entities: entities that perform the collection (Resialentejo / AMCAL / AMBILITAL) and the entity that performs the treatment (Ambigroup). | According to the APA data for the Municipalities of Baixo Alentejo region and also data collected from the Municipalities within the development of WP1 it is considered the acquisition of:<br>• 5 vehicles;<br>• 100 containers. | According to data from APA for the Municipalities of the Baixo Alentejo region and also data collected from the Municipalities within the development of WP1, an investment of |

| Scenarios | Description | Equipment | Investment |
|---|---|---|---|
| | Alternatively, this articulated scenario represents a lower investment since the entities already have the necessary equipment for collection and treatment, namely vehicles and containers. | According to Eurostat data taking also into account INE data regarding the total of building and demolition works for each of the Municipalities, it is considered the acquisition of:<br>• 12 vehicles;<br>• 110 containers. | **1,249,500.00 euros** is required.<br>According to Eurostat data, also taking into account data from INE regarding the total amount of building and demolition works for each of the Municipalities, an investment of **2,439,800.00 euros** is required |
| **Scenario 3** | | | |
| Centralized management model | This scenario considers the establishment of a CDW management entity that covers all municipalities. The collection is done by the established entity through big bags and/or containers. The CDW is collected in each municipality and sent from the production site directly to the final destination - treatment plant (Ambigroup / other entities). | According to APA data for the Municipalities of Baixo Alentejo region and also data collected from the Municipalities within the development of WP1, the acquisition of:<br>• 5 vehicles; | According to data from APA for the Municipalities of the Baixo Alentejo region and also data collected from the Municipalities within the development of WP1, an investment of |

| Scenarios | Description | Equipment | Investment |
|---|---|---|---|
| | The solution implies investment in equipment for the collection and treatment of this type of waste. | • 100 containers;<br>• 1 excavator;<br>• 1 mobile crusher;<br>• 1 sieve;<br>• 1 loader;<br>• 1,300 big bags.<br><br>According to Eurostat data taking also into account INE data regarding the total of building and demolition works for each of the Municipalities, it is considered the acquisition of:<br><br>• 12 vehicles;<br>• 110 containers;<br>• 1 excavator;<br>• 1 mobile crusher;<br>• 1 sieve;<br>• 1 loader;<br>• 3,270 big bags. | **1,828,600.00 euros** is required.<br><br>According to Eurostat data, also taking into account data from INE regarding total building and demolition works for each of the Municipalities, an investment of **3,032,687.69 euros** is required. |
| **Scenario 4** | | | |

| Scenarios | Description | Equipment | Investment |
|---|---|---|---|
| Private Management Model | This scenario considers the introduction of a new entity, and the collection and transport of CDW will be the responsibility of this new entity.<br><br>This scenario implies a higher investment in terms of the creation/acquisition of equipment, namely in infrastructure (administrative and social buildings). This scenario also implies licensing costs for the implementation of spaces for the reception of construction and demolition waste. | According to APA data for the Municipalities of Baixo Alentejo region and also data collected from the Municipalities within the development of WP1, the acquisition of:<br><br>• 5 vehicles;<br>• 100 containers;<br>• 1 excavator;<br>• 1 mobile crusher;<br>• 1 sieve;<br>• 1 loader;<br>• Infrastructure of the storage and treatment plants;<br>• 1,300 big bags.<br><br>According to Eurostat data taking also into account INE data regarding the total of building and demolition works for each of the Municipalities, it is considered the acquisition of: | According to data from APA for the Municipalities of the Baixo Alentejo region and also data collected from the Municipalities within the development of WP1, an investment of **4,328,600.00 euros** is required<br><br>According to Eurostat data, also taking into account data from INE regarding total building and demolition works for each of the Municipalities, an investment of **5,532,687.69 Euros** is required |

| Scenarios | Description | Equipment | Investment |
|---|---|---|---|
| | | • 12 vehicles;<br>• 110 containers;<br>• 1 excavator;<br>• 1 mobile crusher;<br>• 1 sieve;<br>• 1 loader;<br>• Infrastructure of the storage and treatment plants;<br>• 3,270 big bags. | |

*Table 22 - Summary of the equipments considered in the CDW management scenarios for Baixo Alentejo Region.*

| Equipment | Scenarios | | | |
|---|---|---|---|---|
| | Scenario 1 | Scenario 2 | Scenario 3 | Scenario 4 |
| **Vehicles** | | x | x | x |
| **Containers** | | x | x | x |
| **Big Bags** | | | x | x |
| **Excavator** | | | x | x |
| **Mobile Crusher** | | | x | x |
| **Screening** | | | x | x |
| **Wheel Loaders** | | | x | x |
| **Infrastructure of the storage and treatment centers** | | | | x |

# 9. Governance

## 9.1. Entities involved

CDW that is collected and sent for treatment and recovery should be managed in a way that increases its reuse potential, and reduces its environmental impact.

The strategy now presented contemplates two levels of management, taking into consideration the entities that manage the CDW in high and low levels, as described below:

### *9.1.1 Articulated management model*

The high level entity can be described as the entity that will treat the construction and demolition waste after its collection and transportation. Using the articulated management model, the high level entities will consist of private operators currently active in the territory (i.e. Ambigroup), which will process the materials and waste received. This management model is designed to encourage the establishment of partnerships with local entities, minimizing the investments required for CDW management and promoting the use of existing infrastructure.

Regarding the low level entity, this management is ensured by the complementary entity to the current waste management, Resialentejo - RCD. Since Resialentejo, one of the current waste operators, is the entity with the largest covered area (involving eight of the thirteen municipalities of Baixo Alentejo), the possibility of this entity extending its services is considered, in the form of an additional and complementary entity, responding to the need for the management of construction and demolition waste in the territory. Low level management will therefore be the responsibility of this entity and considering the possibility of using (with the necessary adaptations) the existing infrastructures, namely the Ecocenters already existing in the territory.

### *9.1.2 Centralized management model*

The implementation of this scenario will be carried out according to the waste stream, more specifically construction and demolition waste. It is considered that high-level management is the responsibility of Resialentejo - RCD, constituted in addition to the current waste operator, and in order to cover all the municipalities of the Baixo Alentejo region with regard to the management of construction and demolition waste.

Regarding the entity responsible for the management of waste at low level, Resialentejo - RCD will also be responsible for all the logistics associated with the collection and transport of construction and demolition waste. The low level entity will thus operate throughout the Baixo Alentejo territory, standardizing the low level system with regard to CDW management.

### *9.1.3 Private management model*

The implementation of this scenario foresees the creation of a new entity for the management of construction and demolition waste, so this entity, due to its specific activity, will be responsible for the management of CDW in high and low levels.

The low level responsibilities include the collection, at the construction site or in a location determined by each Municipality, and, subsequently, the transport of waste to treatment and valorization locations, in an integrated management process.

In this scenario the constitution of a single entity, common to all municipalities of the Baixo Alentejo region, is planned, which will be responsible for the management of CDW produced in the context of the thirteen municipalities.

# 10. Conclusion

Construction and demolition waste represent one of the largest waste streams worldwide and in Europe, its production is estimated between 25 and 30% of the total amount of waste: In order to reduce the impacts of CDW in the environmental context it is important to establish the importance of circularity in the management of CDW, not only at the end-of-life phase, but covering the entire supply and value chain associated with the design of products. It should also be established the importance of reducing costs in its proper management, on site, through information and awareness of employees and the recovery of materials.

The transition to a circular economy in the management of CDW has to consider the whole life cycle of the construction activity and a cooperation of all stakeholders is necessary. This is the only way to decrease illegal dumping and reduce the production and disposal of waste in landfills.

This transition should be supported by municipal awareness and enforcement actions, reinforcing the importance of reducing illegal dumping and increasing the recovery of CDW.

In turn, establishing communication tools with local and regional stakeholders is of the utmost importance for active collaboration and ongoing relevant support.

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# 12. Attachments

## 12.1 Minutes of the stakeholder consultation

The following are the minutes of the stakeholder consultation meetings held during the month of August, in order to survey the constraints, solutions, and needs of each territory.

# Meeting minutes

**Entity:** Municipality of Aljustrel

**Date:** July 1, 2022, 15:00-16:00

**Participants:** Dr. Liliana Mendes; Dr. Elisabete Benedito; Dr. Flávia Duarte; Arch. Daniela Lages; and Eng. Pedro Sobral

**Objectives:** The consultation meeting with the Municipality of Aljustrel aimed to inform about the objectives of the project "(Des)construct for the Circular Economy", which aims to develop a regional strategy for the reuse of construction products and components, as well as the recycling of construction and demolition waste (CDW). This meeting also aimed to discuss with the Municipality how the CDW management system works, the difficulties, problems and solutions that can be adopted in the territory.

**CDW collection systems:** The Municipality has set up a system to facilitate access to waste management, however, they only receive waste from small repairs or small construction sites. The waste deposited directly on construction sites is separated by type, since there is supervision.

The Municipality charges eleven euros plus VAT per day, for a maximum of three days. After three days an additional one euro is charged per day of use of the big bags.

**Identified constraints:** The Municipality identified some constraints in the management of CDW in the territory, such as the reduced availability of equipment and human resources. Another constraint identified were the distances for transferring and forwarding of CDW and most transfers are made with mixed waste, thus increasing the costs of disposal.

## Conclusions:

- The Municipality considers it essential to have reception sites to later forward this waste;
- Making the population aware of this issue is a priority for the Municipality;
- The collection in big bags is a solution for the territory, since they facilitate waste separation;
- Transfer zones should be created in each Parish, with deposit limitations, in order to prevent illegal deposits due to the waste transport distances.

# Meeting minutes

**Entity:** Municipality of Alvito

**Date:** July 7, 2022, 15:00-16:00

**Participants:** Dr. Joana Coelho; Dr. Nuno Azougado; Dr. Flávia Duarte; Arch. Daniela Lages; Dr. Cátia Morgado; and Eng. Pedro Sobral

**Objectives:** The consultation meeting with the Municipality of Alvito aimed to inform about the objectives of the project "(Des)construct for the Circular Economy", which aims to develop a regional strategy for the reuse of construction products and components, as well as recycling of construction and demolition waste (CDW). This meeting also aimed to discuss with the Municipality how the CDW management system works, the difficulties, problems and solutions that can be adopted in the territory.

**CDW collection systems:** The Municipality has a temporary site for CDW collection and there is control of what is received by an employee. The Parishes receive the waste and forward it to the temporary collection site. Subsequently the waste that are in these locations are forwarded to AMCAL.

The Municipality and the Parishes do not charge for disposal at this temporary site.

The Municipality of Alvito also has an ecocenter in the territory.

**Identified constraints:** One of the constraints identified by the Municipality is the delivery of mixed waste, with no separation of the same, which hinders its treatment. Another constraint is the costs associated with the forwarding of CDW to AMCAL.

## Conclusions:

- The Municipality considers that it is important to invest in infrastructure in order to create a place to receive CDW;
- It is a priority for the Municipality to find efficient solutions to separate incoming waste;
- Making the population aware of this issue is a priority for the Municipality;
- The Municipality does not charge fees for receiving the waste.

# Meeting minutes

**Entity:** Municipality of Barrancos

**Date:** July 7, 2022, 15:00-16:00

**Participants:** Dr. Cláudia Costa; Dr. Flávia Duarte; Arch. Daniela Lages; Dr. Cátia Morgado; and Eng. Pedro Sobral

**Objectives:** The consultation meeting with the Municipality of Barrancos aimed to inform about the objectives of the project "(De)construct for the Circular Economy", which aims to develop a regional strategy for the reuse of construction products and components, as well as the recycling of construction and demolition waste (CDW). This meeting also aimed to discuss with the Municipality how the CDW management system works, the difficulties, problems and solutions that can be adopted in the territory.

**CDW collection systems:** Currently the Municipality is not responsible for the management of CDW, so it does not have a place to receive it. The responsibility for the collection and delivery of waste lies with the site managers or contractors.

The Municipality does not have containers at the treatment station.

The Municipality applies fines to illegal depositions, when the responsible party is identified.

**Identified constraints:** One of the constraints identified by the Municipality was the reduced availability of CDW collection and storage equipment. Another constraint is that the available budget is not sufficient for the acquisition of this equipment.

## Conclusions:

- The Municipality has sites to implement containers for CDW storage;
- Making the population aware of this issue is a priority for the Municipality.

# Meeting minutes

**Entity:** Municipality of Ourique

**Date:** July 7, 2022, 15:00-16:00

**Participants:** Dr. José Vairinhos; Dr. Flávia Duarte; Arch. Daniela Lages; Dr. Cátia Morgado; and Eng. Pedro Sobral

**Objectives:** The consultation meeting with the Municipality of Ourique aimed to inform about the objectives of the project "(De)construct for the Circular Economy", which aims to develop a regional strategy for the reuse of construction products and components, as well as recycling of construction and demolition waste (CDW). This meeting also aimed to discuss with the Municipality how the CDW management system works, the difficulties, problems and solutions that can be adopted in the territory.

**CDW collection systems:** All Parishes in the Municipality have temporary, fenced sites with 6m$^3$ containers for CDW from small construction sites. The Parishes do not apply fees for waste disposal.

The Municipality does not own collection vehicles however, it has a company contracted to collect the containers and forward them to the final destination, using its own vehicles. The disposal of CDW in the containers is the responsibility of the companies contracted for the work.

**Identified constraints:** One of the constraints identified by the Municipality is the mixing of waste which has led to high costs. Another constraint is the small number of containers for CDW production own by the Municipality.

## Conclusions:

- The Municipality intends to implement more containers, in order to promote waste separation;
- Making the population aware of this issue is a priority for the Municipality;
- In order to reduce illegal deposits, the Municipality proposes the creation of a collection system by proximity, with the distribution of big bags.

# Meeting minutes

**Entity:** Municipality of Castro Verde

**Date:** July 5, 2022, 15:00-16:00

**Participants:** Dr. Ana Luísa; Dr. António Brito; Dr. Flávia Duarte; Arch. Daniela Lages; Dr. Cátia Morgado; and Eng. Pedro Sobral

**Objectives:** The consultation meeting with the Municipality of Castro Verde aimed to inform about the objectives of the project "(De)construct for the Circular Economy", which aims to develop a regional strategy for the reuse of construction products and components, as well as recycling of construction and demolition waste (CDW). This meeting also aimed to discuss with the Municipality how the CDW management system works, the difficulties, problems and solutions that can be adopted in the territory.

**CDW collection systems:** The Municipality of Castro Verde currently carries out the municipal collection of big bags, a maximum of 3 big bags per site. The Municipality of Castro Verde does not charge for the supply of these bags.

The Parishes of the Municipality are very dispersed, so the implementation of more collection points is a priority.

**Identified constraints:** One of the constraints identified by the Municipality is that the waste collected through the big bags does not always come separated/clean. Another constraint is the reduced availability of human resources for inspection and the need for several guides (transportation, collection, temporary storage, etc.) that are the responsibility of the Municipality and make the process more difficult.

## Conclusions:

- The Municipality intends to install more collection points, in order to avoid illegal deposit of CDW;
- Making the population aware of this issue is a priority for the Municipality.

# Meeting minutes

**Entity:** Municipality of Ferreira do Alentejo

**Date:** July 5, 2022, 15:00-16:00

**Participants:** Dr. José Valente Rocha Guerra; Dr. Bruno Arvanas; Dr. Flávia Duarte; Arch. Daniela Lages; Dr. Cátia Morgado; and Eng. Pedro Sobral

**Objectives:** The consultation meeting with the Municipality of Ferreira do Alentejo aimed to inform about the objectives of the project "(De)construct for the Circular Economy", which aims to develop a regional strategy for the reuse of construction products and components, as well as recycling of construction and demolition waste (CDW). This meeting also aimed to discuss with the Municipality how the CDW management system works, the difficulties, problems and solutions that can be adopted in the territory.

**CDW collection systems:** The Municipality's CDW collection system consists of only one vehicle for CDW collection. The Municipality intends to create one or more intermediate collection sites however, these spaces must have supervision.

**Identified constraints:** One of the constraints identified by the Municipality is the reduced availability of human resources and the need to purchase collection equipment. Another constraint is that there is not a specific legislation for small repairs/works, which generate large amounts of waste.

**Conclusions:**

- The Municipality intends to install more intermediate collection points, in order to avoid illegal deposit of CDW;
- The Municipality recognizes that it is essential for collection sites to have monitoring;
- Making the population aware of this issue is a priority for the Municipality.

# Meeting minutes

**Entity:** Municipality of Almodôvar

**Date:** July 5, 2022, 15:00-16:00

**Participants:** Dr. Nelson Santos; Dr. António Bota; Dr. Flávia Duarte; Arch. Daniela Lages; Dr. Cátia Morgado; and Eng. Pedro Sobral

**Objectives:** The consultation meeting with the Municipality of Almodôvar aimed to inform about the objectives of the project "(De)construct for the Circular Economy", which aims to develop a regional strategy for the reuse of construction products and components, as well as recycling of construction and demolition waste (CDW). This meeting also aimed to discuss with the Municipality how the CDW management system works, the difficulties, problems and solutions that can be adopted in the territory.

**CDW collection systems:** The Municipality of Almodôvar currently has two collection points in two Parishes. In these locations they also receive waste from unlicensed works.

The Municipality applies a fee for the collection of bulky waste.

**Identified constraints:** One of the constraints identified by the Municipality is the reduced availability of human resources and equipment. Another constraint was the increase of illegal deposits due to the application of a collection fee. There are also constraints regarding the mixing of waste.

## Conclusions:

- The Municipality intends to implement more storage containers;
- The Municipality recognizes that it is essential to invest in transportation for collection;
- The creation of infrastructure for deposition and separation of materials, especially hazardous waste, is essential to improve the forwarding of waste to its final destination and, consequently, to reduce the associated costs;
- Making the population aware of this issue is a priority for the Municipality.

# Meeting minutes

**Entity:** Municipality of Cuba

**Date:** July 7, 2022, 11:00-12:00

**Participants:** Dr. Filipe Chora; Dr. José Borracha; Dr. Flávia Duarte; Arch. Daniela Lages; Dr. Cátia Morgado; and Eng. Pedro Sobral

**Objectives:** The consultation meeting with the Municipality of Cuba aimed to inform about the objectives of the "(De)construct for the Circular Economy" project, which aims to develop a regional strategy for the reuse of construction products and components, as well as the recycling of construction and demolition waste (CDW). This meeting also aimed to discuss with the Municipality how the CDW management system works, the difficulties, problems and solutions that can be adopted in the territory.

**CDW collection systems:** The Municipality currently collects CDW using its own vehicles, and then sends this waste to the AMCAL landfill. The Municipality uses a municipal storage for the disposal of CDW from small construction sites, and does not charge fees for this disposal.

The Parish of Faro do Alentejo has a vehicle and containers for waste collection, and charges fees for waste transportation.

**Identified constraints:** One of the constraints identified by the Municipality is the reduced availability of human resources and the mixtures of waste that have high costs. Another constraint is the costs associated with the transportation and forwarding of CDW.

## Conclusions:

- The Municipality considers it important to implement a fee for waste collection, storage and transportation, in order to lower the costs associated with this management;
- Making the population aware of this issue is a priority for the Municipality.

# Meeting minutes

**Entity:** Municipality of Vidigueira

**Date:** July 6, 2022, 15:00-16:00

**Participants:** Dr. Pedro Silva; Dr. Flávia Duarte; Arch. Daniela Lages; Dr. Cátia Morgado; and Eng. Pedro Sobral

**Objectives:** The consultation meeting with the Municipality of Vidigueira aimed to inform about the objectives of the project "(De)construct for the Circular Economy", which aims to develop a regional strategy for the reuse of construction products and components, as well as recycling of construction and demolition waste (CDW). This meeting also aimed to discuss with the Municipality how the CDW management system works, the difficulties, problems and solutions that can be adopted in the territory.

**CDW collection systems:** The Municipality currently has one reception point for quantities up to 1m$^3$ and one transfer station. The transfer station operates seven days a week. The population deposits the waste, a guide is given to them that later is taken to the City Hall to pay the fees on the deposited waste.

When the person is unable to go to the transfer station, a vehicle is available for collection. All the Parishes have a vehicle for collection.

The Municipality charges fees for the collection of CDW depending on whether the waste is mixed or not. The fee for mixed CDW is about forty-five euros per ton (45€/ton).

**Identified constraints:** One of the constraints identified by the Municipality is the lack of awareness of the population on this issue. Another constraint is the reduced supervision of collection sites and the need for investment in treatment and recycling equipment.

## Conclusions:

- The Municipality considers it is extremely important to inform the population about the market for treated and recycled products: the life cycle of the materials, where they are applied and reused;
- The Municipality recognizes that it is essential to evaluate and create a site at the ecocenter for initial sorting, in order to decrease the costs associated with waste separation;
- The Municipality recognizes the need for supervision at the collection sites;
- Making the population aware of this issue is a priority for the Municipality.

# Meeting minutes

**Entity:** Municipality of Moura

**Date:** July 8, 2022, 15:00-16:00

**Participants:** Dr. José Banha; Dr. Flávia Duarte; Arch. Daniela Lages; Dr. Cátia Morgado; and Eng. Pedro Sobral

**Objectives:** The consultation meeting with the Municipality of Moura aimed to inform about the objectives of the project "(De)construct for the Circular Economy", which aims to develop a regional strategy for the reuse of construction products and components, as well as recycling of construction and demolition waste (CDW). This meeting also aimed to discuss with the Municipality how the CDW management system works, the difficulties, problems and solutions that can be adopted in the territory.

**CDW collection systems:** The collection and management of CDW in the Municipality is contracted to a private company - Ambimoura. Currently the Municipality is creating an ecocenter, which will be managed by the Parish. This ecocenter will be a sealed location, open upon prior notification to the Parish, and where waste separation will take place on site.

**Identified constraints:** One of the constraints identified by the Municipality is the reduced collection capacity since they do not have sufficient human resources and equipment. Another constraint is the reduced supervision of collection sites.

**Conclusions:**

- The Municipality considers it is important to have standard procedures for all municipalities and a centralization of the system;
- The Municipality recognizes the need for supervision at the collection sites;
- The Municipality recognizes the need to strengthen funding for CDW treatment;
- The Municipality considers it is essential to invest in transportation for collection;
- Making the population aware of this issue is a priority for the Municipality.

# Meeting minutes

**Entity:** Municipality of Serpa

**Date:** July 8, 2022, 15:00-16:00

**Participants:** Dr. Pedro; Dr. Flávia Duarte; Arch. Daniela Lages; Dr. Cátia Morgado; and Eng. Pedro Sobral

**Objectives:** The consultation meeting with Municipality of Serpa aimed to inform about the objectives of the project "(De)construct for the Circular Economy", which aims to develop a regional strategy for the reuse of construction products and components, as well as the recycling of construction and demolition waste (CDW). This meeting also aimed to discuss with the Municipality how the CDW management system works, the difficulties, problems and solutions that can be adopted in the territory.

**CDW collection systems:** The Municipality of Serpa does not have a collection center, but has a system of big bags. The big bags are provided by the Parishes, after collection, the CDW is sent to Resialentejo.

**Identified constraints:** One of the constraints identified by the Municipality is not having collection centers. Another constraint identified by the Municipality is the lack of awareness of the population on this issue.

## Conclusions:

- The Municipality considers it is important to have a temporary disposal site;
- Making the population aware of this issue is a priority for the Municipality.

# Meeting minutes

**Entity:** Municipality of Beja

**Date:** July 14, 2022, 16:30-17:30

**Participants:** Dr. Rui Marreiros; Dr. Rita Paiva; Eng. Pedro Sobral; Dr. Flávia Duarte; Dr. Cátia Morgado; Arch. Daniela Lages

**Objectives:** The consultation meeting with the Municipality of Beja aimed to inform about the objectives of the project "(De)construct for the Circular Economy", which aims to develop a regional strategy for the reuse of construction products and components, as well as the recycling of construction and demolition waste (CDW). This meeting also aimed to discuss with the Municipality how the CDW management system works, the difficulties, problems and solutions that can be adopted in the territory.

**CDW management systems:** Currently the Municipality of Beja is a major producer of CDW. The Municipality has an Ecocenter, which is a controlled space, which they intend to expand. Two of the Parishes forward the CDW to this Ecocenter.

The Municipality provides big bags, and later performs the door-to-door collection of the same. This service has a cost of eight euros (8€) for each big bag provided.

**Identified constraints:** In the scope of the management of CDW, the problem of illegal deposits was identified, especially in the Parishes of rural areas, due to the very dispersion of the territory, with greater distances between the disposal centers. The temporary collection centers represent another constraint in that they receive all types of waste, with no separation. The Municipality also identifies the lack of awareness and training of the population, especially small producers, on this issue.

## Conclusions:

- The Municipality considers it is important to invest in infrastructure, equipment, and human resources.
- The CDW management strategy must take into consideration the system and the collection centers.
- The Municipality considers it is essential to create a wider network of waste and waste separation, complemented with an effective collection and transportation system;
- The Municipality recognizes the importance of implementing a free collection site, with a quantity limit, in order to avoid illegal deposits, since it promotes the monitoring of materials and their correct separation;
- The Municipality intends to use existing infrastructure and equipment, optimizing the system.
- The standardization of the fees to be charged among the Municipalities of Baixo Alentejo must be considered.

# Meeting minutes

**Entity:** Municipality of Mértola

**Date:** July 15, 2022, 15:00-16:00

**Participants:** Dr. Rosinda Pimenta; Eng. Pedro Sobral; Dr. Flávia Duarte; Dr. Cátia Morgado; Arch. Daniela Lages

**Objectives:** The consultation meeting with the Municipality of Mértola aimed to inform about the objectives of the project "(De)construct for the Circular Economy", which aims to develop a regional strategy for the reuse of construction products and components, as well as recycling of construction and demolition waste (CDW). This meeting also aimed to discuss with the Municipality how the CDW management system works, the difficulties, problems and solutions that can be adopted in the territory.

**CDW management systems:** Currently the Municipality of Mértola has a collection center and a free big bags system, this service works by request for private works. The Municipality does not perform the separation and reuse of materials.

**Identified constraints:** In the scope of CDW management, the problem of distances between collection sites was identified as well as the costs associated with transportation. Another constraint is related to illegal deposits, so there is a need for greater supervision and application of fines. It is also verified that the existing regulations for small construction sites are not complied with.

## Conclusions:

- The Municipality considers it is important to invest in the infrastructure, equipment, and training of contractors in terms of selective demolition.
- The Municipality considers it is essential that the management strategy takes into consideration the implementation of collection centers in the Parishes (proximity systems);
- The implementation of a Materials Bank (doors, windows, sanitary ware, etc.) should be considered for recycling and reuse of CDW in other rehabilitation contexts;
- Articulated management and communication are needed, with systems suited to the territory.

# Meeting minutes

**Entity:** APA - Portuguese Environment Agency

**Date:** July 20, 2022, 11:00-12:30

**Participants:** Dr. Mário Ramos; Dr. Joaquim Duque; Dr. Ana Carrola; Dr. Graça Martinha; Dr. Mafalda Mota; Dr. Rodrigo Gonçalves; Dr. Susana Francisco; Dr. Marisa Silva; Eng. Pedro Sobral; Dr. Flávia Duarte; Dr. Cátia Morgado; Arch. Daniela Lages

**Objectives:** The consultation meeting with APA intended to inform about the objectives of the project "(De)construct for the Circular Economy", which aims to develop a regional strategy for the reuse of construction products and components, as well as the recycling of construction and demolition waste (CDW). This meeting also aimed to debate with the Entity regulatory clauses regarding the management of CDW as well as to discuss solutions and parameters for its management.

**CDW management systems:** The Portuguese Environment Agency does not have sufficient data for the quantification of CDW produced by the Baixo Alentejo Municipalities. In order to contribute to the reuse of waste, it is necessary to implement Ecocenters to receive sorted materials and in better quality. It is also important to involve small and medium construction companies in order to incorporate recycled materials or for reuse in new works, as well as raising awareness of the initial sorting before forwarding.

The definition of the regional strategy should consider the waste hierarchy and its reuse, providing infrastructures and promoting places to receive this type of waste.

The application of fees for the management of CDW is defined by the Municipalities. In the case of hazardous waste, not all Municipalities have this facility due to the need for various certifications to manage this type of waste.

**Identified constraints:** In the scope of CDW management, constraints were identified at various levels, namely, the training and awareness of technicians, and small producers, being poorly qualified for the sorting and separation of materials that can lead to contamination. Another constraint is based on the definition of rates by the municipalities, thus there is no standardization in the fares.

## Conclusions:

- APA verifies the need to have an articulation at local level that contemplates the whole value chain, from the construction site to the reuse and/or recycling;
- APA may provide assistance for budget lines in order to fit the strategies into the funding (PP2030 Circular Economy);
- APA considers it is necessary to invest in the training and awareness of technicians and waste producers;
- The reuse of materials should be considered as one of the goals for the establishment of an inter-municipal Materials Bank, similar to what happened in Beja in 2017/2018.

# Meeting minutes

**Entity:** AMCAL - Association of Municipalities of Central Alentejo

**Date:** August 11, 2022, 15:00-16:00

**Participants:** Dr. Vitor Picado; Dr. Carlos Monteiro; Eng. Pedro sobral; Dr. Flávia Duarte; Dr. Cátia Morgado; Arch. Daniela Lages

**Objectives:** The consultation meeting with AMCAL aimed to inform about the objectives of the project "(De)construct for the Circular Economy", which aims to develop a regional strategy for the reuse of construction products and components, as well as recycling of construction and demolition waste (CDW). This meeting also aimed to debate with the Entity regulatory clauses regarding the management of CDW as well as to discuss solutions and parameters for its management.

**CDW management systems:** Currently AMCAL receives waste from three municipalities (Alvito, Cuba and Vidigueira), where three Ecocenters are located, so an integrated solution can be included.

**Identified constraints:** In the scope of CDW management, the problem of lack of clarification in terms of responsibility for CDW management in municipal regulations was identified. Another constraint identified is that operators receive mixed waste, so there should be a separation of waste before deposition. There is also the need to have an entity that manages and treats CDW throughout the territory.

## Conclusions:

- The management strategy should define a set of practical, proximity-based solutions together with a standard and clear approach in terms of municipal regulations;
- The management strategy must take into consideration public awareness and monitoring, especially in smaller producers;
- AMCAL believes that articulated management and communication is necessary, with systems suited to the territory.

# Meeting minutes

**Entity:** CCDR Alentejo - Coordination and Regional Development of the Alentejo

**Date:** August 11, 2022, 11:30-12:30

**Participants:** Dr. Rosa Onofre; Eng. Pedro sobral; Dr. Flávia Duarte; Dr. Cátia Morgado; Arch. Daniela Lages; Dr. Maria José Santana; Dr. Joaquim Colaço

**Objectives:** The consultation meeting with CCDR aimed to inform about the objectives of the project "(De)construct for the Circular Economy", which aims to develop a regional strategy for the reuse of construction products and components, as well as recycling of construction and demolition waste (CDW). This meeting also aimed to discuss with the Entity regulatory clauses regarding the management of CDW as well as to discuss solutions and parameters for its management, including funding programs for the implementation of the strategy.

**CDW and Circular Economy:** The CDW management strategy must take into account the decrease of illegal deposits in the territory of Baixo Alentejo. The strategy must contain public procurement manuals (i.e. road construction) for CDW reuse proposals, as well as concession and management manuals for office buildings and services. This strategy should also include an articulation with social entities.

The territory considers it is essential that the strategy takes into account the transition to a Circular Economy.

The CDW management strategy may encounter some obstacles in the execution of the projects due to administrative issues, namely the collection of fees.

Regarding the licenses required for CDW collection and storage centers, the APA - Portuguese Environment Agency, provides a set of documents with general rules for this type of facilities. The facilities are exempt from licensing if they comply with the rules stipulated in these documents.

## Conclusions:

- Funding programs will open application opportunities in this thematic area, so the strategy can be framed in these with the support of CCDR;
- CCDR considers of great importance the communication of the strategy for the establishment of financing lines for its implementation;
- The CDW management strategy should define the permits and/or licenses required for CDW management (collection, storage, transport, reuse, etc.).
- CCDR considers it is necessary for CDW management to include sorting of materials before they reach the collection centers.

# Meeting minutes

**Entity:** (De)construct for the Circular Economy Project Group

**Date:** September 1, 2022, 9:30-10:30

**Participants:** Dr. Mário Ramos; Dr. Filipa Ferreira; Dr. Graça Martinho; Dr. Rui Silva; Dr. Ana Catarina Lopes; Eng. Pedro Sobral; Dr. Flávia Duarte; Dr. Cátia Morgado; Arch. Daniela Lages

**Objectives:** The consultation meeting with the various entities aimed at preparing and defining the activities to be developed within the scope of the workshop to be held on September 21st and 22nd in Prague.

**Workshop:** According to the program temporarily defined, during the meeting the activities to be carried out were discussed, as well as their articulation, taking into account the number of participants.

The workshop will take place on September 21st in the afternoon (Group Collaborative Dynamics I), according to the program below:

***9:30 - 10:00 Welcome Session***

- *CIMBAL*
- *ENVIRONMENTS*

***10:00 - 11:00 Keynote Speakers - Project partners***

- *ID Norway (under confirmation)*
- *CNPCD (under confirmation)*
- *IP Portalegre (under confirmation)*
- *FCT New*

***11:00 - 12:30 Good practices in Czech Republic***

***12:30 - 14:00 Lunch***

***14:00 - 15:45 Group Collaborative Dynamics I***

***15:45 - 16:00 Coffee Break***

***16:00 - 17:30 Group Collaborative Dynamics I***

***17:30 - 17:45 Closing remarks***

## Conclusions:

- Define the materials needed to make the activities more dynamic and the strategy for interactivity among the participants;
- Develop a more targeted document for the participants with a description of the activities to be performed.


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