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(De)construct for Circular Economy

(Des)construir para a Economia Circular

WP 7 – Information, awareness and training

Activity 7.2 – Participatory actions for municipalities and construction companies

Participatory Workshop – Results from Session A

Construction and demolition waste management by *Baixo Alentejo* municipalities – constraints, solutions and training needs

Final report

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Parceiros: LNEG, NOVA SCHOOL OF SCIENCE & TECHNOLOGY, POLITÉCNICO DE PORTALEGRE, RESIALENTEJO E.I.M., Smart Waste Portugal, RDF CONSTRUÇÕES SOCIEDADE IMOBILIÁRIA, LDA., cercibeja, IDN, ENVIROS

Authors

Mário Ramos

Filipa Ferreira

Graça Martinho

Lia Vasconcelos

NOVA University of Lisbon

FCT NOVA – NOVA School of Science and Technology

Department of Environmental Sciences and Engineering

MARE – Marine and Environmental Sciences Centre

waste@NOVA Laboratory

Report reviewed by:

CIMBAL – Comunidade Intermunicipal do Baixo Alentejo.

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1. Introduction

As part of the (De)construct for Circular Economy project, promoted by CIMBAL – Comunidade Intermunicipal do *Baixo Alentejo*, the participatory workshop "Construction and demolition waste (CDW) management by *Baixo Alentejo* municipalities – constraints, solutions and training needs" was held on April 21st of 2021. This workshop was part of the work package (WP) 7 – Information, awareness and training, led by FCT NOVA (NOVA School of Science and Technology), more precisely Activity 7.2 – Participatory actions for municipalities and construction companies.

The methodology for WP 7 was previously developed by FCT NOVA, complemented with contributions from project partners (FCT NOVA, 2021). For the workshop, two specific groups were selected, namely *Baixo Alentejo* municipalities and micro and small construction companies, because specific constraints for CDW management have been identified, especially in the last decade, for these types of stakeholders (Martinho *et al.*, 2013; European Commission, 2017; Ramos & Martinho, 2017; Ramos *et al.* 2020).

This workshop with *Baixo Alentejo* municipalities is the first of three sessions scheduled to present and discuss the following specific themes:

- Session A: the current workshop, about constraints and solutions for CDW management, as well as the training needs identified by the participants;
- Session B: in articulation with WP 2 and regarding the common legal framework to be developed for *Baixo Alentejo* region, focused on CDW management and the application of the circular economy principles to the construction sector, which is expected to happen in August 2021;
- Session C: in articulation with WP 6 and concerning the creation of a regional circularity strategy for the construction sector, scheduled for January 2022.

Within WP 7, and in articulation with other WP of the project, namely with WP 3 – Materials passport, WP 4 – Pre-demolition audits, WP 5 - Model (for the reuse of construction materials and CDW recycling), and also WP 6 – Proposal for strategic action, it is intended to consult other players from the construction sector, namely: the national and regional waste management authorities (Portuguese Environment Agency and the Alentejo Regional Coordination and Development Commission, respectively), construction sector associations, regional waste management operators, among other actors previously identified, that will be validated and complemented later.

This report presents the results from the participatory activities carried out in the scope of the *Baixo Alentejo* municipalities' workshop (Session A), and is structured in the following chapters:

- Introduction (current chapter);
- Programme, workshop dynamics and participants (chapter 2);
- Results of activities (chapter 3);
- Workshop evaluation (chapter 4);
- Complementary action to the workshop (chapter 5);
- Conclusions (chapter 6).

2. Programme, workshop dynamics and participants

2.1. Programme

The participatory workshop (Session A), with *Baixo Alentejo* municipalities, took place on April 21st of 2021, by videoconference, due to Covid-19 pandemic restrictions (images of the workshop in Annex I). The programme and contents are described in Table 1. The programme was structured in two presentation components, three participatory activities and one reflection activity.

Table 1. Programme of the workshop with the municipalities, objectives and responsibilities.

Programme		Main objectives	Responsibilities in the workshop
09h30	Opening session.	– Opening session; – Contribution and importance of the involvement of *Baixo Alentejo* municipalities in the project.	CIMBAL *(promoter)*
09h45	Presentation of the FCT NOVA team and the workshop programme.	– Brief presentation of FCT NOVA team and projects regarding CDW management and participatory actions developed in the last decade; – Presentation of the workshop programme.	FCT NOVA
09h50	Presentation of WP 7 and its activities.	– WP7 framework (Information, awareness and training) in the project, as well as Activity 7.2 (Participation actions).	FCT NOVA
10h00	Expository component 1: Topics about CDW management.	– General topics about CDW management, as an introduction to Activities 1 and 2 (see list of contents in subchapter 2.2).	FCT NOVA
10h15	Activities 1 and 2 (in group).	– Activity 1: municipalities constraints regarding CDW management; – Activity 2: solutions to solve the constraints, as well as identification of the necessary resources and the advantages and disadvantages of the proposed ideas.	FCT NOVA and municipalities
11h15	Session break (and reflection activity – individual).	– Reflection activity (word cloud), to answer to the following question: "How can municipalities intervene to try to mitigate CDW illegal dumping?".	FCT NOVA and municipalities
11h30	Expository component 2: Knowledge challenges about CDW management.	– Topics about current and future knowledge challenges about CDW management, as an introduction to Activity 3 (see list of contents in subchapter 2.2).	FCT NOVA
11h45	Activity 3 (in group).	– Activity 3: training needs for municipal technicians.	FCT NOVA and municipalities
12h15	Debate.	– Debate.	FCT NOVA and municipalities
12h30	Session closure.	– Session closure.	CIMBAL and FCT NOVA

2.2. Workshop dynamics

The participatory workshop (Session A), dedicated to *Baixo Alentejo* municipalities, that took place by videoconference (due to Covid-19 pandemic restrictions), was planned and organized taking into account two main and interrelated elements, namely the presentation components and the participatory activities.

Exhibit components

In the workshop, two presentations were held: the first one about CDW management topics, introductory to Activities 1 and 2 (municipalities CDW management constraints and proposed solutions, respectively); the second concerning the CDW management knowledge challenges, introductory to Activity 3 (training needs of municipal technicians). For these the main contents are listed in Table 2.

Table 2. Contents' list of the presentation components of the workshop.

Component	Main contents list
Component 1 Topics about CDW management (introductory to Activities 1 e 2)	– The evolution of the European strategy for the sustainability promotion in the construction sector, since 2011, and the inclusion of the sector in the European Union Circular Economy Action Plan (2015 version, updated in 2020), as well as in the Leading the Transition – Portugal Action Plan for Circular Economy (2017); – Construction sector potential for the circular economy principles implementation; – The main construction sector environmental impacts (focus on material extraction, CO_2 emissions and CDW generation, in the European Union); – The CDW physical composition in Portugal, highlighting the mineral fraction; – The CDW recovery industrial plants and the facilities at a municipal level with the capacity to receive and store CDW; – CDW illegal dumping in the municipalities of *Baixo Alentejo,* Portugal, and in the municipality of *Timisoara*, Romania (presentation of the main results obtained in the monitoring work developed during March 2021, within WP 1 – Baseline situation analysis and follow-up); – The construction sector and the CDW management main challenges (focused on the size of the construction companies in Portugal, with 95% of micro and small companies; the knowledge of Portuguese construction companies regarding recycled aggregates; economic instruments as a driver for an effective CDW management; the incipient market for recycled aggregates; surveillance/supervision actions in Portugal construction sector, as well as their relationships with the available resources and the feeling of impunity).

Component	Main contents list
Component 2 Knowledge challenges about CDW management (introductory to Activity 3)	Portuguese legal framework changes regarding CDW management (transposing the guidelines of the amendment to the Waste Framework Directive[1]), that will come into force from July 1st of 2021 (*e.g.,* European target for the recovery of 70% of non-hazardous CDW, including backfilling operations, but excluding uncontaminated soils and rocks; 10% target of incorporating recycled materials in public construction works (Portugal); municipalities responsibility in the CDW management resulting from minor do-it-yourself construction and demolition activities within private households; mandatory CDW selective collection, from 2025 onwards; promotion and surveillance/supervision of selective demolition processes); – Knowledge needs perception in the selective demolition specific case (practical example: architects versus engineers); – Articulation between legal regulations with implication regarding CDW management; – The importance of an effective CDW identification and registration, according to the European List of Waste (ELW)[2], and statistics about CDW; – CDW management good practices (*e.g.,* hazardous CDW management; mandatory CDW separation on construction sites; CDW mixtures management – ELW 17 01 07 versus ELW 17 09 04; CDW sorting on construction sites and implications regarding the treatment costs reductions; standards and specifications for the use of recycled aggregates resulting from CDW).

Participatory activities

During this workshop with *Baixo Alentejo* municipalities, the following participatory activities were organized (the assessment adopted criteria will be presented more detailed together with the results analysis, in order to facilitate the understanding; in chapter 3, in general):

- Activity 1 (in group): identification of internal and external constraints for the CDW management by municipalities (specifically in subchapter 3.1);
- Activity 2 (in group): proposed solutions to address the constraints identified in Activity 1 (specifically in subchapter 3.2), complemented with:
    - Reflection activity (individual) for the suggestion of determinants factors that can eliminate or mitigate CDW illegal dumping, carried out in the workshop break (specifically in subchapter 3.3);
- Activity 3 (in group): training needs of municipal technicians (described specifically in subchapter 3.4).

To carry out the participatory activities described above, participants were asked to record their responses on specific forms, allowing one form per activity in each virtual room (participants organization in the participatory activities is described in subchapter 2.3). After the workshop, the forms regarding Activities 1, 2 and 3 were sent to the project representatives from each municipality, to provide the opportunity for the

[1] Directive 2018/851, of 30 May, amending Waste Framework Directive 2008/98/EC, of 19 November.
[2] European List of Waste (ELW): Commission Decision 2014/955/EU, of 18 December, amending Decision 2000/532/EC on the list of waste, pursuant to Directive 2008/98/EC of the European Parliament and of the Council.

participants to conclude the work they started, allowing the reception of the answers, in its final version, until April 23rd of 2021. Contributions from *Cuba* and *Vidigueira* municipalities were also received, although it was not possible to these municipalities to take part of the workshop. Nevertheless, their contributions were considered, individually, complementing the collaboration of the 13 *Baixo Alentejo* municipalities.

2.3. Organization and characterization of participants

Organization of participants in the participatory activities

This participatory workshop with *Baixo Alentejo* municipalities (Session A), was expected to take place in a face-to-face model. However, due to the restrictions of Covid-19 pandemic, it was necessary to do it online. For the organization of the workshop itself, each municipality was previously asked to gather their participants in a common physical space, considering the physical distance imposed by the security restrictions due to the Covid-19 pandemic, and to ensure a good image and sound conditions, to have a good involvement in the participatory activities

Participants were divided into (virtual) rooms, trying to maintain a relatively uniform number of participants in each room, since the number diverged from municipality to municipality, as showed in Table 3.

Table 3. Distribution of participants in the participatory workshop.

Room (virtual)	Municipalities	Number of participants	
1	*Aljustrel*	5	
2	*Almodôvar*	4	
3	*Barrancos*	4	
4	*Castro Verde*	6	
5	*Ourique*	4	
6	*Serpa*	7	
7	*Alvito*	1	3
	Ferreira do Alentejo	1	
	Moura	1	
8	*Beja*	3	5
	Mértola	2	
Total		**38**	

Participant's characterization

In the participatory workshop of *Baixo Alentejo* municipalities (Session A), 11 participated (*Aljustrel, Almodôvar, Alvito, Barrancos, Beja, Castro Verde, Ferreira do Alentejo, Mértola, Moura, Ourique* and *Serpa*). Regarding the municipalities of *Cuba* and *Vidigueira*, in the impossibility of taking part in the videoconference,

FCT NOVA subsequently sent the activities forms to be filled in. In this context, the two municipalities contributed, individually, to the results obtained for all the 13 municipalities that integrate *Baixo Alentejo* region.

Each municipality was represented by the representative assigned to the (De)construct for the Circular Economy project, as well as by other municipal technicians who expressed the interest in participating. In total, 38 technicians participated, with their main functions, in general and in proportion to the number of participants, being identified in the intervention areas categorized in Figure 1.

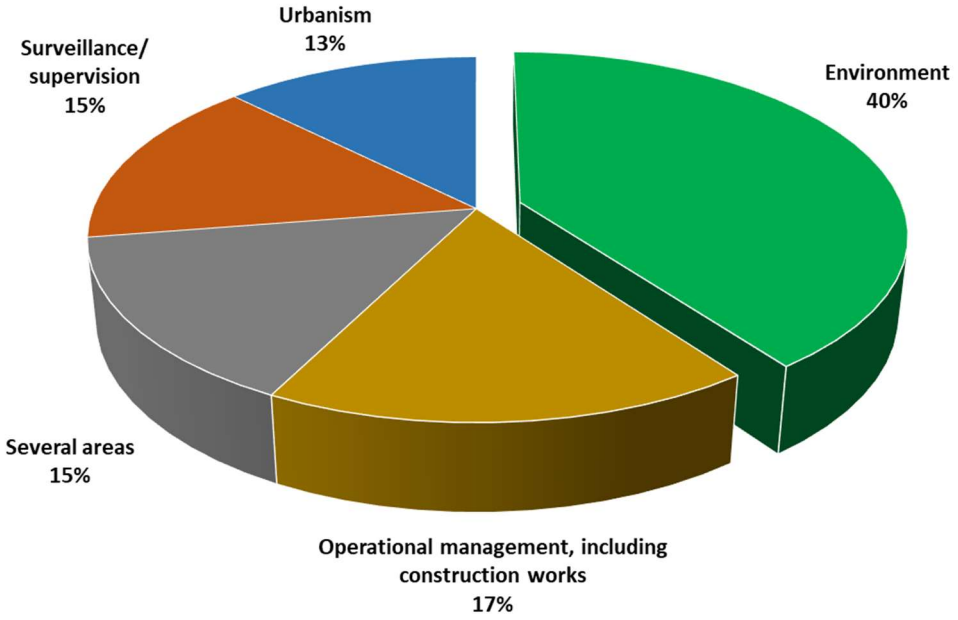


Figure 1. Intervention areas where workshop participants perform their main functions.

2.4. Complementary information

After the participatory workshop (Session A), a weblink was sent to each participant, to perform an evaluation, and to collect suggestions for improvement of the next workshops, as well as to rate their satisfaction level. Answers received until April 30th of 2021 were considered. These contributions, as well as the comments of FCT NOVA, are presented in chapter 4.

This report also presents a complementary action to the project, not initially foreseen: an e-learning course about CDW management, promoted by the project partner Smart Waste Portugal Association, directed to the *Baixo Alentejo* municipal technicians, as well as to the other project partners. This action is described in chapter 5, and it is an important contribution to start filling the knowledge gaps regarding CDW management issues.

3. Results of activities

3.1. Activity 1 – CDW management constraints

In this group activity, and after the presentation component 1 (CDW management topics – subchapter 2.1, Table 1; and subchapter 2.2, Table 2), participants were asked to identify the constraints that municipalities perceive regarding CDW management, distinguishing it into internal and external constraints.

The specific constraints identified by each municipality were organized into wider groups (themes), ordered considering the decreasing order of responses' frequency. The frequency refers to the number of times that each constraint was identified, considering the contributions from the different (virtual) rooms (subchapter 2.3, Table 3), as well as from *Cuba* and *Vidigueira* municipalities contributions.

To allow a cross-sectional and complementary analysis, solution codes were suggested to identify the constraints (subchapter 3.2), which are listed in this section.

Internal constraints

The internal constraints are those related to the municipality itself and the respective services and actions developed. The contributions shared by the municipalities are summarised and ordered in Table 4.

Within the defined themes level, the ones that have the greatest consensus are: the lack of adequate municipal CDW storage infrastructures (CDW with municipal management responsibility), the absence of effective municipal surveillance/supervision actions, as well as the lack of proper resources and equipment to carry out the correct CDW management, ranging from big-bags to vehicles and CDW crushing mobile units.

Analysing the results obtained regarding the specific internal constraints, again shows the absence of CDW municipal adequate infrastructures, followed by the absence or insufficiency of surveillance/supervision actions, as well as the scarcity of human resources allocated to this activity. It is also worth mentioning the high cost that the municipalities have with CDW management in *Baixo Alentejo* region, due to CDW transport considering the long distances to the licensed CDW final destinations locations.

Table 4. Internal constraints in CDW management identified by the municipalities.

Internal constraints (IC)				Frequency		Solutions
IC groups		**Specific IC**		**n.º**		**(sub. 0)**
IC-1	Constraints related to the lack of municipal infrastructures for CDW storing (CDW with municipal management responsibility), and/or their adaptation to the current needs.	IC-1.1	Absence of controlled/appropriate municipal sites for a correct CDW storage and management.	8	10	S-1.2
		IC-1.2	Need to adapt or organize the existing sites to carry out CDW selective separation.	1		S-1.3 S-7.1
		IC-1.3	Limitations about CDW sorting received by the municipality.	1		S-2.1

Internal constraints (IC)				Frequency		Solutions
IC groups		**Specific IC**		**n.º**		**(sub. 0)**
IC-2	Constraints related to the lack of surveillance/supervision (lack of resources and/or actions implementation), and/or their adaptation to the current needs.	IC-2.1	Absence or insufficient surveillance/supervision actions.	4	9	S-6.1 S-6.2 S-7.2
		IC-2.2	Lack of human resources to supervise.	4		S-6.1 S-6.2 S-7.2
		IC-2.3	Absence of internal procedures related to surveillance/supervision actions.	1		S-6.1
IC-3	Constraints linked to the absence of resources and/or equipment for the CDW management, and/or their adaptation to the current needs.	IC-3.1	Lack of resources and equipment (in general).	2	7	S-1.1 S-3.1 S-3.3
		IC-3.2	Lack of containers (or more containers).	2		S-3.3
		IC-3.3	Lack of resources for storing small CDW amounts (*e.g.*, big-bags).	1		S-3.3
		IC-3.4	Lack of vehicles with crane.	1		S-3.1
		IC-3.5	Lack of CDW crushing mobile units.	1		S-3.1 S-3.4
IC-4	Constraints regarding the absence of control construction activity procedures (design phase and construction phase), and/or their adaptation to the current needs.	IC-4.1	Lack of knowledge or control over construction works not subject to license and/or prior notification.	2	5	S-5.2 S-8.1
		IC-4.2	Absence of internal procedures for direct administration construction works.	1		S-2.3 S-8.1
		IC-4.3	Absence of internal procedures for licensing private construction works.	1		S-2.3 S-8.1 S-8.2
		IC-4.4	Absence of information about the CDW generation estimation regarding private construction works.	1		S-2.3 S-8.2
IC-5	Constraints related to CDW management costs, and/or their adaptation to the current needs.	IC-5.1	High costs regarding the CDW transport for licensed CDW management operators, due to the distances.	3	4	S-4.1
		IC-5.2	Mismatch in the renting cost for containers compared to the CDW management costs supported by the municipality.	1		S-4.1
IC-6	Constraints associated to the territory characteristics.	IC-6.1	Territory extension.	2	3	S-1.3
		IC-6.2	Difficulty in collecting CDW scattered over the territory.	1		S-1.1

Internal constraints (IC)				Frequency		Solutions
IC groups		Specific IC		n.º		(sub. 0)
IC-7	Constraints linked to the absence or adequacy of the regulatory framework.	IC-7.1	Lack of specific CDW management municipal regulations.	1	1	S-5.2
IC-8	Constraints associated to the lack of information, awareness and training actions.	IC-8.1	Lack of CDW management issues training for municipal workers .	1	1	S-2.2

External constraints

External constraints are those that are dependent, for example, on other entities, regulatory guidelines, among other aspects not directly related to the municipality. In Table 5 external constraints are registered and organized, by themes, according to the workshop participants answers.

Regarding the themes defined as specific external constraints, the most mentioned are: the absence of solutions in the region regarding the CDW management (waste management operators or specific solutions provided by Municipal Waste Management Systems[3]), the absence of surveillance/supervision actions carried out by external entities, the lack of awareness/knowledge of CDW producers, and the costs incurred in the management of this waste stream.

Assessing the results, from the specific external constraints perspective, it appears that the small number of waste management operators (as well as the consequent costs with CDW management), and the lack of awareness and knowledge of CDW producers (construction companies and individuals/citizens) are the predominant limitations.

Table 5. External constraints in CDW management identified by the municipalities.

External constraints (EC)				Frequency		Solutions
EC groups		Specific EC		n.º		(sub. 0)
EC-1	Constraints related to the absence of CDW management solutions in the region.	EC-1.1	Reduced number of CDW management operators in the region (long distances), with CDW management costs consistent with this reality.	6	12	S-3.4 S-7.3
		EC-1.2	Lack of CDW storage and treatment solutions (general).	4		S-1.1 S-3.3 S-3.4 S-7.3

[3] Municipal Waste Management System: an entity representing a group of municipalities, sharing waste management responsibilities, depending on a specific regulatory framework, as well considering the contracts established between the parties; they are also responsible for the waste treatment, because they are in charge of the waste management facilities (i.e., recycling, disposal, waste to energy).

External constraints (EC)				Frequency		Solutions
EC groups		Specific EC		n.º		(sub. 0)
		EC-1.3	Distance from the Municipal Waste Management Systems, for CDW delivery.	2		S-3.4 S-7.3
EC-2	Constraints associated to the absence or insufficiency of surveillance/supervision actions, carried out by external entities, and its consequences.	EC-2.1	Impunity feeling for those who do not meet the legal/operational criteria.	3	9	S-2.1
		EC-2.2	Proliferation of CDW illegal dumpsites, as a result of the lack of surveillance/ supervision actions.	3		S-1.1 S-2.1 S-3.2 S-5.1
		EC-2.3	Existence of non-legal construction companies (unfair competition).	2		S-2.1
		EC-2.4	Absence of surveillance/supervision actions by entities with this competence.	1		S-5.1
EC-3	Constraints correlated to the CDW producers lack of knowledge (construction companies and individuals/ citizens).	EC-3.1	Lack of awareness/knowledge of construction companies and individuals/ citizens about CDW management issues.	6	6	S-2.1 S-2.3
EC-4	Constraints related to the costs incurred in the CDW management.	EC-4.1	CDW transportation and disposal costs practiced in the region.	3	6	S-4.2
		EC-4.2	CDW disposal costs practiced in the region (in specific).	3		S-4.2
EC-5	Other external constraints.	EC-5.1	Lack of intervention at a political level in relation to strategies and aspects related to CDW management.	1	1	S-2.3
		EC-5.2	Restrictions regarding protected areas (*e.g.*, Natura 2000 network) and the implantation of infrastructures limitation.	1	1	S-1.1
		EC-5.3	Inexistence of a functional market for recycled aggregates.	1	1	S-2.1 S-3.4
		EC-5.4	Absence of CDW sorting on construction sites.	1	1	S-2.1

3.2. Activity 2 – solutions to improve CDW management

Subsequently to the identification by *Baixo Alentejo* municipalities of the constraints (internal and external) associated with CDW management, participants in this group activity were asked to suggest solutions to solve or mitigate the identified problems. The results are registered in Table 6.

The solutions presented were arranged by themes and organized considering the decreasing order of responses frequency. The frequency refers to the number of times that each solution was identified in each (virtual) room (see subchapter 2.3, Table 3), but also considering the contribution of *Cuba* and *Vidigueira* municipalities. The suggested solutions are also related to specific codes that represent the identified constraints (Table 4, for internal constraints, and Table 5, for external constraints), in order to allow for a cross-sectional and complementary analysis.

Regarding the level of the defined themes, the following stand out: the creation (or adaptation) of sites with municipal management responsibility for the CDW storage, the carrying out of information, awareness and training actions, and the acquisition or reinforcement of resources and equipment for the correct management of this specific waste stream.

Analysing the specific solutions, individually, the following are highlighted: the awareness of CDW producers (construction companies and individuals/citizens) to the correct CDW management, with reinforcement regarding the CDW sorting in the construction sites, as well as the creation of municipal controlled sites for CDW storage (CDW management with municipal responsibility).

Table 6. Solutions proposed by the municipalities to the constraints identified for CDW management.

Solution				State	Constraint to which it seeks to answer	Necessary resources	Advantages	Disadvantages	Frequency	
Group of solutions		Specific solutions		Ongoing, planned or unplanned	(sub. 3.1)				(n.º)	
S-1	Creation or adaption of municipal sites for CDW storage (CDW with municipal management responsibility).	S-1.1	Create controlled sites for the temporary CDW storage.	Ongoing (1 municipality); or Planned (1 municipality); or Unplanned	IC-1.1 IC-3.1 IC-6.2 EC-1.2 EC-2.2 EC-5.2	Logistics, human, materials and economic.	– Comply with legal requirements; – Proximity solution to the CDW generation sites (avoiding travel and costs); – Enhance conditions for CDW sorting in situ and the consequent reduction in costs; – Avoid CDW illegal dumping.	– Investment costs; – CDW management costs (human and materials).	6	10
		S-1.2	Create a decentralized system in each parish for temporary CDW storage.	Unplanned.	IC-1.1	Human, materials and economic.			2	
		S-1.3	Organize or adapt existing sites for CDW storage.	Planned (1 municipality).	IC-1.2				2	

Solution				State	Constraint to which it seeks to answer	Necessary resources	Advantages	Disadvantages	Frequency	
Group of solutions		Specific solutions		Ongoing, planned or unplanned	(sub. 3.1)				(n.º)	
S-2	CDW management information promotion, awareness and training.	S-2.1	Raise awareness of CDW producers (construction companies and individuals/citizens), for the correct CDW management, with reinforcement for the CDW sorting on construction sites.	Ongoing (1 municipality); or Planned (2 municipalities); or Unplanned.	IC-1.3 IC-4.2 IC-4.3 IC-4.4 EC-2.2 EC-3.1 EC-5.4	Human/technical and economic.	– Improve CDW management; – Raise awareness of external agents involved in CDW management; – Cost reduction.	– Costs associated.	7	9
		S-2.2	Raise awareness of municipal operational technicians for the correct CDW management.	Ongoing (1 municipality).	IC-8.1		– Improve CDW management; – Raise awareness of the operational staff about CDW management issues.		1	
		S-2.3	Raise awareness of political actors to the problems and challenges of CDW management.	Planned (1 municipality).	EC-5.1		– Improve strategies for CDW management.	– Costs associated; – Political cycles.	1	

Solution				State	Constraint to which it seeks to answer	Necessary resources	Advantages	Disadvantages	Frequency	
Group of solutions		Specific solutions		Ongoing, planned or unplanned	(sub. 3.1)				(n.º)	
S-3	Acquire or reinforce resources and equipment for the CDW correct management, with municipal responsibility.	S-3.1	Acquire equipment for CDW management (storage, collection, transport).	Unplanned.	IC-3.1 IC-3.2 IC-3.3 IC-3.4 IC-3.5	Materials and economic.	– Improve CDW management; – Possibility of CDW recovery.	– Investment costs.	2	7
		S-3.2	Existence/reinforcement of 8 m^3 containers, in controlled sites, in the parishes with urban characteristics.	Ongoing (1 municipality).	EC-2.2		– Comply with the legal requirements in terms of CDW management; – Answer to the needs of construction companies and individuals/citizens.	– CDW management costs (human and materials).	1	
		S-3.3	Acquire big-bags and containers.	Unplanned.	IC-3.1 IC-3.2 IC-3.3 EC-1.2		– Proximity solution, avoiding travels and costs; – Avoid CDW illegal dumping.	– Investment costs.	2	

Solution				State	Constraint to which it seeks to answer	Necessary resources	Advantages	Disadvantages	Frequency	
Group of solutions		Specific solutions		Ongoing, planned or unplanned	(sub. 3.1)				(n.º)	
		S-3.4	Acquire a CDW crushing mobile unit.	Unplanned.	IC-3.5 EC-1.1 EC-1.2 EC-1.3 EC-5.3	Human/technical, materials, and economic.	– Mobility (between parishes or municipalities); – Availability of recycled materials, for internal use (municipality) or for commercialization.		2	
S-4	Adjust the CDW management costs to the reality/constraints of the region.	S-4.1	Adjust/model costs related to the service provided.	Unplanned.	IC-5.1 IC-5.2	Economic.	– Guarantee the sustainability of the service provided for CDW management, while avoiding CDW illegal dumping.	– Demand decrease, due to the increase in cost; – Increase of CDW dumpsites.	1	4
		S-4.2	Adjust the CDW deposition costs (in specific)		EC-4.2			– Discourage CDW sorting in construction sites.	3	

Solution				State	Constraint to which it seeks to answer	Necessary resources	Advantages	Disadvantages	Frequency	
Group of solutions		Specific solutions		Ongoing, planned or unplanned	(sub. 3.1)				(n.º)	
S-5	Adapt or reinforce the legal framework related to CDW management.	S-5.1	Reinforce the appropriate legal framework for CDW management.	Unplanned.	EC-2.2 EC-2.4	Technical.	– Polluter payer principle application.	– Disrespect for the new legal guidelines.	3	4
		S-5.2	Approve the municipal regulation for CDW management.	Planned (1 municipality).	IC-7.1		– Compliance with regulatory requirements.		1	
S-6	Adjust or reinforce the resources necessary to supervise the construction activity and, consequently, CDW management.	S-6.1	Reinforce the surveillance/supervision of construction activity and, consequently, CDW management.	Ongoing (1 municipality); or Planned (1 municipality).	IC-2.1 IC-2.2 IC-2.3	Human and materials.	– Monitoring of construction activity.	– Investment costs.	2	3
		S-6.2	Increase the surveillance/supervision of private construction works, with a training/ pedagogical component, directing the actions to project owners and construction companies.	Unplanned.	IC-2.1 IC-2.2 IC-8.1	Human/technical.	– Raise awareness about CDW management; – Improvement of CDW management procedures on construction sites.		1	

Solution				State	Constraint to which it seeks to answer	Necessary resources	Advantages	Disadvantages	Frequency	
Group of solutions		Specific solutions		Ongoing, planned or unplanned	(sub. 3.1)				(n.º)	
S-7	Direct and reinforce investment with implication in the strategies and procedures related to the CDW management.	S-7.1	Increase investment in strategies or actions that enhance the improvement of CDW management.	Unplanned.	IC-1.2	Executive awareness and action.	– Improve CDW management.	– Investment costs.	1	3
		S-7.2	Create conditions for hiring human resources.		IC-2.1 IC-4.1 IC-7.1				1	
		S-7.3	Assess the feasibility of creating economic incentives that allow the installation of new CDW management operators.		EC-1.1 EC-1.2 EC-1.3		– Reduce CDW transport costs, by optimizing the distances from the waste recovery sites.		1	
S-8	Adjust or reinforce the procedural control with implications in CDW management.	S-8.1	Define internal procedures for private and direct administration construction works, as well as for surveillance/supervision actions.	Ongoing (1 municipality).	IC-4.1 IC-4.2 IC-4.3	Human/technical.	– Standardization of criteria for monitoring and validating procedures; – Fast and consistent response (pedagogical surveillance/ supervision).	– Resistance to the creation or adaptation to new procedures.	1	2
		S-8.2	Require the CDW generation estimation for building construction permits processes.	Planned (1 municipality).	IC-4.3 IC-4.4				1	

Solution				State	Constraint to which it seeks to answer	Necessary resources	Advantages	Disadvantages	Frequency	
Group of solutions		Specific solutions		Ongoing, planned or unplanned	(sub. 3.1)				(n.º)	
S-9	Enhance the market for recycled aggregates.	S-9.1	Enhance the market for recycled aggregates.	Unplanned.	EC-5.3	Logistics, human, materials and economic.	– Promote the partial replacement of raw materials with recycled aggregates.	– Resistance in relying on the use of recycled materials.	1	1

3.3. Reflection activity to mitigate CDW illegal dumping

Prior to the session break of the participatory workshop (Session A), held with *Baixo Alentejo* municipalities, the participants were asked to individually identify, using the tool available online, called Mentimeter[4], two determining factors, based on a pre-selection of factors, to answer the following question: "How should municipalities intervene in order to reduce or eliminate CDW illegal dumping?". The pre-selected factors consisted in the following list, made available in alphabetical order: penalties (in Portuguese: *coimas*), communication (in Portuguese: *comunicação*), equipment (in Portuguese: *equipamentos*), surveillance/supervision (in Portuguese: *fiscalização*), training (in Portuguese: *formação*), incentives (in Portuguese: *incentivos*), infrastructures (in Portuguese: *infraestruturas*), legislation (in Portuguese: *legislação*), and another option (in this case, specifying which one).

The answers obtained were visualized and analysed with the participants, after the workshop break. It was noted that words with divergences/errors regarding the proposed spelling have been registered (*e.g.*, infraestruturas/infra-estruturas, fiscalizacao/fiscalização, equiapmentos/equipamentos, incentivos/ incentivo). However, the visual predominance of answers (the size of the text is proportional to the frequency of responses for a given option) show the need to focus mainly on the infrastructures implementation or improvement, on the equipment availability, and on supervision actions (Figure 2), in line with what had been already identified as solutions, in general, in order to solve the general constraints of CDW management by the municipalities (see subchapter 3.2).

Figure 2. Determinants identified by municipalities to try to mitigate CDW illegal dumping.

[4] *Online tool Mentimeter*: https://www.mentimeter.com/

3.4. Activity 3 – training needs

In this activity, carried out after presentation component 2 (Knowledge challenges about CDW management – subchapter 2.2, Table 2), each municipality was asked to register their training needs, using for this purpose a 5-point Likert scale (between 1 "very unnecessary", and 5 "very necessary"), and taking into consideration different pre-selected topics, which pursued to cover the different aspects related to this specific waste stream management. The results were grouped and organised, in a training needs decreasing order of priority for the *Baixo Alentejo* region (Table 7).

The training topic that shows more consensus is related to the surveillance/supervision procedures about CDW management (4,6 average), interdependent with the two topics that appear classified immediately below, namely the good practices about CDW management on construction sites and the legal framework about this specific waste stream (both with an 4,5 average). The incorporation of recycled materials on construction sites, as well as technical specifications of the Portuguese Laboratory of Civil Engineering regarding CDW, also met consensus regarding the need for training (both with an 4,4 average). It is also interesting to note that, although apparently less demanding from the point of view of the regulatory requirements, the participants pointed out the procedural control of private works as needing more training than the procedural control of public works, where it is mandatory, for example, to elaborate and verify a specific CDW Prevention and Management Plan (4,4 and 4,2 average, respectively).

The topics showing less need for training are those related to the CDW transport and electronic waste monitoring guides (e-GAR), and the CDW composition and identification (3,3 and 3,8 average, respectively).

This hierarchy of the training needs for the municipal technicians, belonging to the public administration, will be considered jointly with CIMBAL, within the scope of the "Alentejo Regional Operational Program – Public Administration Workers Training" (in Portuguese: *Programa Operacional Regional do Alentejo – Formação dos Trabalhadores da Administração Pública*), ALT20-09-5763-FSE-000002, also evaluating possible synergies between complementary topics, in order to decide intervention methods.

Table 7. Training needs (and its hierarchy) for municipal technicians.

Training needs, measured in a Likert scale between 1 "very unnecessary", e 5 "very necessary"	
Suggested training topic	**Average**
Surveillance/supervision procedures about CDW management.	4,6
Good practices about CDW management on construction sites (*e.g.*, CDW sorting, hazardous CDW).	4,5
CDW legal framework (general).	4,5
CDW procedural control (in specific for private construction works).	4,4
Incorporation of recycled materials on construction sites (*e.g.*, recycled aggregates).	4,4
Technical specifications of the Portuguese Laboratory of Civil Engineering regarding CDW.	4,4
CDW containing asbestos legal framework.	4,2
CDW generation indicators.	4,2
Communication approaches (with applicants, technicians, others).	4,2

Training needs, measured in a Likert scale between 1 “very unnecessary”, e 5 “very necessary”	
Suggested training topic	**Average**
CDW procedural control (in specific for public construction works).	4,2
Elaboration and validation of the CDW Prevention and Management Plan (only for public works).	4,2
Reuse of construction materials onsite or in other construction works (*e.g.*, doors, tiles).	4,1
CDW final destinations (waste management operators and identifying tools).	4,0
CDW composition and identification (by European List of Waste 6 digits codes).	3,8
CDW transport and electronic waste monitoring guides (e-GAR).	3,3

4. Workshop evaluation

A weblink was also sent to each participant, in an anonymous and confidential format, regarding the workshop evaluation. Twenty responses were received (response rate of 53%), and the overall evaluation of the workshop, measured on a 7-point Likert scale (between 1 "very bad", and 7 "very good"), was 5,8 (see details of the evaluation in Figure 3).

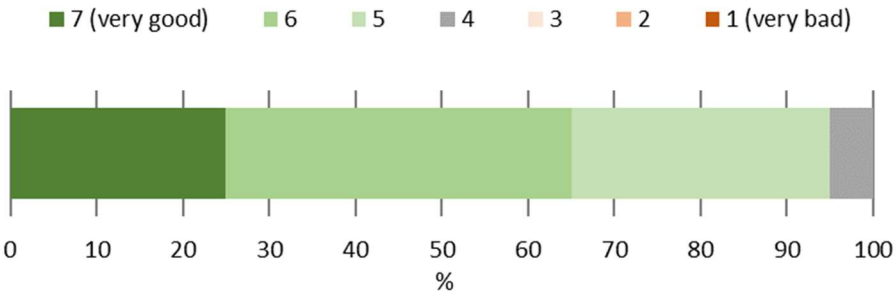


Figure 3. Overall evaluation of the workshop with the municipalities, in relation to the number of respondents.

The results are detailed below, where comments from the FCT NOVA team are also presented:

- What the participant liked more and less, according to pre-selected options, but allowing to add other choices, and accepting, in both cases, more than one answer (Table 8);
- Improvement suggestions for the next workshops (Table 9).

Table 8. Evaluation of the workshop by the respondent participants - what they liked more and less.

Topics evaluated	Answers (in relation to who answered)		Feedback from FCT NOVA
	N.º	%	
What you liked more			
Structure and organization.	13	65,0	– Maintain/reinforce in the next workshops, especially in the structure and organization and in the participatory activities, although fulfilling the approved in the project, the previously agreed with the municipal representatives of the projects, and the established programme.
Participatory activities.	12	60,0	
Utility.	10	50,0	
Contents.	5	25,0	
Rhythm/dynamics.	4	20,0	
What you liked less			
Rhythm/dynamics.	5	25,0	– This workshop was held by videoconference, due to Covid-19 restrictions, but if everything goes as planned, the next ones will be in a face-to-face model. – It is recognized that, online, the rhythm/ dynamics is compromised, as well as the time for debate, so the team will try to improve these aspects in the next workshops;
It was not possible for the workshop to be in a face-to-face model.	3	15,0	
Lack of time to debate and raise questions.	2	10,0	

Topics evaluated	Answers (in relation to who answered)		Feedback from FCT NOVA
	N.º	%	
			– Anyway, the workshop program was discussed with the municipal representatives of the project, with the general idea that more prolonged actions would not be feasible due to the technicians planned schedules.

Table 9. Evaluation of the workshop by the respondent participants – improvement suggestions.

Improvement suggestions	Answers (in relation to who answered)		Feedback from FCT NOVA
	N.º	%	
Participation of the municipal executive, because the absence of solutions is also due to the lack of political initiative.	4	20,0	– This issue was also raised in the workshop debate, and must be assured, in the foreground, by the project promoter (CIMBAL); – It was informed that the project already foresees the participation of the municipal executive, in WP 6 – Proposed strategic action, in which the results obtained in the initial phase of the project (where these activities are inserted) will serve as the basis for the strategic action to be adopted by *Baixo Alentejo* region, where the participation of the municipal executives will have great relevance; – However, FCT NOVA team suggests that the ideal time to involve municipal executives will be after the next municipal elections, but also after the identification of concrete project proposals (whit the need to discuss investment), within the scope of WP 6, which will happen mainly from the beginning 2022 forwards.
Increase the duration of the workshops.	2	10,0	– See answer to the component “what you liked less” (Table 8).

Improvement suggestions	Answers (in relation to who answered)		Feedback from FCT NOVA
	N.º	%	
Increase the frequency of the workshops.	1	5,3	– Three workshops are planned within the scope of the project, and two more will be held: in August 2021 and in January 2022 (see chapter 1 - Introduction); – In addition, activities are and will be developed jointly with *Baixo Alentejo* municipalities, during the project development, where participants can be called to get involved, or seek to get involved, by their own initiative.
To present practical solutions.	1	5,0	– The project is scheduled to run until August 2022, and at that moment it is in a preliminary stage of collecting contributions from stakeholders, including from *Baixo Alentejo* municipalities; – The workshops serve to give voice to all participants and stakeholders, to be considered in the design of practical solutions, to be discussed again with everyone, later, within the scope of the project.
Try to improve the rhythm/dynamics in the face-to-face workshops, as it is affected in the videoconference.	1	5,0	– See answer to the component "what you liked less" (Table 8).
To present the objectives of the participatory activities in advance, to allow preparatory work.	1	5,0	– FCT NOVA will consider the suggestion, taking into account the adaptation of the workshops to the face-to-face model; – However, the team show openness to receive activity forms with further adaptations, until April 23rd 2021 in articulation with the representative of the project, and several municipalities opt to send improved versions.
Sharing the contents of the workshop prior to the event.	1	5,0	

5. Complementary action to the workshop

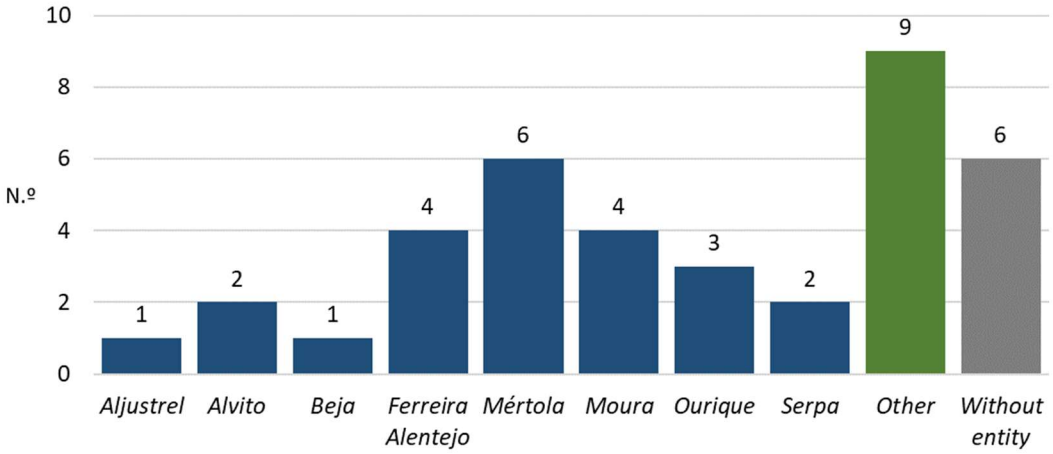
As a complement to the workshop, and although not initially foreseen, the Smart Waste Portugal Association, partner of the (De)construct for Circular Economy project, together with the Faculty of Engineering of the University of Porto, made available and free of charge, to CIMBAL (the project promoter), to *Baixo Alentejo* municipal technicians, as well as for all the project partners, an e-learning course called "Construction and Demolition Waste: Prevention and Recovery", aiming to start levelling the knowledge of the technicians in this area.

This course was developed within the scope of the Circular Construction Project – CDW Prevention (In Portuguese: *Projeto Construção Circular - Prevenção dos RCD*), whose objective was to promote education/awareness actions to agents in the value chain of this specific waste stream, in line with the circular economy principles. It is noteworthy that the course is not yet adapted to the new legal requirements of Decree-Law 102-D/2020, of December 10th, which will come into force in July 1st 2021, but it was considered that this fact was not a major weakness, for the reason that the contents of the course remain, in general, updated.

In this context, the course took place between February 15th and March 25th of 2021, had an estimated duration of eight hours, and was organized in four modules (with an evaluation activity after the conclusion of each module), including the following topics:

- Introduction to CDW;
- Processing and treatment of CDW;
- Legislative framework and quality management;
- Use of CDW on construction sites.

This initiative had the enrolment of 68 interested participants, of which 38 (corresponding to 56% of those interested) attended/completed the course. The data referring to the participants are presented in Figure 4, in which the category "without entity" includes the participants who did not register their work entity, and in the "other" category are the technicians of the project promoter and project partners.



Source: information made available to CIMBAL by Smart Waste Portugal Association, in April 2021

Figure 4. Number of technicians who completed the e-learning course on CDW management, by municipality.

6. Conclusions

Within the scope of the (De)construct for Circular Economy project, more precisely WP 7 (information, awareness and training), this report presents the results of the participatory workshop (Session A), held online on April 21st of 2021, entitled "Construction and demolition waste management by *Baixo Alentejo* municipalities – constraints, solutions and training needs".

On the participatory activities carried out with *Baixo Alentejo* municipalities, the following **main conclusions** stand out:

- Thirty-eight technicians from 11 municipalities participated in the workshop; however, the activities' forms were subsequently shared with the municipal technicians from two municipalities that were unable to participate in the videoconference, having their contributions been integrated into the results, being obtained in this way the participation of all the 13 municipalities of the *Baixo Alentejo* region;
- Regarding internal constraints about CDW management, the municipalities highlighted the lack of infrastructure for CDW storage (CDW with municipal management responsibility), the lack of effective municipal surveillance/supervision actions, as well as constraints related to the lack of resources and equipment (*e.g.,* big-bags, containers, vehicles and a CDW crushing mobile unit);
- For external constraints, the most common referred were the absence in the region of CDW treatment solutions (private operators or specific solutions by Municipal Waste Management Systems), the absence of surveillance/supervision actions by external entities, the lack of knowledge from CDW producers, and the costs incurred in the CDW management;
- For the solutions that the municipalities propose to resolve or mitigate the constraints (internal and external) identified, there is a need to create sites for CDW storage (with municipal management responsibility), to promote information, awareness and training actions, and to acquire or reinforce the resources and equipment for the correct management of this specific waste stream;
- With regard to the way in which municipalities must intervene to eliminate or mitigate CDW illegal dumping, there is again consensus on the need to invest in the implementation or improvement of infrastructures, in the provision of equipment, and in surveillance/supervision actions;
- For municipal technicians training needs, it appears that the topics that generate the most consensus are related to the surveillance/supervision of procedures about CDW, their management good practices and the respective legal framework; it is also worth mentioning the incorporation of recycled materials on construction sites, as well as the technical specifications of the Portuguese Civil Engineering Laboratory;
- In addition to the workshop, and although not foreseen at the beginning, the e-learning course "Construction and demolition waste: prevention and recovery" took place between February 15th and March 25th of 2021, promoted by the project partner Smart Waste Portugal Association, with the objective of start filling knowledge gaps, having been enrolled in this course 38 participants that have completed it.

As **next steps**, two more workshops are scheduled to be performed with *Baixo Alentejo* municipalities, and will occur until the beginning of 2022: one dedicated to the common legal framework for *Baixo Alentejo* region; the other in articulation with the proposed regional strategy for the application of the circular economy to the construction sector. In the next workshops, the project partners will be called upon to intervene more actively, contributing through content, or sharing experiences, to be agreed later.

Iceland Liechtenstein Norway grants

References

European Commission, 2017. *Resource-efficient use of mixed wastes. Improving management of construction and demolition waste*. Developed for the European Commission (Directorate-General for Environment) by the consortium led by Deloitte, in partnership with BRE, ICEDD, RPS, VTT and FCT NOVA (NOVA School of Science and Technology, NOVA University of Lisbon). Luxembourg: Publications Office of the European Union. Available at: https://ec.europa.eu/environment/system/files/2021-01/resource_efficient_uses_mixed_waste_Final_Report.pdf

FCT NOVA (2021). *Stakeholders' consultation methodology report*. WP 7 – Information, Awareness and Training. (De)construct for Circular Economy. EEA Grants Portugal. Promoted by CIMBAL - Comunidade Intermunicipal do Baixo Alentejo. Partners: LNEG – Laboratório Nacional de Engenharia e Geologia (Portugal); FCT NOVA – Nova School of Science and Technology (Portugal); IPP – Instituto Politécnico de Portalegre (Portugal); Associação Smart Waste Portugal (Portugal); RDF Construções (Portugal); Cercibeja (Portugal); International Development Norway AS (Norway); CNPCD – National Centre for Sustainable Production and Consumption (Romania); e ENVIROS s.r.o. (Czech Republic).

Martinho, G.; Ramos, M.; Pires, A.; Santos, P.; Gomes, A.; Moura, E., 2013. *Study for the sustainable design of a construction and demolition waste management model in the Northern Interior Region of Portugal* (in Portuguese: *Estudo para a Conceção Sustentável de Modelo de Gestão de Resíduos de Construção e Demolição, na Região Norte Interior de Portugal*). Developed for the Norte Portugal Regional Coordination and Development Commission by FCT NOVA – NOVA School of Science and Technology (NOVA University of Lisbon). Caparica. Available at (in Portuguese): https://www.ccdr-n.pt/noticia/servicos/estudo-da-ccdr-n-propoe-reciclagem-dos-residuos-de-construcao-e-demolicao-159

Ramos, M. & Martinho, G. (2017). *Study about the practices adopted in the construction and demolition waste management and the use of recycled materials by Portuguese construction companies* (in Portuguese: *Estudo sobre as práticas adotadas na gestão dos RCD e a utilização de materiais reciclados pelas empresas de construção portuguesas*). FCT NOVA – NOVA School of Science and Technology (NOVA University of Lisbon). Caparica.

Ramos, M.; Martinho, G.; Lorena, A.; Carvalho, S., 2020. *Action Plan for the Sustainable Management of Construction and Demolition Waste in Porto Metropolitan Area. Demonstration Projects. Guides for the Implementation of Demonstration Projects* (in Portuguese: *Plano de Ação para a Gestão Sustentável dos Resíduos de Construção e Demolição. Projetos Demonstradores. Guias para a Implementação dos Projetos Demonstradores*). Developed for Porto Metropolitan Area by FCT NOVA – NOVA School of Science and Technology (NOVA University of Lisbon) and 3drivers. Available at (in Portuguese): http://portal.amp.pt/media/documents/2020/09/21/5_PD_GuiasPD_jun2020.pdf

ANNEX I – Images from the workshop with *Baixo Alentejo* municipalities