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(De)construct for Circular Economy

(Des)construir para a Economia Circular

WP 3 – Materials Passport

Activity 3.3 – Stakeholder's consultation for the validation of the Materials Passport

WP 4 – Pre-demolition audits

Activity 4.2 – Stakeholder's consultation

Stakeholder: Building companies

The Workshop occurred on the 27th of January 2022

Final report

24th of February 2022

Operador do Programa: REPÚBLICA PORTUGUESA AMBIENTE E AÇÃO CLIMÁTICA

Promotor: cimbal COMUNIDADE INTERMUNICIPAL DO BAIXO ALENTEJO

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

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Operador do Programa: REPÚBLICA PORTUGUESA AMBIENTE E AÇÃO CLIMÁTICA

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1. Introduction

This report is part of the (De)construct for Circular Economy project, promoted by CIMBAL, and concerns the workshop held with a set of construction companies on the 27th of January 2022. The workshop is part of work package (WP) 3, activity 3.3 - Stakeholder consultation for the validation of the MP (materials passport) and of WP 4, activity 4.2 - Stakeholder consultation. The organization of the workshop was supported by FCT NOVA, as part of WP 7 - Information, Awareness and Training, and it is also part of activity 7.2 - Participatory actions for municipalities and construction companies.

As these are new tools, both material passports and pre-demolition audits raise practical implementation issues, so stakeholder consultation is essential to identify opportunities, constraints, and conditions for success, with the following objectives:

- Integrate recommendations and outcomes of stakeholder interactions into tool development wherever possible;
- Elaborate recommendations that can be included in the circularity strategy for the construction sector, which will be developed within WP6 and is an important outcome of the project.

The report presents the results of the participatory activities carried out as part of the workshop, and is structured in the following sections:

- Introduction (current section);
- Participants, programme and dynamics of the workshop (section 2);
- Results (section 3);
- Recommendations and conclusions (section 4).

2. Participants, programme and dynamics of the workshop

The companies participating in the workshop were identified through the IMPI - Institute of Public Markets for Real Estate and Construction platform, which provides information on public and private construction companies. Considering the work to be developed and the objectives of the session, companies based in the municipalities of Baixo Alentejo with license 4 or higher were selected by LNEG, as well as project development companies, and targeted employees of the following functions:

- Environmental experts;
- Health and safety technicians on site;
- Control technicians;
- Construction directors;
- Designers.

Companies were invited to participate in the workshop and collaborate in the project through e-mail communications from CIMBAL and LNEG.

Table 1 shows the companies (5) and their employees (10) participating in the workshop.

Table 1 – Companies and employees participating

Company	Type of license	Name of Participants	Function
CONDESP	6	Marta Miranda	Civil Engineer
Francisco Charneca, Lda.	5	Lara Tagarroso	Construction Director
Canudo Lança, Lda.	5	Helena Ferreira Lança Luís Lança Cristina Pires	HST Technician Construction Director Environmental Engineer
RDF Construções, Sociedade Imobiliária	5	Ricardo Santos Pedro Honório	Construction Director HST Technician
Calculaocubo	(Project company)	Jorge Almeida Pedro Vilão Patrícia Diogo	Civil Engineer / HST (Specialty Project / HST / Construction Management and Supervision) Civil Engineer / HST (Specialty Project) Eng. Civil (Specialty Project)

The session was structured in two blocks, according to the objectives for the presentation and feedback gathering from the participants about the two tools under development within WP3 - Material Passports and WP4 - Pre-demolition audit guides (table 2).

Table 2 – Workshop Programme - Companies

10.00 – 10.10	Welcome and presentation of the workshop programme and work in parallel rooms
10.10 – 10.25	**Presentation of the material passport model (plenary)**
10.25 – 10.30	Q&A
10.30 – 10.50	Working in parallel rooms • Opportunities • Constraints • Successful conditions (internal and external)
10.50 – 11.05	Presentation of the results of the work in parallel rooms (plenary)
11.05 – 11.20	**Presentation of the model of pre-demolition audits (plenary)**
11.20 – 11.25	Q&A
11.25 – 11.45	Working in parallel rooms • Opportunities • Constraints • Successful conditions (internal and external)
11.45 – 12.00	Presentation of the results of the work in parallel rooms (plenary)
12.00	Closing

After detailed presentations of each of the tools and a brief questions and answers period in plenary, the participants were distributed over three parallel rooms, moderated by one or more project partners (table 3).

Table 3 - Distribution of participants per virtual working room

Room 1	Room 2	Room 3
Marta Miranda – CONDESP	Lara Tagarroso – Francisco Charneca, Lda.	Jorge Almeida – Cálculo ao Cubo
Helena Ferreira Lança – Canudo Lança, Lda.	Ricardo Santos – RDF	Pedro Vilão – Cálculo ao Cubo
Luís Lança – Canudo Lança, Lda.	Pedro Honório – RDF	Patrícia Diogo – Cálculo ao Cubo
Cristina Pires – Canudo Lança, Lda.	Paula Duarte – LNEG	Cristina Rocha – LNEG
David Camocho – LNEG	Filipa Ferreira – FCT NOVA	Mário Ramos – FCT NOVA
Ana Gonçalves – LNEG		Rui Silva – CIMBAL
Ana Catarina Lopes – CIMBAL		

The discussion and joint reflection between the participating companies and the project partners were guided by a template, developed for the purpose and with relevant issues in the structuring of feedback collection according to the experiences and needs of the participating companies.

For both the material passport tool and the pre-demolition audit guide, the questions for discussion in sub-groups were broadly as follows:

- What are the opportunities and constraints associated with the implementation of the tool?
- What internal and external conditions are necessary for the successful application of the tool by companies?

In the working groups, the partners had the task of stimulating the debate and recording the ideas proposed by the participants.

Once again in plenary, the results of the parallel rooms were presented, and a debate was promoted among the participants.

3. Results

After the workshop, the LNEG team analyzed the ideas recorded in the templates of the three rooms and organized them by eliminating repetitions and including other comments that emerged in the plenary. To systemize the results obtained, the following dimensions associated to opportunities, constraints and conditions for success were considered:

- Technical;
- Economic;
- Environmental;
- Legal;
- Competencies needs.

3.1. Material Passport: results of the discussion in working groups

Table 4 shows the results of the discussion in working groups regarding the tool under development in WP3, materials passport.

Table 4 – Opportunities, constraints and conditions for success identified by the companies - material passport

Opportunities	
Technical	• On site, confirm the information, which may already have been filled in with the tool (you can update the Excel spreadsheet) • The tool can be part of the specifications • Help with demolition - indicate what kind of materials are in the building • During demolition it is useful to have information available on how to dismantle the building • The application of the tool is of interest in the design phase • It is useful to orientate the deconstruction process • Useful to characterize the building by age and location • Initial application in new buildings, with later application to all buildings • More applicable to public buildings • Designers would be open to such a tool • Opportunity, if the tool is easy to fill in
Economic	• Potential to reduce what goes to landfill
Environmental	• Potential to reduce landfill • Facilitates reuse of materials • Useful information for application of materials in subsequent works (reuse of materials and recycling of CDW)
Legal	• Supporting rigorous waste management
Competencies	• -
Constraints	
Technical	• Tool lifetime - built at the start of the project and must be available in 10, 15, 40 years at the time of demolition. The tool must have the durability of the life of the site. • Data can be difficult to obtain

	• Quantification of building materials can be difficult • Difficult to discriminate data for composite materials • In the future, there will always have to be a physical space where to store materials (e.g. construction site); • In new buildings it is possible to have access to the data, in refurbishments it is very complicated • Constraint in older buildings, easier for new ones, from the bills of quantities
Economic	• Cost, who will pay? Construction owner should not want to pay the designer to fill in the data • Usually, the owner is not already thinking about demolition (it is further away in time - time scale)
Environmental	• -
Legal	• It must be defined at project level, licensing
Competencies	• Should not be done by the contractor • Elaboration at architectural level • Can be done in two phases - in design and in execution
INTERNAL Successful Conditions	
Technical	• -
Economic	• Need of dedicated human resources to fill in this type of information
Legal	• Making passports compulsory
Competencies	• Training of the staff involved in the filling in • Training for the use of the tool • Internal motivation to use the tool, due to its usefulness (e.g. for waste plans)
EXTERNAL Successful Conditions	
Technical	• Increased availability of material/product data sheets (more should be available) • Improve/complete manufacturers' product sheets with data on the recyclability of materials as well as the content of recycled materials • Expect good receptivity to the tool
Economic	• -
Legal	• -
Competencies	• Designer • Mentality to use this type of tool

Regarding the **opportunities** identified and discussed in the session, in technical terms, the development of material passports is a tool that requires a vast knowledge of materials and the availability of data from suppliers of materials and components, designers, builders and owners, among others.

Considering the needs and the knowledge required, it is expected that the designers will be, potentially, the ones who can be more capable of filling the tool, since they have a knowledge of the whole process, from the definition of the solutions to be implemented to their application in the building. Thus, the tool will be more successful if it is implemented in the design phase, and this will also depend on its structure and ease of filling in.

The connection to other instruments already available in the process of construction and licensing of buildings, such as the specifications, for example, can be an added value in the application and dissemination of the tool. It can also be important in the characterization of the various elements of the building, and, in the future, it can facilitate the deconstruction process, either through the quantification and characterization of materials and components, or in the instructions for dismantling and potential reuse of these.

Being a tool of voluntary use and that implies an extra effort by the intervenient parts in the construction process, it is important to identify its advantages in the short, medium, and long term. The perception of the participants is that in an initial phase, public buildings may be the best candidates, who will have a dissemination and leadership effect by example.

The application of this tool may also, in the long term, constitute a relevant database for the classification and determination of building evolution trends.

In economic and environmental terms, although not many opportunities were observed, it was observed that through a better identification and characterization of materials and the identification of the reuse potential, there may be a positive effect associated to the decrease of materials and products sent to landfill.

From a legal point of view, the work developed will have the potential to support waste management.

In terms of **constraints**, and at a technical level, accessing the necessary data in terms of quantities, characteristics, and details in terms of sustainability can be a complex process, mainly in already constructed buildings and refurbishments.

There is also a pertinent concern related to the evolution of the tool. Since the products and components are part of a system with a long-life span, the tool will have to adapt to technological evolutions, both in terms of making data available in the long term and in its adaptation to the evolution of the construction sector.

In economic terms, there are constraints since its application requires significant costs in terms of time for the identification and characterization of the various inputs of the tool.

From the point of view of the necessary skills, it is essential to provide the professionals involved with notions of sustainability, life cycle thinking, among others, to facilitate the process and guide them to a more reliable data fulfilment.

Regarding the **conditions for success** for the implementation of material passports, internally there needs to be a dedicated workforce with the skills to identify data and enter it into the tool. There must also be internal motivation and the perception of the usefulness and added value of making the passports available.

Externally, a greater availability of data sheets and data on materials and components by manufacturers, including information on recyclability, recycled material content, among others, could facilitate the whole process.

3.2. Pre-demolition audits: results of the discussion in working groups

Table 5 presents the results of the working group discussions regarding the tool under development in WP4, pre-demolition audit guides.

Table 5 – Opportunities, constraints and conditions for success identified by companies - pre-demolition audit guide

Opportunities	
Technical	• Interest for application in buildings with heritage value • Solutions for application of the materials resulting from selective demolition • Allows interconnection between documents, especially with the demolition project • The application of the guide enables the quality of the reused products to be guaranteed to the most demanding clients.
Economic	• Tax incentives for businesses • Cost reduction due to: - Improved work planning - at the time of demolition if the guide is filled in it makes it easier to manage demolition/stages/materials on site - The guide will support and facilitate deconstruction • Promotion of the market for reuse that captivates and promotes the reintegration of materials and products in new buildings • Creating new markets for used products (example in BEJA - REMAR association) • Added value of reused material for companies
Environmental	• Environmental improvements • More environmentally friendly company • Increased reuse and recycling rate • Stop consumerism
Legal	• -
Competencies	• -
Constraints	
Technical	• Difficult application in view of the activities associated with the implementation of the guide • Lack of storage sites and conditions • Difficulty in reusing certain products
Economic	• Costs increase: ○ Time allocated to the guide ○ Cost of testing which may affect reuse ○ Recovery of materials - on site it is often easier and quicker to use a new product

	○ Hiring external auditors ○ Storage costs • Balance between the cost of repairing materials for re-use and the purchase of new materials • Storage sites cannot be mere material depots
Environmental	• -
Legal	• Bureaucracy - company/business and other impediments resulting from the application of the materials resulting from selective demolition • Constraints related to the compliance with regulatory requirements
Competencies	• Lack of experience of companies in applying the concepts/practices underlying pre-demolition audits
INTERNAL Successful Conditions	
Technical	• Ensure safety, for a more careful demolition - need for product safety sheets and use of appropriate machinery • Internal methodology for the application of the audit • Great articulation of the companies with the architecture offices
Economic	• Cost reduction (use of the company's specialized labour for the audit), maintaining independence
Legal	• -
Competencies	• Increase the motivation of companies, architects and clients through training and awareness-raising
EXTERNAL Successful Conditions	
Technical	• Lack of design for deconstruction • Definition of the scale for application of the tool • Knowledge of storage sites • Need for information and publicity of storage sites
Economic	• Tax incentives for the inclusion of recycled and reused material in new housing (private works) • Market dynamics Demand / Supply
Legal	• Requirement to apply the Guide in public works • Need for a material acceptance note for legal proof • Legal obligation at municipality level for reuse
Competencies	• Awareness of the owners of construction sites to incorporate this type of material (private works) • Existence of qualified professionals in the storage area to receive/control/manage

Regarding **opportunities**, the technical and environmental categories should be highlighted. If, on the one hand, on a technical level it is indicated that its application in buildings with heritage value is an opportunity and that, given the demand of some customers for reused products, on the other hand, the application of the guide will allow a greater quality assurance of the products removed. The application of the guide is also seen as an opportunity to indicate solutions for the application of the materials resulting from selective demolition and the reused materials can be an added value for companies, besides being an opportunity for interconnection between documents, especially with the demolition project. The solutions that come out of

the guide should be obligatorily transposed to the demolition project. On the other hand, on an environmental level, it was indicated that it is an opportunity to stop consumerism and lead to environmental improvements since it will allow an increase in the reuse and recycling rate and the implementation of a successful selective demolition with lower environmental and social impacts. For companies it is also an opportunity as they will be seen as environmentally friendly.

On an economic level it was indicated as an opportunity for the inclusion of tax incentives for companies and an opportunity for cost reduction in companies through improved work planning and the fact that the guide will support and facilitate selective demolition. It was indicated that if at the time of demolition if the guide is filled in it makes it easier to manage demolition/stages/materials. Also, the promotion of the market for reuse is seen as an opportunity, given the possibility of creating new markets for used products, which captivates and promotes the reintegration of materials and products into new buildings.

Regarding **constraints**, mainly economic constraints emerged, with the greatest concern being the increase in costs, not only due to the need for more time by the professionals allocated to the application of the guide or its control and in the recovery of the materials, but also to the need to carry out tests (the cost of the tests may condition reuse), together with storage costs, external auditors and also the concern about who pays for the repair of the materials. A balance will always have to be struck between the cost of preparing materials for reuse and the purchase of new materials, the latter remaining easy to acquire (affordable in terms of costs and quantity on the market, plus on site it is often easier and quicker to use a new product).

At the technical level, it was indicated that it is difficult to apply in view of the activities associated with the implementation of the guide, that it is difficult to reuse certain products/materials for further reuse (e.g. tiles, which usually break) and above all lack of places and conditions for storage of the materials removed from selective demolition. It was mentioned that there is a risk that the storage places could be only deposits of materials.

At the legal level, the issue of bureaucracy was indicated, which can condition the business, as well as the possibility of constraints related to compliance with regulatory requirements. At the skills level, the

companies' lack of experience in applying the concepts/practices underlying pre-demolition audits was indicated.

Regarding the **internal success conditions**, this is the technical category which had the highest number of answers. The need to ensure safety conditions on site was highlighted, and it was indicated that there should be safety sheets for all materials to be removed, as well as indications about the use of machinery for a more careful demolition. It was also indicated the need to have an internal methodology for the application of the guide and that there should be greater articulation between companies and architecture offices.

The economic category was also indicated, with emphasis on the need to reduce the costs of the companies. It was indicated that the audit could be made with recourse to the qualified labour existing in the companies, if the independence of those making the audit was not affected. Another very important issue was the need for training and awareness raising within the companies, for architects and owners, to increase the motivation for the application of the guide.

Regarding **external success conditions**, the technical and legal categories were the most indicated. The lack of design for deconstruction was indicated, as there are few products/materials that allow for non-destructive removal. The need to have a definition of the scale for application of the tool is also an important external condition. It is also to emphasize the need to have a knowledge of the storage places of the materials removed from the selective demolition, and that for that it is necessary to have an extensive publicity of those places. As noted above, the need for storage sites is a recurring issue that was raised in almost every room and in every question.

Regarding the legal aspects, there should be a requirement to apply the guide in public works, a legal obligation on the part of municipalities on reuse (i.e., in addition to the national requirement, there should also be a municipal regulation that obliges reuse) and the existence of a guide to receive the material in the storage locations that proves that all the legal requirements are being complied with.

In economic terms, the concern had to do mainly with the need to have tax incentives for the inclusion of recycled and reused material in new housing to motivate designers and building owners to incorporate this type of materials with regard to private works. If there is no demand-supply dynamic in the market, it will not be possible to achieve these objectives.

It was also highlighted the need to raise the awareness of the owners of works to incorporate this type of materials (private works) and the existence of qualified professionals at the storage site.

4. Recommendations and conclusions

This workshop proved to be a clear added value for the further development of the WP3 and 4 tools of the (De)Construct for the Circular Economy project.

4.1. Materials passport

To conclude the development of the tool, the following conclusions were drawn from the workshop:

- A balance needs to be struck between ease of completion and the desirable depth of the material passport. Strategies to deal with this issue include the division of the tool into sections that allow for a partial and gradual completion, as well as the preparation of instructions for completion with indication of sources of information (previously planned but confirmed as necessary); it is also suggested to ensure, as far as possible, compatibility between the materials passport and the specifications or other relevant project elements (including the BIM tool - Building Information Modeling);
- Since the main potential users will be designers, a test with these entities is highly desirable, although it is not foreseen in the project activities, including accounting for the costs associated with filling in the tool;
- The need to ensure compatibility and synergy between the material passport and the pre-demolition audit guides was confirmed.

As recommendations for complementary activities, namely at the level of the circularity strategy for construction in Baixo Alentejo:

- It is essential to promote training actions aimed at designers, contractors, municipal technicians, waste management bodies and other stakeholders who may be involved in some way in the preparation of material passports or benefit from the information contained therein;
- As this is a tool whose benefits will be perceived in the medium/long term, it is very important to make this potential known and discussed, distinguishing between residential and service buildings, as the latter are subject to more frequent alterations and refurbishments and, therefore, will be those that will sooner demonstrate the usefulness of passports;
- The adoption of material passporting as good practice in new public buildings is important to create critical mass and knowledge, which will facilitate its use by a wider public;
- It is worth considering how to integrate this tool in the municipal regulations on urbanization and building, or at least how its elaboration could be a recommendation;
- Since this is a tool that will boost the reuse and recycling of products and materials, it is essential that the infrastructures and mechanisms for collecting and recycling these products and materials are put in place so that the tool is not left "in a vacuum" and the benefits are not reaped;
- Dialogue with manufacturers of construction products should be promoted, so that they provide information in the product sheets that allows for quick and accurate completion of the tool;
- For the data of a material passport to exist and be accessible when later there is an intervention in the building, or even its deconstruction (which usually occurs decades after the project), it is important to

approach the Municipal Councils and the Regional Coordination Commission of Alentejo, to study this issue and possible synergies with urban planning instruments.

4.2. Pre-demolition audits

For the pre-demolition audits the following conclusions were drawn from the workshop:

- It was considered an excellent opportunity to indicate solutions for the application of materials resulting from selective demolition and lead to a higher rate of re-use of materials and deconstruction products, with obvious environmental improvements;
- As well as for the promotion of the market for reuse, given the possibility of creating new markets for used products, which captivates and promotes the reintegration of materials and products in new;
- Cost is a very indicated constraint due to the need for more professional time allocated to the application of the guide or its control and in the retrieval of materials, the cost of testing, together with storage costs, external auditors and also the concern about who pays for the preparation and retrieval of the materials;
- That the various activities required to implement the guide hinder its implementation;
- Bureaucracy can constrain business, as can the possibility of constraints related to compliance with regulatory requirements regarding the reuse of materials;
- Lack of locations and conditions for storage of the materials removed from selective demolition, was a very indicated constraint and that could make the reuse of materials unfeasible;
- The need to ensure compatibility and synergy between the materials passport and the pre-demolition audit guides as well as with other documents, especially the demolition project, has been confirmed.

As recommendations for complementary activities, namely at the level of the circularity strategy for construction in Baixo Alentejo:

- It is necessary to create storage sites in the municipalities, with a view to their reuse. For example, it was indicated that there should be places to deposit at zero cost and those who reuse would buy those materials for a symbolic value that would serve to cover the costs of those who work at the storage place;
- There must also be intensive publicity of the storage places for materials removed from selective demolition, for the knowledge of all the actors involved;
- Consideration should be given to providing added value to businesses at municipal, regional or national level as a cost reward for delivering materials for re-use to storage sites;
- Consideration should also be given to the possibility of tax incentives, in the case of private construction work, whenever recycled and reused material is included in new housing;
- The guide should be compulsory for all public works, and this obligation is seen as very important;
- Consideration should be given to the existence of a material receipt note or similar document in the storage locations, proving that all legal requirements are being complied with;
- It is essential to promote information, awareness and training actions aimed at company staff, architects, contractors, construction site owners, and other stakeholders who may be involved in some way in the implementation of the pre-demolition audit guide or benefit from the information contained therein;

- Agree with the possible obligation at national level to implement the guide, with definition of the scale for applying the tool;
- Also, at national level, there is a need for a policy that captivates and promotes the re-use of materials taken from deconstruction, as new materials are still accessible in terms of cost and quantity on the market.

Acknowledgements

The project team would like to thank all the companies and their representatives for their active and constructive collaboration in the workshop and hopes that the tools presented here and the project in general will be useful for the development of their work, in line with the principles of circularity and sustainability in the Baixo Alentejo region.

ANEX I – *Templates* of collecting feedback in the working groups

Template for the materials passport

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Templates

WP 3 – Passaporte de materiais

Grupo nº: 1
Nome das empresas:
Nome e função dos participantes/empresa (facultativo):

1. Oportunidades e Constrangimentos

Do seu ponto de vista e da sua empresa **quais as oportunidades e constrangimentos associados à elaboração de passaportes de materiais em novas obras na região do Baixo Alentejo**? Por favor, registe-as respetivamente nos campos "OPORTUNIDADES" e "CONSTRANGIMENTOS".

(P.f. acrescente linhas, se necessário)

OPORTUNIDADES	**CONSTRANGIMENTOS**	**OBSERVAÇÕES** (p. ex., tipos de obras em que a oportunidade se verifica)

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2. Condições de sucesso

Quais as **condições internas e externas** necessárias para que os **passaportes de materiais sejam úteis à sua empresa e ao impulsionamento da circularidade no setor** da construção no Baixo Alentejo?

(P.f. acrescente linhas, se necessário)

CONDIÇÕES DE SUCESSO INTERNAS (isso é, a nível da sua empresa	**CONDIÇÕES DE SUCESSO EXTERNAS** (a nível de outras entidades locais, regionais e nacionais)

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WP 4 – Auditorias de Pré-demolição

Grupo nº:1
Nome das empresas:
Nome e função dos participantes/empresa (facultativo):

1. Oportunidades e Constrangimentos

Do seu ponto de vista e da sua empresa, **quais as oportunidades e constrangimentos que considera existir para as empresas decorrentes da implementação do guia de auditorias de pré-demolição?** Por favor, registe-as respetivamente nos campos "OPORTUNIDADES" e "CONSTRANGIMENTOS".

(P.f. acrescente linhas, se necessário)

OPORTUNIDADES	**CONSTRANGIMENTOS**	**OBSERVAÇÕES** (explique porque a oportunidade se verifica)

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2. Condições de sucesso

Quais as **condições internas e externas** necessárias **para a aplicação do guia de auditoria de pré-demolição com sucesso pelas empresas**?

(P.f. acrescente linhas, se necessário)

CONDIÇÕES DE SUCESSO INTERNAS (isso é, a nível da sua empresa)	**CONDIÇÕES DE SUCESSO EXTERNAS** (a nível da envolvente, responsabilidade de outras entidades locais, regionais e nacionais)

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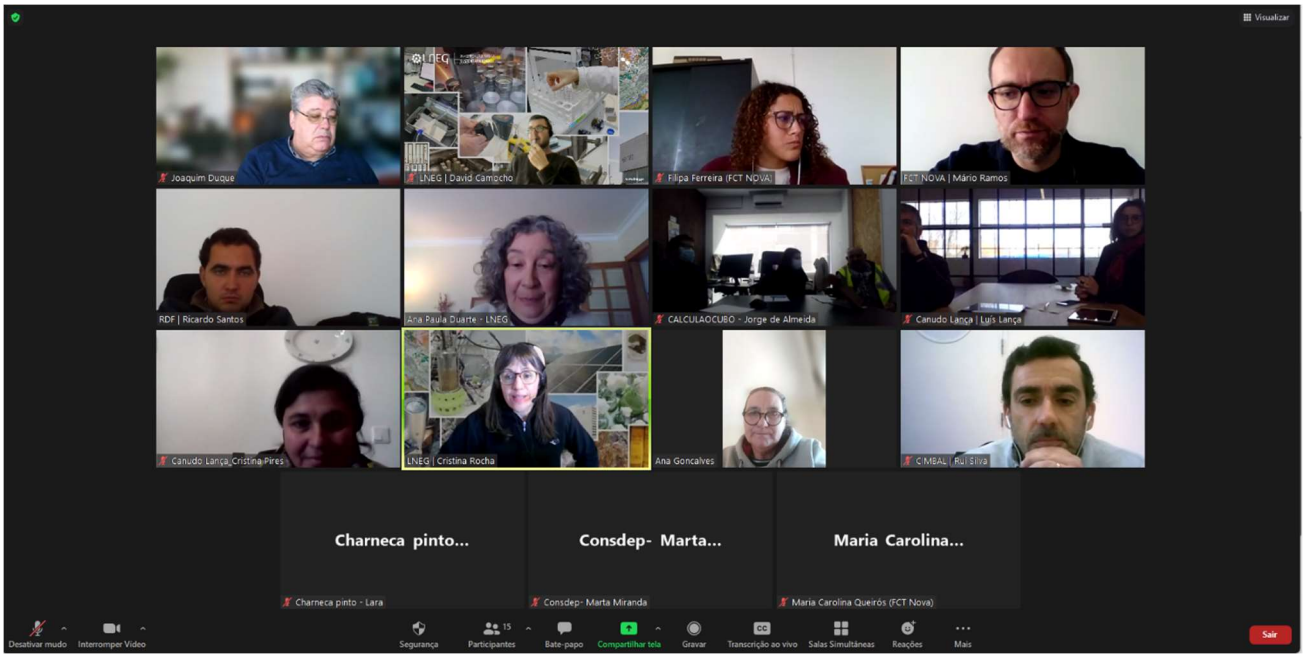
ANEX II – Photos of the session



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Parceiros: LNEG, NOVA, Politécnico de Portalegre, Smart Waste Portugal, RDF Construções, cercibeja, IDN, ENVIROS