I INTERNATIONAL WORKSHOP ON CDW DEMOLITION AUDITS SUPERVISION AND DOCUMENTATION

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INTERNATIONAL WORKSHOP ON CDW DEMOLITION AUDITS SUPERVISION AND DOCUMENTATION

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LINK:

https://www.interregeurope.eu/condereff/events/event/2501/1st-international-workshop-in-valencia/

Date: April 2nd- 3rd 2019

Lead Beneficiary: Universitat Politècnica de València

Editors: Javier Cárcel Carrasco (Project Manager); Elisa Peñalvo López (Universitat Politècnica de València)

PRESENTATION OF THE I INTERNATIONAL WORKSHOP ON CDW DEMOLITION AUDITS SUPERVISION AND DOCUMENTATION

CONDEREFF project is framed in the field of the European projects and its objectives are focused on the European problematics. The aim of this project is to promote the sustained growth through a better management of the construction and demolition waste based on the recycling, reuse and the improvement or creation of policies that make it possible.

The project will involve different organizations from Italy, Greece, Austria, Germany, Czech Republic, France and finally, as coordinator of the project, Spain with the Polytechnic University of Valencia. It is focused on the exchange of experiences and practices in order to learn about the existing procedures in the waste management field, and then be able to adopt the best techniques and procedures which will be contained in seven action plans for the improvement of regional policy instruments. In addition, one of the main lessons learned from this type of project is the strong collaboration with the different participating regions, from which strong links and synergies emerge. In this aspect, in order to promote the exchange of experiences and the management of the project, there is stated the organization of two annual interregional meetings in which all the partners should participate.

Aligning with these interregional meetings, the Polytechnic University of Valencia organized the first international workshop on pre-demolition audits, demolition activities supervision and documentation. The event took place on 2nd and 3rd of April 2019 at the Polytechnical University of Valencia facilities and it was attended by public authorities like the Councilor of Environment of Valencia and the Autonomous Secretary of housing, public works and coordination of the territory; the legal representative of an important non-profit association of selection and recycling of residues of the Construction and the Industry companies; several construction and recycling private companies; some experts from the colleges of architects or engineers, freelancers and students of the sector, among others.

The topics covered during the meeting were aligned with the identification of the main requirements established by the waste management regulation for new constructions and buildings demolition, the state of art of pre-demolition audits in several countries of Europe, the current problems as well as good practices and potential solutions. In short, to establish general mechanisms to solve technical and environmental issues as well as legal and documentary requirements.

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This document seeks to compile the information shared during the interregional workshop as well as to gather the presentations and notes of the authors in order to be disseminated and to increase public awareness. This is the result of a very useful and fruitful meeting for getting a wider vision of the matter thanks to the partners contribution.

CONDEREFF – FIRST INTERNATIONAL WORKSHOP

2nd– 3rd of April 2019

Subject: 1st day.

Meetingdate: 2nd of April 2019.

Location: Higher Technical School of Architecture (UPV), Valencia, Spain.

Partners Participants Present:

1. **UPV (Polytechnic University of Valencia):** Javier Cárcel **(Project Manager):** Elisa Peñalvo, Vicente López Jaime Linares, Consuelo Gómez, Marcos Gamella, Manuel Calabuig, Manuel Valcuende, José M. Gandía, Laura Molina, Clara Andrada.

   Stakeholder Attendees: Ivan Cabrera Fausto**,** José María Bravo, Lluís Ferrando, Helena Granados**,** Vicente Ferrer, Jorge Andújar, Ángel Moragón.

2. **AURA-EE (Auvergne-Rhône-Alpes Energie Environnement):** Mathieu Bazaud, Lucile Drancourt.

3. **RRAPK (The Regional Development Agency of the Pardubice Region):** Iva Kubatova.

   Stakeholder Attendees: Ing. Vladislav Borecký, Ing. Pavel Lopour.

4. **ENEA (Italian national agency for new technologies, energy and sustainable economic development):** Cristian Chiavetta.

   Stakeholder Attendees: Paola Altamura.

5. **Lazio Region:** Alessandro Drago, Gaetano Mandarino, Emanuele Rotili, Moreno Tuccini, Stefania Michetti, Gabriella Trufelli.

6. **Styrian Provincial Government:**Josef Mitterwallner.

   Stakeholder Attendees: Lisa Wimmer, Roland Starke, Ernst Schneeberger, Thomas Room.

7. **ISW (Institute for Structural Policy and Economic Development):** Paul Hoyer.

8. **Region of Thessaly partner (RoT)**: Stamatia Papadimopoulou, Georgios Karagkounis.

INDEX

BEST PRESENTATIONS

LECTURE I–CONDEREFF PROJECT-OVERVIEW AND VISION

Javier Cárcel Carrasco and Elisa Peñalvo López (Universitat Politècnica de València)

CONDEREFF PROJECT-OVERVIEW AND VISION

Javier Cárcel Carrasco[1] and Elisa Peñalvo López[2]

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ABSTRACT

Construction and demolition waste (CDW) are one of the heaviest and most voluminous waste streams generated in the EU, being responsible for the 33% of the total waste generated in the EU. Although there is a high potential for recycling and re-use since its components have a high resource value, only 50% of this waste is recycled. The target according to the Waste FrameworkDirective is to reach 70% waste recycled by 2020.

The initiatives of the European Commission in the field of circular economy together with the European Union protocol on construction and demolition waste management, is leading some European regions want to improve their policies in this area with views to a more sustainable growth. CONDEREFF project is born from the initiative of these countries together with the support of the program Interreg Europe.

The challenge to be faced by the regions over the 5 years project is to accelerate the improvement in the regional policies instruments, to increase confidence in the C&D recycled materials quality and strengthen public authorities' capacities in managing C&D waste, public procurement, landfill restrictions, recycling facilities, public perception, and acceptance. For this purpose, it will be needed:

- Increase capacity to implement resource efficiency policies related to C&D waste management.
- Enhance practices in managing C&D waste streamsgeneration, tracing, and processing that improve the waste identification, source separation and collection.
- Adopt proven C&D monitoring processes and regulationenforcement methods.

- Improve regional chain actors' perception and confidence in C&D waste re-use potential and value.

In order to achieve these objectives, the project partners will work and cooperate in a a series of activities organized as follows:

- A. Exchange of experience activities, which consist of:
  - A1: Joint thematic studies and analysis on regulatory frameworks comparative analysis, economic potential of C&D waste, available and required C&D recycling capacity and public perception and acceptance of C&D waste re-use potential.
  - A2: Stakeholder policy learning through 6 meeting with the regional stakeholder groups and a final regional confidence building meeting with the relevant chain actors.
  - A3: Interregional learning and capacity building through 5 international events.
  - A4: Policy improvement tools and resources through the identification of best practices and lessons learnt.
  - A5: Policy instruments impact. Each country will develop an action plan to improve the policy instruments.
- B. Communication and dissemination activities, which consist of:
  - B1 Planning of communication activities & tools
  - B2 Development of communication materials
  - B3 Implementation of communication activities
- C. Project management activities, which consist of:
  - C1 Technical coordination
  - C2 Financial management

It is expected at the end of the project aspects like lack of investment (and skills) on infrastructure, weaknesses in policy coherence, lack of efficient procurement procedures and lack of administrative capacity of public authorities to manage relevant projects and programmes have been significantly improved.


CONDEREFF
Interreg Europe
European Union
European Regional
Development Fund
Overview and vision
Javier Cárcel
Elisa Peñalvo
Construction & demolition
waste management policies for
improved resource efficiency
2nd – 3rd April, 2019 – Interregional Workshop Valencia


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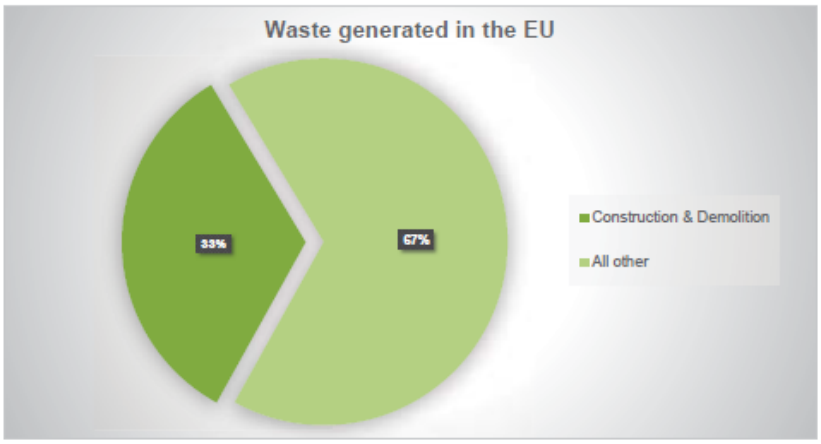
Interreg Europe
CONDEREFF
Topic & challenge
2

C&D waste



Construction & demolition waste is one of the heaviest and most voluminous waste streams generated in the EU

3

C&D waste recycled in the EU

The target is 70% by 2020
(Waste Framework Directive)

4

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European Union
European Regional Development Fund

Overview and vision

Javier Cárcel
Elisa Peñalvo

Construction & demolition waste management policies for improved resource efficiency

2nd – 3rd April, 2019 – Interregional Workshop Valencia

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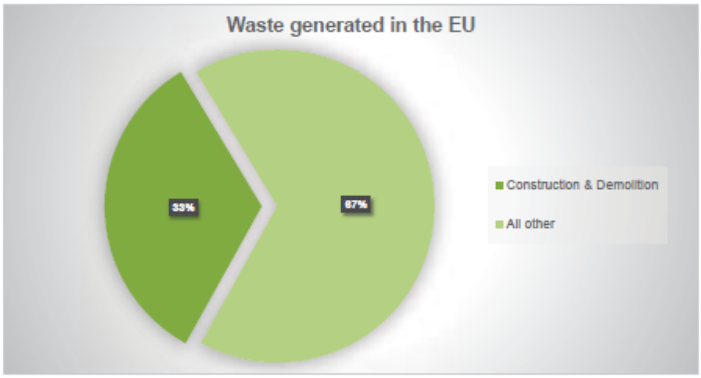
Topic & challenge

2

C&D waste



Construction & demolition waste is one of the heaviest and most voluminous waste streams generated in the EU

3

C&D waste recycled in the EU

The target is 70% by 2020
(Waste Framework Directive)

4

C&D waste is an EU priority waste stream

- There is a high potential for recycling and re-use, since its components have a high resource value.
- There is a re-use market for aggregates from C&D waste in roads, drainage and other constructions.
- Technology for the separation and recovery of C&D waste is well established, readily accessible and in general inexpensive

5

C&D waste management policy challenges

- Different approaches throughout the EU hindering cross-country comparisons & collaboration
- Lack of confidence in C&D recycled materials quality
- Policy improvements required at different levels

6

EU C&D waste management protocol

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To increase confidence in the

- C&D waste management process
- Quality of C&D recycled materials

By:

- Improved waste identification, source separation and collection
- Improved waste logistics
- Improved waste processing
- Quality management
- Appropriate policy and framework conditions

7

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Goal & objectives

8

Project goal

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- Support the integration of the EU C&D Waste Management Protocol in territorial policies
- Strengthen public authorities' capacities in managing C&D waste, public procurement, landfill restrictions, recycling facilities, public perception, and acceptance
- Transfer the lessons learnt into partners' regional policies.

9

Project objectives

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1. Increase capacity to implement resource efficiency policies related to C&D waste management.
2. Enhance practices in managing C&D waste streams generation, tracing, and processing.
3. Foster the economic potential of C&D waste re-use.
4. Adopt proven C&D monitoring processes and regulation enforcement methods.
5. Improve regional chain actors' perception and confidence in C&D waste re-use potential and value.

10

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Partners & policy instruments

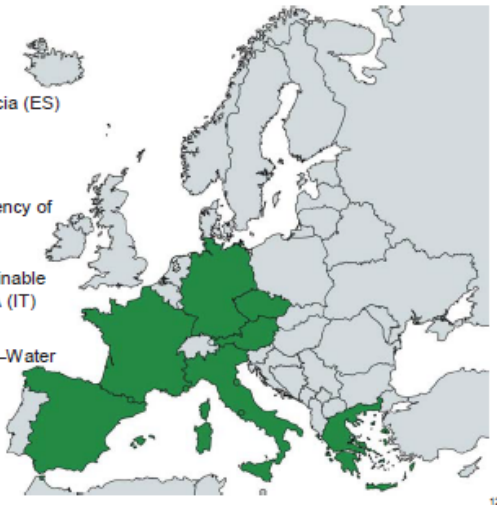
11

Partnership

CONDEREFF

8 partners from 7 countries

- Polytechnic University of Valencia (ES)
- Region of Thessaly (GR)
- Auvergne-Rhône-Alpes Energy Environment Agency (FR)
- The Regional Development Agency of the Pardubice Region (CZ)
- Italian national agency for new technologies, energy and sustainable economic development – ENEA (IT)
- Lazio Region (IT)
- Styrian Provincial Government –Water management, Resources and Sustainability (AT)
- ISW Institute for Structural Policy and Economic Development (DE)



12

Policies addressed

Country	Policy instrument	Managing Authority	Partner responsible
ES	Integral Plan of Waste by the Valencian Community (Decree 81/2013)	Valencia Regional Government	UPV
GR	Regional Operational Programme of Thessaly 2014-2020	Region of Thessaly	RoT
FR	Regional ERDF programme Rhône Alpes 2014-2020	Regional Council of Auvergne-Rhône-Alpes	AURA-EE
CZ	Operational Programme Environment	Czech Republic Ministry of the Environment	RRAPK
IT	POR Lazio ERDF	Lazio Region	LAZIO
AT	Investments in Growth and Employment Austria 2014-2020	Styrian Provincial Government	STYRIA
DE	Guidelines for the production and use of quality controlled recycling construction material in Saxony-Anhalt	Saxony Anhalt Ministry of Environment, Agriculture and Energy	ISW

13

Reasons for improving policy instruments (indicative selection)

- Revisions according to the EU C&D waste management protocol.
- Improvement of indicators that support monitoring & measurement with regards to C&D waste management.
- Improve public awareness & acceptance.
- Exploit new technologies and models to develop actions and products in this priority area.
- Promote recycling, while extracting more value from resources, and reducing the pressures on landfills and the environment.
- Include measures on selection, permits, and monitoring of C&D waste management sites and facilities.
- Promote and incentivise re-use of C&D waste.
- Support sustainable urban development.
- Adapt measures for the selection, recycling and re-use of C&D waste materials.

14

Policy improvements envisaged (indicative selection)

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- **NEW PROJECTS**
  - Awareness raising for economic operators.
  - C&D waste reduction / recollection at source.
  - Green renovation.
  - Quality control mechanisms to support C&D waste recycling.
- **IMPROVED GOVERNANCE**
  - Monitoring mechanisms, indicators and use of experts to assist evaluation of progress for funded projects.
  - Mechanism to evaluate selection, permits and monitoring of C&D waste management facilities.
  - New forms of cooperation between authorities and key actors.
- **STRUCTURAL CHANGES**
  - Include measures related to the EU C&D Waste Management Protocol

15

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Overview, activities & outputs

16

Facts and figures

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Start date: **01/06/2018**

Duration: **36 months** (implementation)
+ 24 months (monitoring)

Specific objective: **4.2 improving resource-efficient economy policies**

Budget: **1.617.955 euros**

17

Activities

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A. Exchange of experience

- A1: Joint thematic studies and analysis
- A2: Stakeholder policy learning
- A3: Interregional learning and capacity building
- A4: Policy improvement tools and resources
- A5: Policy instruments impact

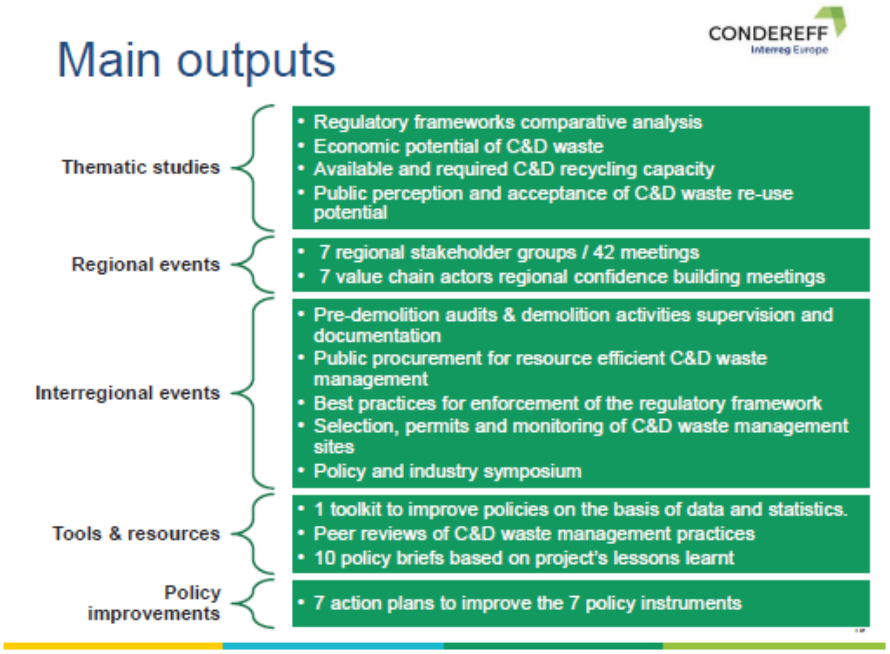
B. Communication and dissemination

- B1 Planning of communication activities & tools
- B2 Development of communication materials
- B3 Implementation of communication activities

C. Project management

- C1 Technical coordination
- C2 Financial management

18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Main outputs
Thematic studies
• Regulatory frameworks comparative analysis
• Economic potential of C&D waste
• Available and required C&D recycling capacity
• Public perception and acceptance of C&D waste re-use potential
Regional events
• 7 regional stakeholder groups / 42 meetings
• 7 value chain actors regional confidence building meetings
Interregional events
• Pre-demolition audits & demolition activities supervision and documentation
• Public procurement for resource efficient C&D waste management
• Best practices for enforcement of the regulatory framework
• Selection, permits and monitoring of C&D waste management sites
• Policy and industry symposium
Tools & resources
• 1 toolkit to improve policies on the basis of data and statistics.
• Peer reviews of C&D waste management practices
• 10 policy briefs based on project's lessons learnt
Policy improvements
• 7 action plans to improve the 7 policy instruments


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European Union
European Regional Development Fund
Thank you for your attention!
Questions welcome

LECTURE II – CONSTRUCTION AND DEMOLITION WASTE CHALLENGES

(RESIDUOS DE CONSTRUCCIÓN Y DEMOLICIÓN)

Vicente Ferrer (ARCI, Spain), (Spanish language)

CONSTRUCTION AND DEMOLITION WASTE CHALLENGES

Vicente Ferrer [1]

[1]*ARCI (Association of employers of selection and recycling of waste from construction and industry)*

ABSTRACT

There are more than 25 illegal uncontrolled landfills in Valencia. The largest percentage of waste is produced by small reform companies, but it comes from the lack of application and control of RD 105/2008, royal decree that regulates CDW production. This is due to the non-application of regulations and the lack of interest of the administration to regulate this situation, which allows companies to throw disposals and debris in wherever. What is more, it is estimated that the valorisation and recycling plants that belong to ARCI association manage only 20% of the CDW production in Valencia.

The measures are the ones below:

- Apply the royal decree 105/2008, February the 1st, which regulates the production and management of construction and demolition waste.
    - Civil service must demand technical documents (study of waste management in licenses) that guarantee a correct waste management in construction sites and demolitions.
- Monitor and control all operators:
    - The lack of suitable supervision and control of the Administration means that the number of illegal operators, who carry out an activity that is not permitted and contrary to regulations, increases.
    - In each public tender, competing companies are required to justify and valorise the waste management they will perform as an essential condition for their bidding. These companies always request an offer to the waste treatment plants, including a Letter of Commitment of Acceptance of that waste, and when obtaining it, in the case of obtaining the biding, the procedure does not continue.

- Use of recycled arid: circular economy.
    - Public procurement does not encourage the lower generation of CDW, nor the use of recycled aggregates.
    - Private contracting does not take it into account. The reuse, recycling and any other recovery of CDW is meaningless.
    - The Administration's involvement is essential for the right functioning of the Circular Economy. For this reason, a compulsory norm that requires to use 15% recycled or recovered material in all public or private construction works, is necessary.


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Interreg Europe
De la teoría a la práctica:
GESTIÓN Y CONTROL
DOCUMENTAL DE
RESIDUOS
ARCi


CONDEREFF
Interreg Europe
VICENTE
FERRER.
Representante de ARCI
ARCi

¿POR QUÉ NACE ARCI?

Asociación de Empresarios de Selección y Reciclaje de residuos de la Construcción y de la Industria.

Nace, en plena crisis económica, como reacción ante la falta de trabajo provocada por los operadores que actúan al margen de la ley.

OBJETIVO

Relación con la ADMINISTRACIÓN y ser la voz del sector.

Proliferación de

VERTEDEROS INCONTROLADOS

ARCI

Más de 25 vertederos ilegales de residuos en los accesos de AVE y del Euromed

R.V.-Valencia

Existen más de 25 vertederos ilegales e incontrolados de residuos de construcción y demolición en los accesos del AVE y del Euromed, según denunció la Asociación de Empresarios de Selección y Reciclaje de Residuos de la Construcción y de la Industria (ARCI). En total, cerca de 5.000 toneladas de escombros diseminados en un radio de acción de 5 kilómetros dentro de la ciudad de Valencia, concretamente en las zonas de Malilla, la Creu Coberta, la Fonteta de Sant Lluís y La Punta.

Para la asociación, que integra al total de empresas legalmente establecidas para tratar y valorizar residuos de construcción e industriales de la provincia de Valencia, la proliferación de estos vertederos ilegales es consecuencia de la mala praxis e intrusismo en el sector.

Al respecto, apuntó que el mayor porcentaje de los residuos los generan las pequeñas empresas de reformas. Pero sobre todo deriva de la falta de aplicación y control del RD 105/2008, normativa que regula la producción y gestión de los residuos de construcción y demolición (RCD).

Según el portavoz de ARCI, Vicente Ferrer, las plantas legalizadas de valorización y reciclaje de los RCD en Valencia que conforman su asociación sólo alcanzan a gestionar unas 215.000 toneladas, un 20 por cien estimado de la producción que genera el sector.

Esta cifra pone de manifiesto una «sobresaliente» y clandestina eliminación de residuos. Pero, sobre todo, evidencia la falta de interés de la Administración por cumplir con su obligación de regular esta situación».

Sanidad estudiará el contrato del General con la empresa de resonancias Eresa

Valencia

invitación de Federico Félix contra el Ministerio de Fomento, en el madrileño Paseo de la Castellana, para que Rafael Catalá, titular en funciones por partida doble (todo el Gobierno y por el traslado de Ana Pastor a la Presidencia del Congreso) firme la adjudicación y construcción inmediatas del Corredor del Mediterráneo.

Aprovecharon la acometida y de paso, «apedrearemos y rompamos cristales» del Ministerio de Empleo y Seguridad Social, pared con pared, para que Fátima Báñez tome nota y acabe con el paro en la Comunitat.

¿...? Así es la vida.

LAS PROVINCIAS | VALENCIA | 5

Sanidad estudiará el contrato del General con la empresa de resonancias Eresa

Cinco mil toneladas de escombros reciben a los turistas que llegan en tren

La asociación de Empresarios de Residuos de la Construcción alerta de la existencia de más de 25 vertederos ilegales e incontrolados

Valencia

POR BARRIOS

Basura para recibir al turista

▶ Los empresarios denuncian que hay 5.000 t de escombros junto a las vías

Cuatro Carreres

Uno de los vertidos de escombros junto a las vías.

CONDEREFF Interreg Europe

INICIATIVA INNOVADORA

Creamos el VERTEDERO VIRTUAL

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Vertedero virtual


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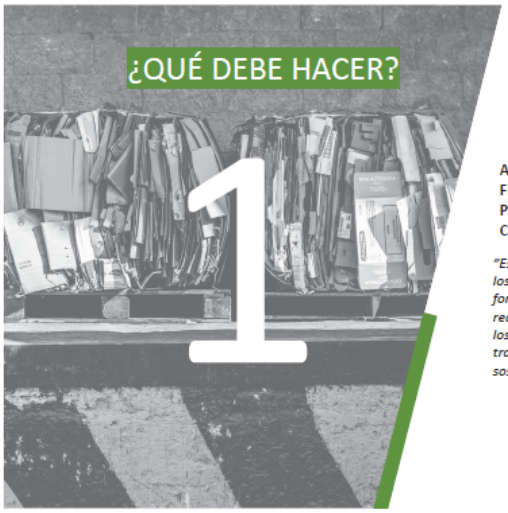
Interreg Europe
¿CONOCES ALGÚN VERTEDERO ILEGAL?
DENÚNCIALO

CONDEREFF Interreg Europe

Pero SOLOS NO PODEMOS

Necesitamos contar con EL APOYO DE LA ADMINISTRACIÓN.



CONDEREFF Interreg Europe

APLICAR EL REAL DECRETO 105/2008, DEL 1 DE FEBRERO, POR EL QUE SE REGULA LA PRODUCCIÓN Y GESTIÓN DE RESIDUOS DE CONSTRUCCIÓN Y DEMOLICIÓN.

"Establecer el régimen jurídico de la producción y gestión de los residuos de construcción y demolición, con el fin de fomentar, por este orden, su prevención, reutilización, reciclado y otras formas de valorización, asegurando que los destinados a operaciones de eliminación reciban un tratamiento adecuado, y contribuir a un desarrollo sostenible de la actividad de construcción"

ARCI

El destinatario de este RD son los **Ayuntamientos**, que deben velar en la tramitación de sus licencias de obras y demolición por la adecuada gestión de los residuos que se generen exigiendo documentos técnicos (estudio de gestión de residuos en licencias…), sino sobre todo una garantía económica que asegure la correcta gestión del residuo.

Paralización de negociados
Carencia de interés
Desconocimiento
Falta de una norma autonómica que les guie

ARCI no ha sido capaz de encontrar un solo municipio en el ámbito de la Comunidad Valenciana que cumpla el RD 105/2008.

ARCI

VIGILAR Y CONTROLAR TODOS LOS OPERADORES.

CONDEREFF Interreg Europe

2.1 OPERADORES QUE ACTÚAN AL MARGEN DE LA LEY

La falta de vigilancia y control adecuado de la Administración fomenta el que proliferen los operadores ilegales y, como consecuencia, todo tipo de vertederos incontrolados

Dichos vertederos pueden responder al "*efecto llamada*" o ser ya profesionalizados.

CONDEREFF Interreg Europe

CONDEREFF Interreg Europe

Existen dos consecuencias claras:

El subsuelo es un basurero

Se desconoce el dato real de producción de residuos

Dentro de ese grupo de operadores que profesionalmente actúan al margen de la normativa, existen los que al amparo de una licencia ambiental, como puede ser para la valorización de residuos, realizan una actividad no permitida por la misma y contraria a la normativa.

2.2 LICITACIONES Y OBRAS PÚBLICAS

En toda licitación pública se exige que las empresas concurrentes justifiquen y valoren la gestión del residuo que van a realizar como condición *sine qua non* de su licitación.

La experiencia de Arci es que estas empresas siempre solicitan una oferta a las plantas de tratamiento de residuos, incluida una Carta de Compromiso de Aceptación de esos residuos, y al obtenerla, en caso de ser adjudicatario del concurso DESAPARECEN.

Si se les exige un documento contractual vinculante para emitir esa Carta de Compromiso de Aceptación de los residuos, DESAPARECEN.

¿CÓMO GESTIONAN ESOS RESIDUOS?

¿QUÉ VIGILANCIA Y CONTROL REALIZA LA ADMINISTRACIÓN SOBRE DICHA GESTIÓN?

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UTILIZACIÓN Y SALIDA DEL ÁRIDO RECICLADO.

ECONOMÍA CIRCULAR

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En la contratación pública:

- ❑ NO se fomenta NI la menor generación de residuos de construcción y demolición
- ❑ NI la utilización de áridos y otros productos procedentes de valorización de residuos.

La contratación privada ni se lo plantea.

La reutilización, el reciclado y cualquier otra valorización de residuos de la construcción carece de sentido sin poder dar salida a tales materiales valorizados.

Hoy en día el destino natural es una RIA

DECRETO 200/2004, de 1 de octubre, del Consell de la Generalitat, por el que *se regula la utilización de residuos inertes adecuados en obras de restauración, acondicionamiento y relleno, o con fines de construcción*

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Sin dicha colaboración e implicación de la Administración, **la ECONOMÍA CIRCULAR es una QUIMERA.**

Necesidad de una **Norma que exija** la Obligatoriedad de utilizar un 15% de material reciclado o valorizado en toda obra pública o privada.

Necesidad de que se vigile la efectiva utilización de dicho material.

ARCi

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Si se puede decir lo **avanzada que es una sociedad por la cantidad de basura que recicla.**
Sin la implicación de todos los agentes del sector bajo la dirección de la Administración no es posible y **sólo aspiramos a ser una sociedad avanzada.**

ARCi

LECTURE III - SAXONY-ANHALT GUIDELINES FOR REUSE AND RECYCLING MINERAL WASTE

Paul Hoyer (Institute for Structural Policy and Economic Development)

SAXONY-ANHALT GUIDELINES FOR REUSE AND RECYCLING MINERAL WASTE

***Paul Hoyer*[1]**

[1]*ISW (Institute for Structural Policy and Economic Development)*

ABSTRACT

The content of this presentation covers the legal framework for the management of C&D waste in Saxony-Anhalt and a guideline for the reuse and recycling of mineral waste.

The guidelines for reuse and recycling of mineral waste in Saxony-Anhalt clarify the general principles for the management of waste, defines responsibilities and duties of public actors, the need to establish waste management plants and the organization and implementation of the disposal of hazardous waste. It brings the necessary regulations of the country in accordance with the circular economy act to ensure the environmentally sound disposal of waste. The guide also provides information on the most important aspects of the management of mineral waste as the procurement procedure for public work projects and the operation and monitoring of waste management pre-treatment and treatment plants.

It also deals with the different documents which frame these different construction topics:

- The use of mineral waste as quality-assured recycling building materials in technical structures, the documents sets out the conditions under which certain mineral wastes lose their waste properties and can be used as recycled building materials.
- The regulations for the solid recovery of mineral waste.
- The extraction of recycling construction furnace from the demolition of buildings and other technical structures.
- The regulations for the solid recovery of mineral waste.
- And the extraction of recycling construction furnace from the demolition of buildings and other technical structures.

This guideline enables stakeholders to access to necessary information for reuse and recycling of mineral waste and are expendable depending on changes in the legislative framework and properties of C&D.

Content

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(1) legal framework for the management of C&D waste in Saxony-Anhalt

(2) guideline for the reuse and recycling of mineral waste

2

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legal framework for the management of C&D waste in Saxony-Anhalt

3

Overview legal framework

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Level	Name	Abbreviation	General Objective
national	Act to promote the circular economy and ensure the environmentally sound management of waste	KrWG	The purpose of the law is to promote the circular economy for the protection of natural resources and to ensure the protection of humans and the environment in the generation and management of waste.
regional	Building Code of the Land Saxony-Anhalt	BauO LSA	The building code is the main component of the building regulations; It regulates the requirements to be observed in construction projects. On the other hand, the conditions on which land may be built at all and in what kind and extent, are determined by the planning law.
national	Directive on the Management of Municipal Solid Waste and Certain Construction and Demolition Waste	GewAbfV	Regulates management, in particular the collection, pre-treatment, preparation for re-use, recycling and other recovery of municipal solid waste and certain construction and demolition waste.

4

Overview legal framework

Level	Name	Abbre-viation	General Objective
national	Federal Pollution Control Act	BImSchG	The purpose of this law is to protect people, animals and plants, the soil, water, the atmosphere and cultural and other material assets from harmful environmental effects and to prevent the occurrence of harmful environmental effects.
national	Directive on landfills and long-term storage	DepV	Waste and waste mixtures with an organic content of more than five percent are treated according to the provisions of the Landfill Directive (DepV) before the deposit. The allocation of waste to differently equipped types of landfill is done according to the landfill ordinance and thus according to the waste legislation.
regional	Waste Law of the Land Saxony-Anhalt	AbfG LSA	The aim of the law is to promote the low-waste circular economy in accordance with the Closed Substance Cycle Law and to ensure the environmentally sound disposal of waste.
National	Waste Directory Directive	AVV	Implements the European specification on the subdivision of Waste according to der dangerous potential

5

Legal framework description

Act to promote the circular economy and ensure the environmentally sound management of waste (KrWG)

- Promotes circular economy and environmental protection
- According to the EU Waste Framework Directive
- Defines Waste Hierarchy and means for managing pollutants
- **Aims at reducing waste**

6

Legal framework description

Directive on the Management of Municipal Solid Waste and Certain Construction and Demolition Waste (GewAbfV)

- Relevant for the management of waste, especially
  - Recording
  - pre-treatment
  - Preparation for the reuse
  - Recycling
  - And other usage

  of Construction & Demolition Waste by producer and operators of pre-treatment and treatment plants
- Forsees the separation of waste on the spot

7

Legal framework description

Waste Law of the Land Saxony-Anhalt

- The waste law of the state of Saxony-Anhalt clarifies
  - ✓ general principles for the management of waste
  - ✓ defines responsibilities and duties of public actors
  - ✓ the need to establish waste management plans
  - ✓ Organization and implementation of the disposal of hazardous waste
- It brings the necessary regulations of the country in accordance with the circular economy act to ensure the environmentally sound disposal of waste.

8

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Guideline for the reuse and recycling of mineral waste

Examining the basic principles for the management of C&D waste in Saxony-Anhalt

9

General Structure of the Guideline

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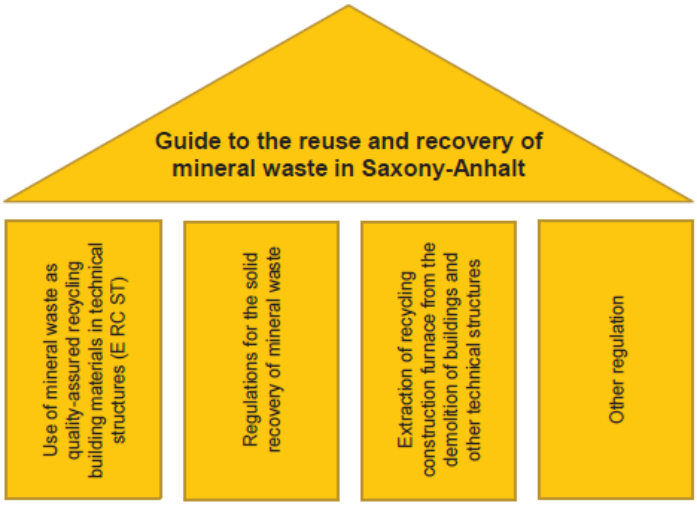

10

Guide to the reuse and recovery of mineral waste in Saxony-Anhalt

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- basic document for the management of waste in Saxony-Anhalt
- modular structure
- expandable and adaptable to changing structures and demands
- shows the general structure of the approach
- applies for Saxony-Anhalt
- defines responsible persons

11

Guide to the reuse and recovery of mineral waste in Saxony-Anhalt

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- **The guide also provides information on the most important aspects of the management of mineral waste**
  - Planning and preparation of constructional actions, in which a demolition or partial demolition of an object takes place or which have a new or conversion to the object, in which recycled building materials can replace primary building materials
  - Procurement procedure for public works projects
  - Operation and monitoring of waste management pretreatment and treatment plants in which components and products are prepared for reuse or mineral waste is processed as recycled building materials for their further recycling or use as building material.

12

Guide to the reuse and recovery of mineral waste in Saxony-Anhalt

- **Defines the relevant actors for the C&D management**
  - Persons commissioning construction work
  - planning institutions
  - Construction and demolition companies
  - Companies that collect, transport or trade in waste spoil their waste
  - Waste management companies
  - People who use recycled building materials.

13

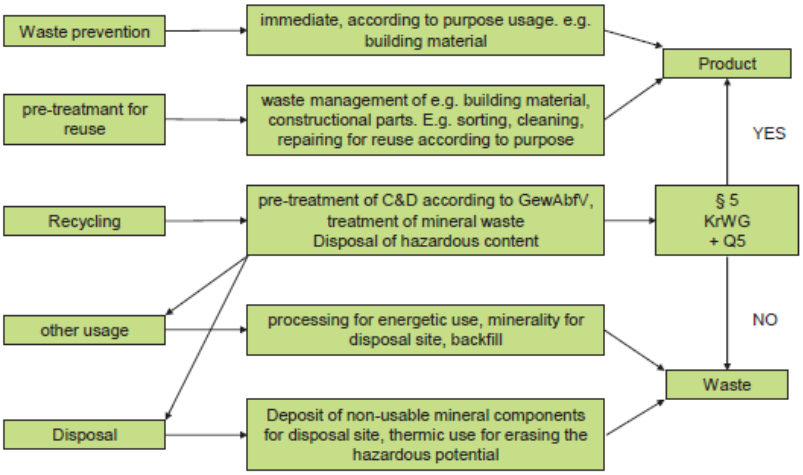
Guide to the reuse and recovery of mineral waste in Saxony-Anhalt

- **guides to the management of waste for the reuse or for recycling processes**

"For the purposes of this guide, mineral recycled construction materials are materials derived from the treatment of mineral waste. The raw materials are mainly construction and demolition waste from construction activities such as new construction, dismantling, conversion and demolition, demolition and maintenance of civil engineering structures such as buildings, structures, roads, paths and other traffic structures. Such wastes should be assigned in particular to Chapter 17 of the waste list in the Annex to the List of Waste Catalogs (AVV)."

14

Guide to the reuse and recovery of mineral waste in Saxony-Anhalt



15

Use of mineral waste as quality-assured recycling building materials in technical structures

- document sets out the conditions under which certain mineral wastes lose their waste properties and can thus be used as recycled building materials with product characteristics
- An essential component of these regulations is the quality control through proof of suitability, factory production control, external monitoring and archiving.

16

Regulations for the solid recovery of mineral waste

- The document sets out the requirements for the recycling of mineral waste in technical structures, in the manufacture of construction products and below the rooting soil layer in soil-like applications.
- It consists of three parts:
  - Part 1 explains the principles and general conditions of technical treatment.
  - Part 2 contains specific provisions for the examination and evaluation of the respective waste as well as supplementary specifications for the installation.
  - Part 3 contains requirements for the generally valid and accepted procedures for sampling, preparation and analysis.

17

Extraction of recycling construction furnace from the demolition of buildings and other technical structures

- The aim of this document is to enable the actors in the value chain of building removal to achieve the highest possible proportion of the reuse of components or recycling into recycled building materials in accordance with waste legislation
- The module considers the phases of preliminary planning, reconnaissance sampling, dismantling planning, preparation and construction site installation, execution of dismantling work, removal of pollutants and impurities and preparation of materials for recycling

18

Conclusion or Confusion?

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- **What is important?**
  - several legislative conditions must be considered
  - KrWG and GewAbfV most important
  - depending on the nature of waste and composition
- **Guidelines enable stakeholders to access necessary information**
  - detailed information accessible in the three modules presented
  - the guidelines are expendable depending on changes in the legislative framework and properties of C&D

19

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Thank you!

Questions welcome

Project media

LECTURE IV - STUDY OF REGIONAL AND LOCAL REGULATIONS. EVALUATION OF RATIOS AND COMPARISON.

(ESTUDIO DE NORMATIVA. EVALUACIÓN DE RATIOS Y COMPARATIVA)

Helena Granados Menéndez (Superior council of the College of Architecture of Spain) (Spanish language)

STUDY OF REGIONAL AND LOCAL REGULATIONS. EVALUATION OF RATIOS AND COMPARISON.

***Helena Granados*[1]**

[1]*Superior council of the College of Architecture of Spain*

ABSTRACT

The aim of this presentation is to study of autonomous and local regulations and to refine the ratio's estimates throughout the Spanish geography.

To get started, the Administration must check the waste management documentation before, during and at the end of the work and it should test what has been developed. For this, technical documents that allow tracking are needed:

- Study of waste management: It is a generic study that tries to focus on how this work is going to be developed, it is known what work is going to be done, but not how it will be executed.
- Waste management plan: It materializes how the operation is going to be carried out. There is a possibility that the first estimate changes and is refined, because now the available means are known.
- Completed works documentation (not recognized in RD 105/2008 but in some autonomous communities): It is a final report that allows to compare what happened in that global estimation of ratios, to what happens.
- The documentary control focuses on two main objectives:
- To separate hazardous materials from the construction materials flow.
- To identify the output materials of the work, by its LER code. So, they can be properly treated, either to discharge in landfills, to include them in a recycling process, or to generate secondary raw materials.

When an autonomous community does not have its own regulations, it uses state-level regulations, and when an autonomous community generates its own regulations it can never be less restrictive than the state regulations.

RD 105/2008 indicates that it is necessary to include an approximation of the waste management study that will be generated, expressed in tons and m3 and according to LER codes, which are identification codes that are associated with all wastes.

In the work procedure to refine ratios, it must be identified, first, if the binding regulations are national, autonomous or local, type of building and type of construction. The RD 105/2008 requires to define the weight and volume of waste. It is convenient to remind that the volume is apparent, and it depends on the sponginess, which will be different depending on the tenacity of the material and on the tool that is going to be used. To define weight and volume of each type of waste, it is required to know composition: percentage of each type of waste, adjusted to its LER code, and the corresponding density.

This presentation introduces the most complicated case example: New work. It could be emphasized that there are still hazardous materials in new work. Therefore, it is needed to check and refine the composition, to refine the system's average densities and to refine the densities of the different groups of materials according to the LER codes.

To conclude, it must be remarkable the need of checking the data collection and refining composition and densities of each waste, in order to achieve a real overview of the CDW that is produced.

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Estudio de normativa. Evaluación de ratios y comparativa

Helena Granados Menéndez

SEMINARIO INTERNACIONAL SOBRE RCD: DEMOLICIÓN, SUPERVISIÓN Y DOCUMENTACIÓN

Valencia, 2 y 3 de Abril de 2019

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European Union
European Regional Development Fund

▪Control de RCD. Agentes y roles

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Fuente: http://www.construccion circular.com/materiales/

ADMINISTRACIONES PÚBLICAS	Comunidades autónomas y ayuntamientos
COMERCIALIZADORES (IMPORTADORES Y DISTRIBUIDORES)	Toda persona física o jurídica en la cadena de suministro, distinta del fabricante, que comercializa un producto de construcción o, en el caso de importadores, introduce un producto de un tercer país en el mercado de la Unión
DIRECCIÓN FACULTATIVA	Técnicos competentes encargados de la dirección y control de la ejecución de la obra
FABRICANTE PRODUCTOS CONSTRUCCIÓN	Persona física o jurídica que fabrica, manda diseñar o fabricar un producto de construcción
GESTOR DE RESIDUOS	Persona o entidad, pública o privada, registrada mediante autorización o comunicación que realice operaciones que componen la gestión de los residuos
POSEEDOR-CONTRATISTA	Persona física o jurídica que tenga en su poder los RCD y que no ostente la condición de gestor de residuos
PROMOTOR-PRODUCTOR	Persona física o jurídica titular de la licencia urbanística en una obra de construcción y/o demolición
PROYECTISTA	Agente que por encargo del promotor y con sujeción a la normativa técnica urbanística redacta el proyecto

▪Estimación de cantidades de RCD en el RD 105/2008

Fuente: http://www.construccioncircular.com/materiales/

Artículo 4. Obligaciones del productor de residuos de construcción y demolición.
Deberá cumplir con las siguientes obligaciones:
a) Incluir en el proyecto de ejecución de la obra un estudio de gestión de residuos de construcción y demolición, que contendrá como mínimo:
1.º Una **estimación de la cantidad, expresada en toneladas y en metros cúbicos, de los residuos de construcción y demolición que se generarán en la obra**, codificados con arreglo a la lista europea de residuos publicada por Orden MAM/304/2002, de 8 de febrero, por la que se publican las operaciones de valorización y eliminación de residuos y la lista europea de residuos, o norma que la sustituya.
…
b) En obras de **demolición, rehabilitación, reparación o reforma**, hacer un **inventario de los residuos peligrosos que se generarán, que deberá incluirse en el estudio de gestión** a que se refiere la letra a) del apartado 1, así como prever su retirada selectiva, con el fin de evitar la mezcla entre ellos o con otros residuos no peligrosos, y asegurar su envío a gestores autorizados de residuos peligrosos…

▪Tipos de materiales — Recursos y RCD

Orden MAM 304/2002

MATERIALES ➡ **CÓDIGOS LER** ➡ **RCD**

Residuos de la construcción y demolición [incluida la tierra excavada de zonas contaminadas].

17 01	**Hormigón, ladrillos, tejas y materiales cerámicos** y sus mezclas con o sin sustancias peligrosas
17 02	**Madera, vidrio y plástico** y sus mezclas con sustancias peligrosas.
17 03	**Mezclas bituminosas, alquitrán de hulla y otros productos alquitranados.**
17 04	**Metales [incluidas sus aleaciones]** y sus mezclas con o sin sustancias peligrosas
17 05	**Tierra (incluida la excavada de zonas contaminadas), piedras y lodos de drenaje** con o sin sustancias peligrosas
17 06	**Materiales de aislamiento y materiales de construcción que contienen amianto.**
17 08	**Materiales de construcción a ~~partir~~ base de yeso** con o sin sustancias peligrosas
17 09	**Otros residuos de construcción y demolición** con o sin sustancias peligrosas

+

OTRO TIPO DE RESIDUOS (URBANOS, ENVASES…)

▪Objetivos de la estimación

- Segregación de peligrosos del flujo de RCD
- Separación de materiales no peligrosos para su tratamiento posterior
- Tratamiento para su reutilización como materias primas secundarias

→ **Trazabilidad** →

Legislación
Mercado
Buenas prácticas

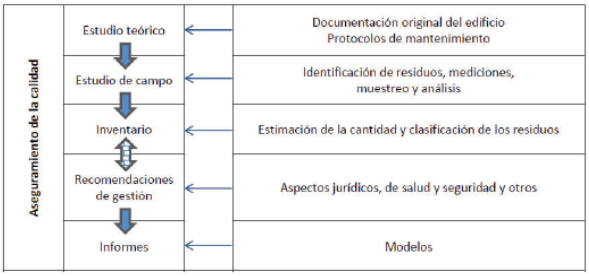

Figura 2: Esquema general de la auditoría de residuos

▪Punto de partida Ratios generales

CANTIDAD GENERAL:

Parámetros estimativos con fines estadísticos:

✶ densidad tipo del orden de 0,5 tn/m³ a 1,5 tn/m³

s m² superficie construida	V m³ volumen residuos (S x h)	d densidad tipo (tn/m³) 0,5≤ d ≤ 1,5	Tn toneladas de residuo (v x d)

PORCENTAJES DE LOS DIFERENTES TIPOS DE MATERIALES

Diferentes ratios según instituciones y CCAA

Densidad estimada según fuentes y tipo (uso) de edificio

▪Cantidades de RCD — Cuantificación

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Obra nueva	Materiales existentes (tierras no reutilizables) RCD asociados al proceso productivo ⇨RATIOS ORIENTATIVOS OBRA NUEVA	Tipología edificatoria
Demolición	Diagnóstico •Vistos •Ocultos ⇨RATIOS ORIENTATIVOS DEMOLICIÓN	Tipología obra pública
Reforma	Suma de los anteriores ⇨RATIOS ORIENTATIVOS REFORMA	Tipología constructiva

CARACTERÍSTICAS CLIMÁTICAS Y CULTURALES REGIONALES

Comisión CSCAE-CGATE para la estimación de ratios de RCD

CONDEREFF Interreg Europe

Consejo General de la Arquitectura Técnica de España

CSCAE Consejo Superior de los Colegios de Arquitectos de España

Objetivos

- Estimación de ratios para su inclusión en el EGR en cumplimiento de los requerimientos del RD 105/2008
- Aportaciones a modificación pendiente del RD 105/2008

Fuentes de datos

- Colegios profesionales
- Instituciones, entidades públicas…
- Agentes implicados en la gestión de los RCD

Tipo de datos

- Ratios
- Datos reales

▪Consideraciones

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El RD 105/2008 nos pide 2 datos por Código LER:

✶ Peso (T) y Volumen (m3) de RCD

- El volumen es $V_{aparente}$ y depende del Esponjamiento

$$D = \frac{m}{V}$$

- El volumen aparente de los RCD generados en obra nueva incluye el de los materiales del sistema constructivo, el de sus envases y el de los restos (pérdidas, roturas, sobrantes,,,)

$$D_{ap} = \frac{m_s}{V_{ap}}$$

- El método de retirada/demolición y tenacidad del elemento condicionan el incremento del volumen por esponjamiento (cociente entre D y Dap) .
  - ✶ Algunas estimaciones
  - ⇨ 1,2 para materiales homogéneos de fracción pequeña demolido a mano
  - ⇨ 2,2 para los materiales muy tenaces como las estructuras de hormigón armado demolidas por voladura
  - ⇨ en un edificio de pisos de fábrica de ladrillo y forjados de vigueta y revoltón demolido a mano en un 30% y a máquina el resto se estima un esponjamiento de 1,6 – 1,8.

▪Parámetros analizados

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Tipo obra	OBRA NUEVA País Vasco
ORIGEN	IHOBE
AUTOR	Cscae 3_19
COMENTARIOS	Ratios del Decreto Vasco 112/2012 en Herramienta IHOBEpara residencial
URL	https://www.euskadi.eus/y22-bopv/es/bopv2/datos/2012/09/1203962a.shtml

Tipo edificatorio	Residencial			Terciario		
	Plurifamiliar	Unifamiliar	Comercial	Residencial	Administrativo	Industrial
	X	x		X		

Sistema constructivo	Pesado	Medio	Ligero	Genérico
				X

Codigo LER	Tipo de Residuo	Porcentajes	Cantidades		Densidades		Esponjamiento
		%	m3/m2	T/m2	Densidad aparente T/m3	T/m3 tabla base CTE	Valor unitario
	Datos			x	x	x	
	Estimado a partir de datos	x	x				x
0. RATIOS GLOBALES			0,09	0,08	0,90	1,25	
	Tierras y petreos de la excavación	5,10	0,00	0,00	1,30		0,00
17 05 04	Tierras y piedras distintas de las especificadas en el código 17 05 03	5,10	0,00	0,00	1,30		N/A
17 05 06	Lodos de drenaje distintos de los especificados en el código 17 05 06						
17 05 08	Balasto de vías férreas distinto del especificado en el código 17 05 07						
	RCD: Naturaleza no pétrea	28,50	0,04	0,02	0,54		
1. Asfalto					0,87		
17 03 02	Mezclas bituminosas distintas a las del código 17 03 01	1,50	0,00	0,00	0,87	1,30	1,50

▪Recogida de datos

- Tierras y pétreos excavación
- No pétreos
- Pétreos
- RCD mezclado
- Potencialmente peligrosos, basuras y otros
- Comprobación y cálculo Dmedia

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	RCD: Naturaleza no pétrea	28,50	0,04	0,02	0,54		
1. Asfalto					0,87		
17 03 02	Mezclas bituminosas distintas a las del código 17 03 01	1,50	0,00	0,00	0,87	1,30	1,50
2. Madera					0,36		
17 02 01	Madera	9,50	0,02	0,01	0,36	0,60	1,65
3. Metales		5,15	0,00	0,00	1,00	1,50	1,50
17 04 01	Cobre, bronce, latón						
17 04 02	Aluminio						
17 04 03	Plomo						
17 04 04	Zinc						
17 04 05	Hierro y acero						
17 04 06	Estaño						
17 04 07	Metales mezclados	5,15	0,00	0,00	1,00	1,50	1,50
17 04 11	Cables distintos de los especificados en el código 17 04 10						
4. Papel					0,60		
20 01 01 /030308	Papel-Cartón (codigo espejo)	2,00	0,00	0,00	0,60	0,90	1,50
5. Plástico					0,83		
17 02 03	Plástico	2,75	0,00	0,00	0,83	0,90	1,09
6. Vidrio					1,49		
17 02 02	Vidrio	0,25	0,00	0,00	1,49	1,50	1,01
7. Yeso					0,58		
17 08 02	Materiales de construcción a partir de yeso distintos a los del código 17 08 01	7,35	0,01	0,01	0,58	1,20	2,06
RCD: Naturaleza pétrea		60,60	0,08	0,08	1,11		
8. Arena Grava y otros áridos		0,00	0,00	0,00		1,50	
01 04 08	Residuos de grava y rocas trituradas distintos de código 01 04 07	0,00	0,00	0,00	1,38	1,50	
01 04 09	Residuos de arena y arcilla				1,38	1,50	1,09
9. Hormigón					1,67		
17 01 01	Hormigón	23,00	0,01	0,02	1,67	2,50	1,50
10. Ladrillos , azulejos y otros cerámicos		37,60	0,03	0,03	1,00	1,30	1,30
17 01 02	Ladrillos				1,00	1,20	
17 01 03	Tejas y materiales cerámicos	37,60	0,03	0,03	1,00	1,50	1,50
17 01 07	Mezclas de hormigón, ladrillos, tejas y materiales cerámicos distintas de las especificadas en el código 1 7 01 06.				1,00	1,50	
Residuo mezclado		2,50			1,50		1,00
17 09 04	RDCs mezclados distintos a los de los códigos 17 09 01, 02 y 03	2,50	0,00	0,00	1,50	1,50	1,00
RCD Potencialmente peligrosos y otros		3,30	0,01	0,00			
11. Basuras					0,60		
20 02 01	Residuos biodegradables						
20 03 01	Mezcla de residuos municipales	1,00	0,00	0,00	0,60	0,90	1,50
12. Potencialmente peligrosos					0,33		
17 09 03*	Otros residuos de construcción y demolición que contienen SP's	2,30	0,01	0,00	0,33	0,50	1,50

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▪Abordaje de recogida de datos

hgranados@hg-arctres.es

▪Recopilación de datos

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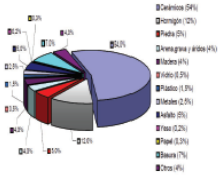

- Andalucía
- Principado de Asturias
- Baleares
- Canarias
- Castilla y León
- Cataluña
- Extremadura
- Galicia
- La Rioja
- Comunidad de Madrid
- Región de Murcia
- Comunidad Foral de Navarra
- País Vasco
- Comunidad Valenciana

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▪Análisis de datos

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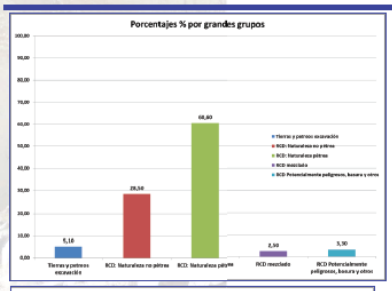
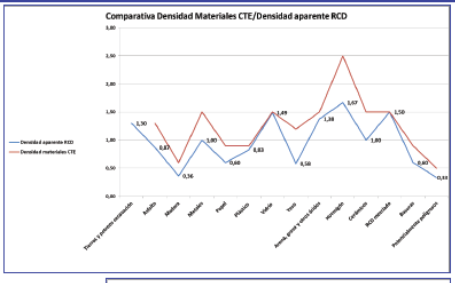
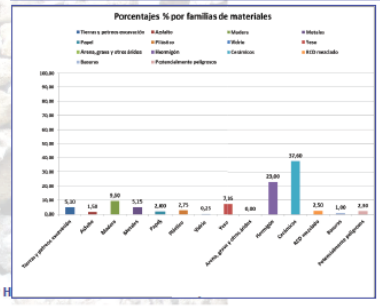
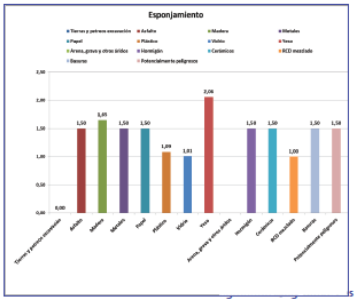
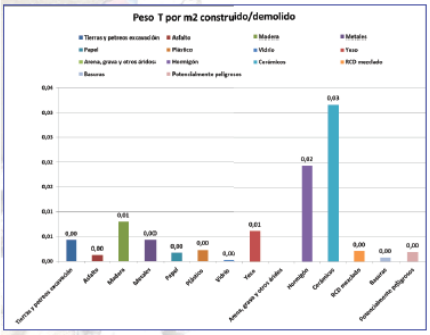


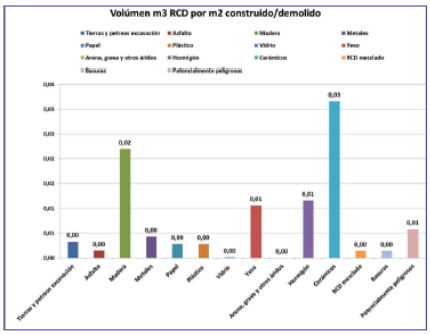




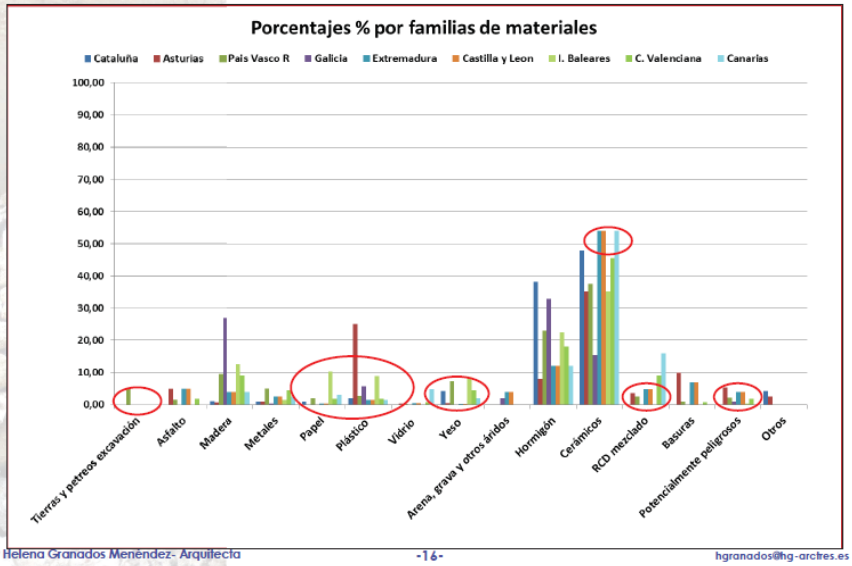


▪Análisis de datos. Requerimientos de RD 105/2008

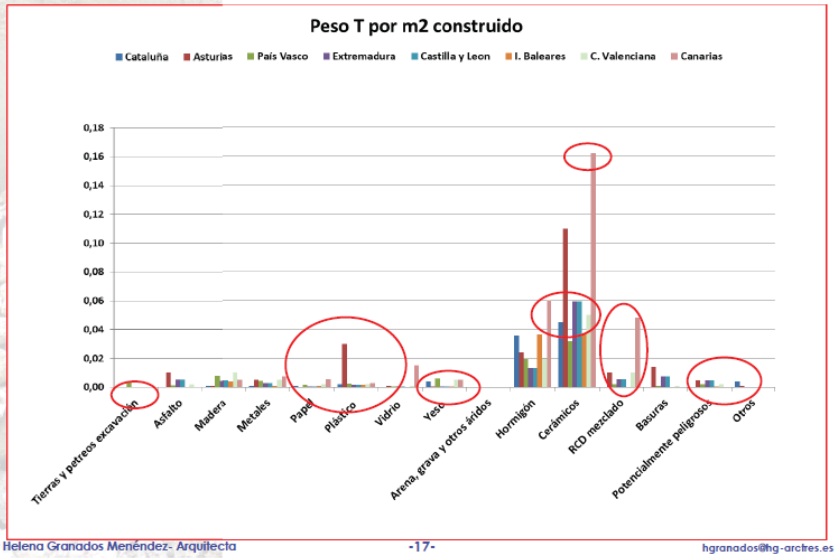




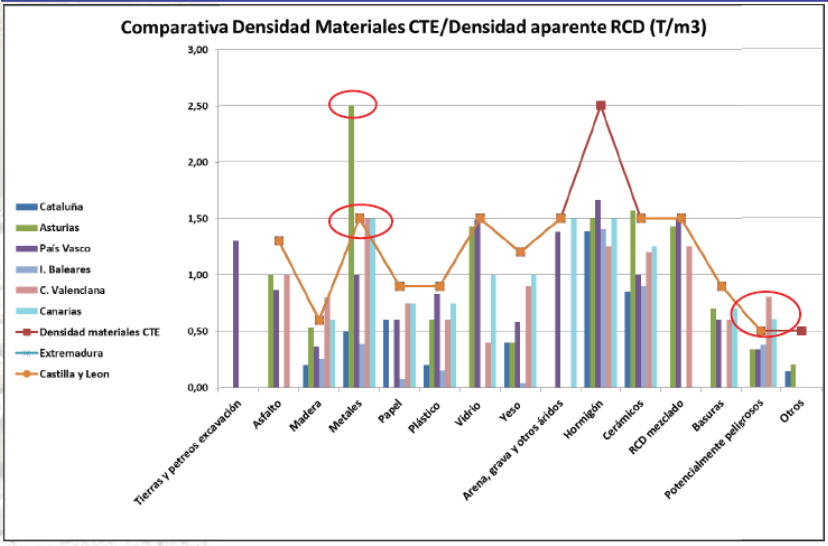
▪Comparativa



▪Comparativa



▪Densidad aparente



▪Conclusiones parciales

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Requerimientos de refinamiento de datos existentes

- El porcentaje de RCD mezclados (Código LER 170904) es muy pequeño o inexistente, lo que no se corresponde con la realidad de las obras.
- El porcentaje de RCD peligrosos (Código LER 170903) es muy pequeño o inexistente tanto en obra nueva como en reforma y demolición, lo que no se corresponde con la realidad de las obras.
- Es necesario realizar ajustes en la composición de los RCD a nivel regional o, expresado de otra manera, para los diferentes tipos de construcción ligera, media y pesada.
- Es necesario realizar ajustes en los valores de las densidades medias y en los de las densidades aparentes de las diferentes familias de RCD para las distintas regiones climáticas.
- Es necesaria una cantidad suficiente de datos para posibilitar el análisis estadístico.

Gracias/Thank you!

Helena Granados Menéndez

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LECTURE V: PRE-DEMOLITION AUDITS. LEGAL FRAMEWORK IN AUSTRIA AND PRACTICAL EXPERIENCES

Josef Mitterwallner

PRE-DEMOLITION AUDITS. LEGAL FRAMEWORK IN AUSTRIA AND PRACTICAL EXPERIENCES

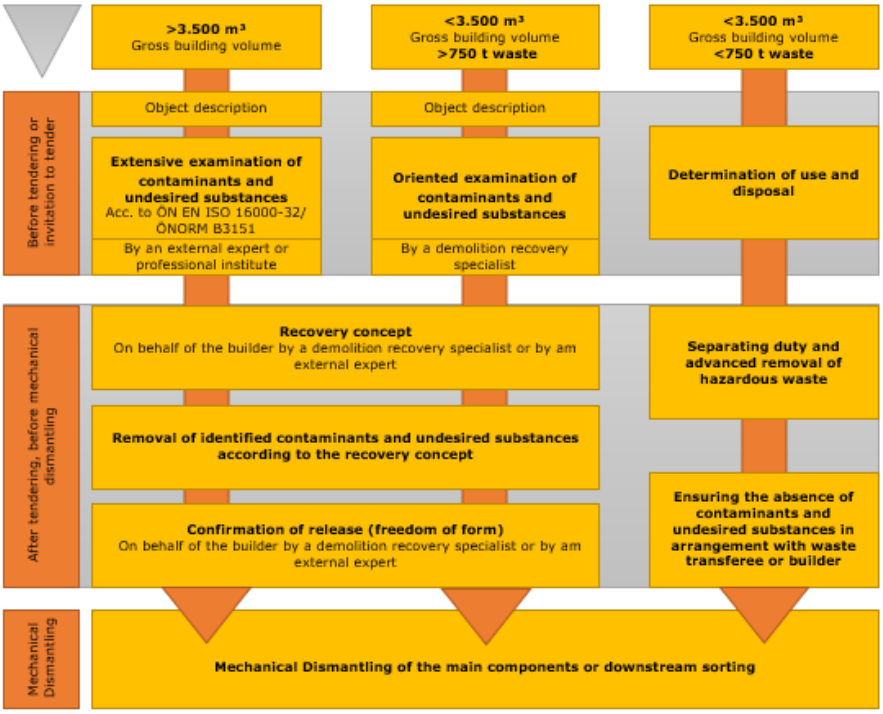
Josef Mitterwallner

ABSTRACT

The main objective of this paper is to outline the Austrian Recycled Construction Material Ordinance, the production and use of recycled construction material and the state of the art regarding the treatment of C&D waste in Austria.

In 2015, 10 million tons of construction and demolition waste have been generated in Austria and 87% of C&D waste have been treated in a treatment plant.

The Austrian Recycled Construction Materials Ordinance entered into force fully on 1st January 2016. This ordinance is to promote the recycling of construction and demolition waste by ensuring a high quality of waste generated during the construction and demolition activities. Here below you can find an overview diagram of the control process for dismantling activities:



The builder and the building contractor are responsible for the separation of the construction and demolition waste. Furthermore, the builder is responsible for the supply of the required area and establishment.

Hazardous and non-hazardous waste, C&D waste and other waste occurring have to be separately collected on-site. Excavated soil, mineral waste, excavated asphalt, wood waste, metal waste, plastic waste and residential waste have to be separately collected. If the separation on-site is not possible, due to technical reasons or disproportionate costs, the separation has to be executed at an authorized treatment plant.

In order to produce a secondary raw material from recycling-construction material, the quality-assurance process has 5 steps: receiving inspection, quality requirements, quality assurance, designation of the quality-assured recycling construction materials, end of waste of the quality-assured recycling construction materials.

Landfilling is connected to negative impacts if this is not performed according to the legal requirement. The main faced issues are the occurring danger during demolition activities due to hazardous substances, the mixing of the different materials and *landfilling* at the end of the demolition process. Hazardous substances are in first instance harmful to workers on the building site.

The recently published revision of the Waste Prevention Program containing a multitude of individual measures which need to be carried out in order to ensure a successful waste prevention policy. The area of CDW consists of two packages: “Low-waste construction and extending the useful life of buildings” and “Design and reuse of parts of buildings”. Both the Austrian Recycled Construction Material Ordinance (2016) and the Waste Prevention Program 2017 are suitable to foster the move towards circular economy in Austria. Especially the Recycled Construction Material Ordinance provides clear instructions and procedures for a quality-assured recycling of C&D waste. Both documents also aim to increase the volume of reused waste. The current challenge is, however, to better transfer these provisions into the daily practice of the building sector. To get this done, better dissemination of specialist information and targeted awareness raising activities are highly needed.

The construction and demolition waste management policy should be evaluated and, if necessary, developed further, in order to guarantee efficient resource management and waste prevention. The EU-project CONDEREFF is the ideal platform to initiate the necessary steps.

LECTURE VI: REUSE OF SECONDARY MATERIAL IN TRANSPORT STRUCTURES, ROADS AND GEOTECHNICS

Vladislav Borecký and Pavel Lopour (University of Pardubice)

PRESENTATION OF THE UNIVERSITY/DEPARTMENT AND RELEVANT RESEARCH. REUSE OF SECONDARY MATERIAL IN TRANSPORT STRUCTURES, ROADS AND GEOTECHNICS

Vladislav Borecký[1] and Pavel Lopour[2]

[1] University of Pardubice (CzechRepublic)

[2]University of Pardubice (CzechRepublic)

ABSTRACT

The most common recycled materials used in transport structures can be distinguished to the **Construction and demolition waste** (defined by **Group 17 of the Waste Catalog** according to Decree No. 93/2016 Coll), and **Industrial secondary raw materials**. It is essential that the recycled material reach properties comparable to the raw material. The requirements for building materials are:

Concrete structures

1. Recycling of fresh liquid concrete residues from fresh concrete production: This waste is primarily produced by **daily cleaning**.
2. Recycling of hardened concrete: Concrete structure remains, and parts are transported to concrete recycling plants and processed by concrete mixers, crushers and screens. Recycled concrete material can be used as backfill material, material for the earth body for road and rail construction, aggregate of the superstructure or unbound construction layers of the roads, and aggregate for concrete of lower strength classes with low requirements for the quality of aggregates (base or filler layers of concrete).

The focus should be placed on the following concrete properties and characteristics:

- a suitable shape indexes
- lower bulk density
- higher absorbability
- effect on fresh concrete consistency
- compressive strength and modulus of elasticity is 10- 20% lower
- creep coefficient is up to 50% higher
- higher shrinkage by 20- 40%

Transport Structures Foundation

Geotechnics tasks in improving unfit soil/subgrade are generally solved by treated soil. For soil stabilization, the following agents are utilized:

- Binder – cement and lime, foamed asphalt
- Hydraulic road binder (mixed cement)
- Slag: is a by-product in the production of iron in a blast furnace. Its properties are among the latent hydraulic additives. The quality of the slag is assessed in terms of the alkalinity module. The fine slag particles are advantageous for filling the space between the cement particles, thereby improving flow ability, porosity, durability, water- tightness and especially frost resistance of hardened concrete. After adding water, slag itself does not solidify or harden. The hydraulic properties become apparent only after the addition of the so-called activator, which is cement in the concrete. In fresh concrete improves rheological properties and viscosity. However, it adversely affects the strength increase.
- Fly ash or stabilized mixture: In fresh concrete, fly ash improves workability and when used, the amount of water used decreases. In hardened concrete, it positively affects carbonation and long-term strength, but short-term strength is lower. Concrete with fly ash resists aggressive environment (frost and CHRL).

Railways

In Czech Republic, there are steel railways with corresponding amount of rail fastenings. There are sleepers (wood or concrete) layered in track bed. It is showed in the chart below the reuse and material handling of railways structure components:

Gravel bed	rolling bed recycling (partly) recycling into structural layers (often) recycling" to other earth structures (only marginally) landfill hazardous waste landfill
Structural layer material	recycling to structural layers recycling to other earth structures landfill (probably mostly) hazardous waste landfill
Prefabricates from concrete or reinforced concrete	sleepers (mostly as other prefabricated elements of similar material, possibly for low frame and retaining walls) Others
Impregnated wood	sleepers (hazardous waste)
Other matter	similar to other constructions

Ballast layer

The most important functions of ballast structure can be stated as: Structural Support, Drainage, Reduce Frost Problems, Absorb noise. Upon cyclic loading of trains and through weathering processes, ballast deteriorates by time. Recycling of a rail bed aggregate is currently carried out essentially by two technologies:

- The **machine cleaning**, which is performed by ballast cleaners or also called undercutters.
- Within the use of **recycling and crushing method,** the track bed is completely excavated with wheeled rotary excavators and transported by trucks to a recycling base. Sorting of aggregate is performed on vibration screens with supercritical vibrations of the sorter. Crushing is performed by a conical or reflective crusher. This method achieves better parameters of recycled aggregate produced, as well as a smaller amount of "waste ", that is difficult to use. However, this approach is time consuming and there are relatively high transport costs.

Railway sleepers

To treat impregnated wooden railway sleepers, toxic chemicals are used to prolong their durability, resistance to weathering, rot, parasites, water and fire. In the past, especially tarry residues from the distillation of coal coke were used. Impregnated wooden sleepers can be used: for construction purposes, as a designated construction product, and for reinforcement of taxiways and courtyards. Concrete sleepers can be used e.g. for building of retaining walls and similar structures.

Roads

Road pavement challenges are operational capability and bearing capacity, durability of surface course, maintainability and reparability. In the Czech Republic, the technical standard is the use of recycling C&D materials to road construction by cold and hot recycling of flexible pavement structures (rehabilitation procedures).

The most important material is recycled bituminous aggregate – R-material, which can be used without the addition of a new binder for recycled use for low-load pavement course and base course, or with the addition of a hydraulic binder (cement, lime or slag) for the underlying underlays of all types of roads, for pavements, parking lots, etc. CRmB- Crumb Rubber modified Bitumen helps to reduce traffic noise, reduces stopping distance (skid resistance), creating ruts and cracks in the road and layer thicknesses.


University of Pardubice
Faculty of Transport Engineering
CONDEREFF
Interreg Europe
European Union
European Regional Development Fund
REUSE OF BUILDING MATERIALS IN TRANSPORT STRUCTURES
(CZECH REPUBLIC)
ROADS, RAILWAYS, TRANSPORT STRUCTURES FOUNDATION AND CONCRETE STRUCTURES
LOPOUR PAVEL
BORECKÝ VLADISLAV


CONTENTS
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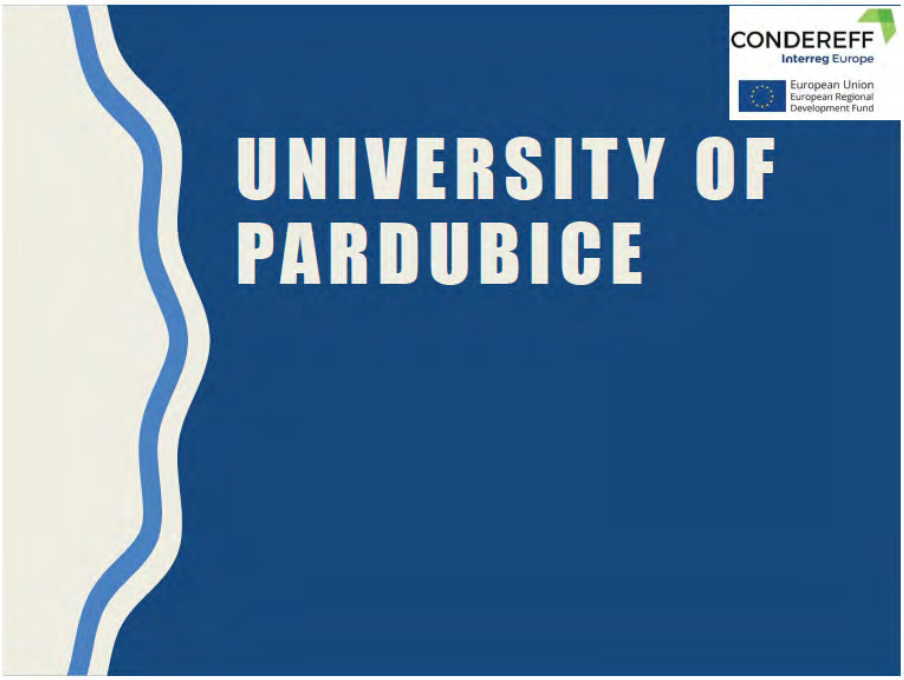
• University of Pardubice
• General Preface C&DW in Czech Rep.
• Concrete Structures
• Transport Structures Foundation
• Railways
• Roads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FACULTY OF TRANSPORT ENGINEERING

Transport technology and communications
Transport engineering and communications
Civil engineering - Transport Construction
Technique and technology in transport and communication

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EDUCATIONAL AND RESEARCH CENTRE IN TRANSPORT

Transport structures (***section DS***)
Transport means – rail vehicles (***DP-KV***)
Transport means – road vehicles (***DP-SV***)
Transport means – measurements and diagnostic (***DP-D***)
Transport means – electrical engineering, electronics and control systems (***DP-E***)
Materials and Mechanics (***MM***)
Dynamic test stand (***DZS***)

SECTION OF TRANSPORT STRUCTURES

- Diagnostic of Roads
- Concrete Properties
- Geotechnical Tests
- Mechanical Properties of Building Materials
- Dynamic Test Stand
- NDT by Ground Penetrating Radar

GENERAL PREFACE

C&DW IN CZECH REP.

Recycled Materials used in Transport Structures

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Construction and demolition waste

- Cement-concrete recycled
- Underlying recycled pavement
- Brick recycled
- Asphalt recycled
- Compound recycled

Industrial secondary raw materials

- Slag (Blast furnace s., Foundry s.)
- Fly ash
- Fly ash stabilizer
- Cold dump
- Used tires
- Coal tailings

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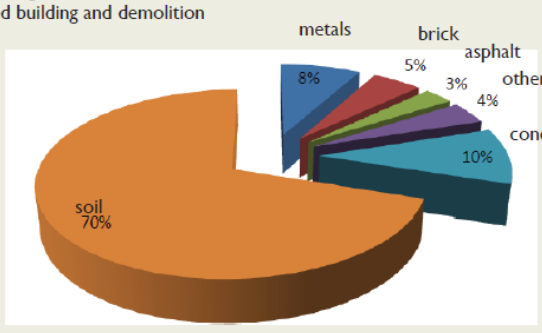
Construction and demolition waste defined by **Group 17 of the Waste Catalog**.

according to Decree No. 93/2016 Coll.

17 0100 - Concrete, coarse and fine ceramics and plaster and asbestos products
17 0200 - Wood, glass, plastics
17 0300 - Asphalt, tar, tar products
17 0400 - Metals, metal alloys
17 0500 - Soil extracted
17 0600 - Insulating materials
17 0700 - Mixed building and demolition



Construction and demolition waste reuse

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	rok	2007	2008	2009	2010	2011	2012	2013	2014
Total	[kt]	14 264	15 365	14 883	15 210	13 239	13 447	14 004	15 916
Recyclation	[kt]	2 943	2 932	2 503	2 475	2 647	3 300	3 797	4 110
Reuse on ground I	[kt]	6 796	7 939	8 225	5 555	5 221	5 300	5 686	7 654
Recultivation II	[kt]	1 048	1 922	566	480	1 007	987	1 031	752

In 2017, 8 987t of 24 925 was from construction waste.

Waste and secondary raw material distribution in 2017

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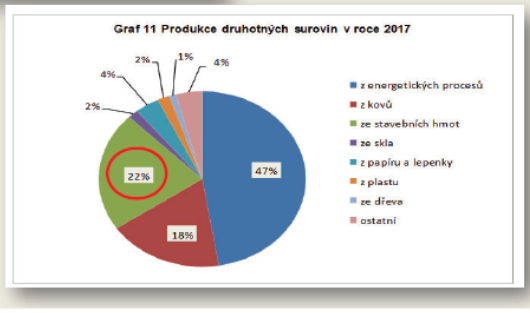

Requirements for building materials

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- mechanical strength and stability
- fire protection,
- hygiene, health and the environment,
- safety in use
- noise protection
- energy saving and heat protection.

Criteria for assessing industrial waste for use in construction

- technical quality
- environmental burden
- psychological moments (accepting waste in structures) accepting materials that, in addition to the technical - science criteria of quality and environmental burden, are also added to the psychological moments that often come from irrational elements, or from competing elements
- economic advantage of using recyclates.

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CONCRETE STRUCTURES

CONCRETE RUBBLE RECYCLATION

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CONCRETE

Concrete is a high-energy and raw material demanding construction material.

Globally, the volume of concrete produced annually is estimated at **9 billion cubic meters**, of witch **9,000,000 cubic meters** per year in the **Czech Republic.**

Production of each ton of traditional Portland cement results in the release of one ton of carbon dioxide into the atmosphere.

RECYCLING OF FRESH LIQUID CONCRETE RESIDUES FROM FRESH CONCRETE PRODUCTION

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Use recycling device for dissolution and dispersion of liquid fresh concrete residues - (i.e. sorting to aggregate and sludge water). This waste is primarily produced by **daily cleaning** of concrete mixers, concrete autoclaves, concrete mixing plants and prefabricated units.

RECYCLING OF HARDENED CONCRETE

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The ways to use recycled concrete material:

- as backfill material
- as material for the earth body for road and rail construction
- as the aggregate of the superstructure or unbound construction layers of the roads
- as aggregate for concrete of lower strength classes with low requirements for the quality of aggregates (base or filler layers of concrete)

RECYCLING OF HARDENED CONCRETE / CONCRETE RUBBLE

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Concrete structures are transported to concrete recycling or concrete plants.

Recycled Concrete Aggregate Properties

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Characteristics

- a suitable **shape index**, **lower bulk density** and higher absorbability
- effect **on fresh concrete consistency (higher w)**
- compressive **strength and modulus of elasticity** is 10 - 20% lower,
- **creep coefficient** is up to 50% higher
- higher **shrinkage** by 20 - 40%

Weaknesses

- occurence of **variable** properties
- uncertainity of **age,**
- uncertainity of **composition**
- uncertainity of **chemical and mechanical exposure**
- limit the **maximum grain size** to 16 - 22 mm (cracks)

APPLICATION OF SECONDARY MATERIALS

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- application of admixtures to concrete,
- application of artificial porous aggregate,
- use of cement with added waste materials

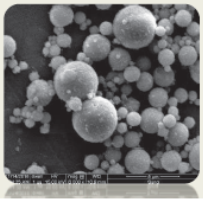
APPLICATION OF WASTE ADMIXTURES IN CONCRETE PRODUCTION:

Fly ash

Fly ash is produced by high-temperature combustion of pulverized coal. It contains more than 50% glassy phase (note: the greater the content, the more ash is reactive).

The use of fly ash has an effect on the color of the concrete. In fresh concrete, fly ash improves **workability** and when used, the amount of **water used decreases**.

In hardened concrete, it positively affects carbonation and **long-term strength**, but short-term strength is lower. Concrete with fly ash **resists aggressive environment** (frost and CHRL).




APPLICATION OF WASTE ADMIXTURES IN CONCRETE PRODUCTION:

Blast furnace slag

Its properties are among the latent hydraulic additives. The slag has a very similar **chemical composition to cement**, but differs in its percentage.

The **quality of the slag** is assessed in terms of the **alkalinity module**.

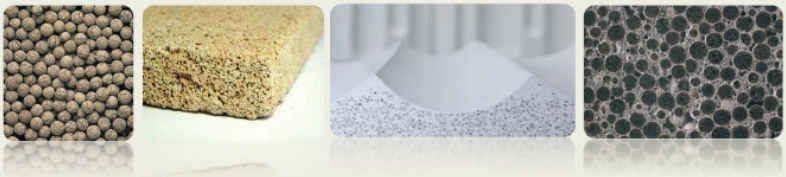
The fine slag particles are advantageous for filling the space between the cement particles, thereby **improving flowability** (similar to microsilica), **porosity**. **durability**, **watertightness** and especially **frost resistance** of hardened concrete.

Fresh concrete improves rheological properties and viscosity. However, it adversely affects the **strength increase**.



COMPARISON OF TECHNICAL AND TECHNOLOGICAL PARAMETERS OF LIGHTWEIGHT ARTIFICIAL AGGREGATES AVAILABLE IN THE CZECH REPUBLIC:

Name	Fraction [mm]	Bulk density [ρ_s]	Crush resistence [MPa]	Share of waste materials [%]	Production temperature [°C]
Rugen	4/8	500 - 1200	2 - 20	60 - 100	≥ 5
	8/16	400 - 1000	1 - 12	60 - 100	≥ 5
SioPor	0,1/1	120 - 160	0,08	0	300
	0,63/2,5	60 - 100	0,03	0	300
	2,5/4	60 - 80	0,01	0	300
Poraver	2,4/4,8	145 - 230	1,3	100	900
Liapor	0/2	575	4	0	> 1100
	0/4	450	2,1	0	> 1100
	4/8	450	1,7	0	> 1100
	8/16	275	0,6	0	> 1100



RELATED RESEARCH

Topics

- Constructional lightweight concrete with an emphasis on the types of used aggregates
- Comparison of the effect of admixtures on the durability of concrete
- Experimental Analysis of the Impact on the Durability of Concrete Additions
- Edit the Properties of the Fresh Concrete Admixing Additives and Steel Fibres
- The experimental analysis of ultra-high strength concrete
- etc.

TRANSPORT STRUCTURES FOUNDATION

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SUBGRADE AND BED STABILIZATION - GEOTECHNICS TASKS

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Technical standards

- TP 94 -Treated soil
- ČSN 73 6133 - Road earthwork – Design and execution

Bounded courses - subgrade

Soil stabilization

- Binder – cement and lime, foamed asfalt
- **Hydraulic road binder (mixed cement)**
- **Slag**
- **Fly ash or stabilized mixture**

EARTHWORKS -EMBANKMENTS

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To prevent flooding by Labe river near Pardubice - Svítkov

Stabilized mixture

- 3-5% lime
- 20-25% FGD
- 45-52% fly ash
- 18-20% water

- Mixture conditions
  - screw mixer with water
  - mixture hardening

EARTHWORKS - EMBANKMENTS

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- Technological conditions
  - Earth water protection with drainage layer
  - Levelling, compacting

EARTHWORKS - EMBANKMENTS

- Laboratory and field tests
  - Moister content
  - Compaction ratio 97% PM

RELATED RESEARCH

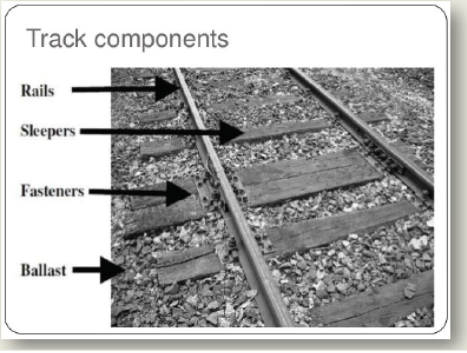
Topics

- Use of secondary materials in the construction of linear structures
- Improvement and soil stabilization using hydraulic binders, slag and ash
- Use of fly ash and ash stabilizer in construction
- Etc.

RAILWAYS

Amount of material on railways in Czech Republic

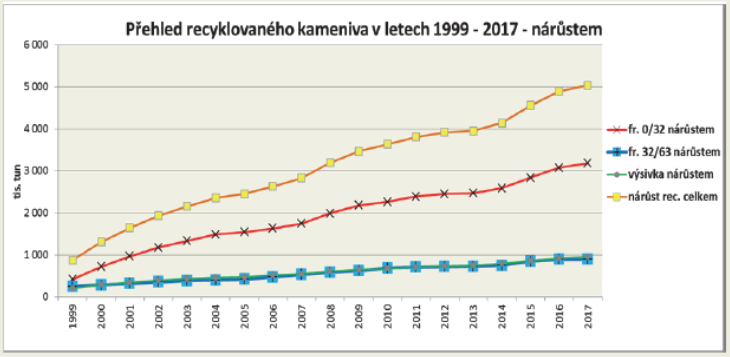
1. rails - approx. 31 000 km, different types, mostly 49 E1, 60 E2, ie. over 200 ths. m3 of steel rail
2. fastening rails to rail supports
3. sleepers - approximately 25 Million Pcs
4. track bed (about 25.4 million m3 of gravel fr. 31.5-63 mm)
5. the structural layers of the substructure body – aggregates and bound courses
6. other parts of railway structures



Amount of recycled material on railways

More than **5 million tones of aggregate from the railway bed** have been recycled at the end of 2017, which is approximately 3.5 million m^3 in approximate conversion.

It coresponds to **3 years** of usual production for railway structures in our quarries.



Reuse and Material Handling

1. Gravel bed
a. Rolling bed recycling (partly)
b. Recycling into structural layers (often)
c. "recycling" to other earth structures (only marginally)
d. landfill
e. hazardous waste landfill

2. Structural layer material
a. recycling to structural layers
b. "Recycling" to other earth structures
c. landfill (probably mostly)
d. hazardous waste landfill

3. Prefabricates from concrete or reinforced concrete
a. Sleepers (mostly as other prefabricated elements of similar material, possibly for low frame and retaining walls)
b. Others

4. Impregnated wood - sleepers (hazardous waste)

5. other matter - similar to other constructions

Ballast layer

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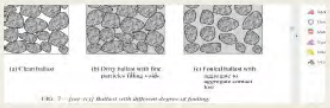
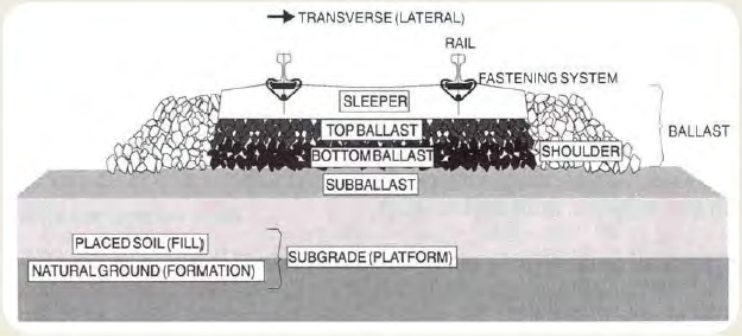
The most important functions of ballast structure can be stated as:

- **Structural Support** : Resist vertical, lateral and longitudinal forces, Support sleepers, Reduce stress on subgrade
- **Drainage**
- **Reduce Frost Problems**
- **Absorb noise**





Recycling technologies of ballast

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Machine cleaning

- sorting the fine fraction from the existing rail bed so that fraction 32/63 aggregate remains for further use.
  - advantage - speed and simplicity,
  - disadvantage - worse effecienty.

RM 79 Plasser und Theurer unit

The RM 900 VB Plasser und Theurer unit

Recycling technologies of ballast

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Recycling and crushing method

- using technology to **bring the superstructure down**.
- **track bed is completely excavated** with wheeled rotary excavators and transported by trucks to a recycling base.
- Sorting is performed on **vibration screens** with supercritical vibrations of the sorter.
- The **crushing** is performed by a conical or reflective crusher.

- Advantage – achieve better parameters of recycled aggregate produced as well as a smaller amount of „waste" that is difficult to use;
- Disadvantage – time consuming technology, transport cost

Recycling technologies of ballast

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Rail assembly technology

- combines the advantages of **better quality** of aggregate produced by recycling by crushing and sorting with a **shorter time needed**.

The rail units allow the complete recovery of the ballast bed, or the rehabilitation of the substructure layers using recycled material, without dismantling the **rail grate**.

Impregnated wooden sleepers

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Some possible uses of impregnated wooden sleepers:

- for construction purposes, in accordance with a construction project, as a designated construction product (eg staircase for outdoor use)
- as a bridge in accordance with a construction project on other line constructions than on railway lines (as a designated construction product)
- for reinforcement of taxiways and courtyards



Concrete sleepers

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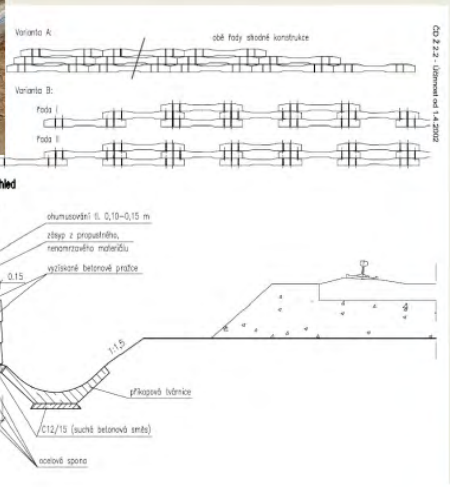

ROADS

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ROAD PAVEMENT CHALLENGES

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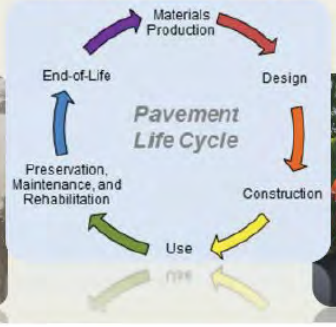
It is estimated that **more than 90%** of the 5.2 million kilometers of European paved roads and highways are **surfaced with asphalt**. Also, about 44% of goods are transported by road in the EU.

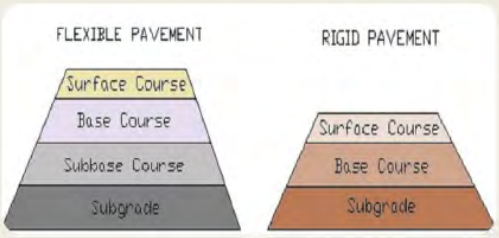
Road pavement challenges – operational capability and bearing capacity, durability of surface course, maintainability and reparability

= Reliability of the pavements



Road pavement layers

- Structures
- Materials
- Survey / diagnostic



C&DW – TECHNICAL STANDARDS

Technical standards

- **TP 210 - The use of recycling C&D materials to road construction**
- **TP 208 - Cold recycling of flexible pavement structures**
- **TP 209 - Hot recycling of flexible pavement structures**

Others related standards – „design and execution“

- TP 111 „přímé využití recyklovaného materiálu do vozovek“
- ČSN EN 13108-8 „ Asfaltové směsi – Specifikace pro materiály – Část 8 : R-materiál
- TP 126 „použití R-materiálu smícháním s kamenivem a asfaltovou pěnou pro PK“
- TP 134 „údržba a oprava vozovek s použitím R-materiálu obalovaného za studena asfaltovou emulzí a cementem“
- TP 150 „Souvislá údržba a oprava vozovek PK obsahující dehtová pojiva“
- TP 162 „ Recyklace konstrukčních vrstev netuhých vozovek za studena na místě s použitím asfaltových pojiv a cementu“

RECYCLED BUILDING MATERIALS FOR ROAD CONSTRUCTION

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- **Concrete recycled - Rc ≥ 90 %;**
  (Ru + Rb) ≤ 6 %; Rg ≤ 1 %; (X + Y + FL) max 3 % and FL max 1 %
- **Pavement recycled - (Rc + Ra + Ru) ≥ 95 %;**
  Ra max 30 % and (X + Y + FL) max 5 %
- **Masonry recycled - (Rb + Rc + Ru) ≥ 90 %;**
  (X + Y + FL) min 10 %
- **Mixed recycled – (X + Y + FL) ≤ 10 %**
- **Reclaimed asphalt material / R-material - Ra > 95 %;**
  (Rc + Rb + Ru + X + Y + FL) = 5 %
- **Recycled asphalt - 30 % < Ra < 95 %**
  - Other Particles (X)
  - Other nonC Particles (Y)
  - Floating Particles (FL)

Marking	Description
Rc	Concrete, products, mortar products, masonry
Ru	Unbound, natural and hydraulic bound aggregates
Rb	Burnt and sand-lime masonry elements, Masonry items, aerated concrete
Ra	Asphalt material
Rg	Glass
X	Adhesion (clay and dirt), Diverse: metals (ferrous and non-ferrous), non-floating wood, plastics and rubber, gypsum plaster

Recycled bituminious aggregate = R - material

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- Without the addition of a new binder for recycled use for **low-load pavement course and base course**.
- With the **addition** of a hydraulic binder (cement, lime or slag) for the underlying underlays of all types of roads, for pavements, parking lots, etc.

SURFACE COURSES

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CRmB - Crumb Rubber modified Bitumen

Asphalt produced in this way helps to **reduce traffic noise**, reduces **stopping distance** (skid resistance), **creating ruts and cracks** in the road and layer **thicknesses**.

Asphalt mixtures + CRmB

SMA (Stone mastic asphalt)

AC (Asphalt concrete)

BBTM (Bétons bitumineux très minces)

PA (Porous *Asphalt)*

Disadvantages

High requirments for bitumen rubber materials (shape and size) – quality control req.

Construction – temperature req.

Req. to store

Over 8 years of application in Pardubice Region especially for reconstruction of II/II class roads.

Správa a údržba silnic
ŘSD ČR
Gumoasfalt

SURFACE COURSES

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Partialy substitution of „greener" materials into asphalt mixtures

- **Modified Bitumen** – bio-fluxing bitumen / bio-derived industrial waste
  - lignin (by-product of 2nd generation bioethanol processing) and
  - bio-binder from vegetable oil
- **Aggregates substitution** – high rates of RAP and C&DW

BASE COURSES

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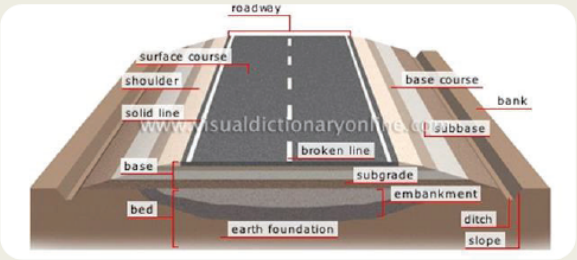
Bounded courses of pavement structure according binder

- Bounded courses with cement (SC)
- **Bounded courses with slag (SS)**
- **Bounded courses with fly ash (SP)**
- **Bounded courses with hydraulic road binders (SH)**



REHABILITATION PROCEDURES

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Acc technology temperature

Cold recycling

- The cold recycling process involves milling and granulating damaged asphalt layers which are then rebound, placed again and compacted.

Hot recycling

- Hot in-place recycling is a method in where the existing pavement is heated and softened, and then scarified/milled to a specified depth.
- Around **85 % of truck transports and about 70 % of virgin mix** are saved in comparison to conventional methods using milling machines and road pavers.

REHABILITATION PROCEDURES

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Acc mixing place

- **Mixed-in-plant process**
  - reclaimed asphalt pavement and crushed stone are transported to a mixing plant located in the vicinity of the construction site.
    Here the milled material is mixed with binders (or RAP) to produce a new construction material mix which is reused either on the same or on a different construction site.

- **Mixed-in-place / in-situ process**
  - a cold recycler granulates the existing pavement while mixing in binders and water homogeneously at the same time.

COLD RECYCLING

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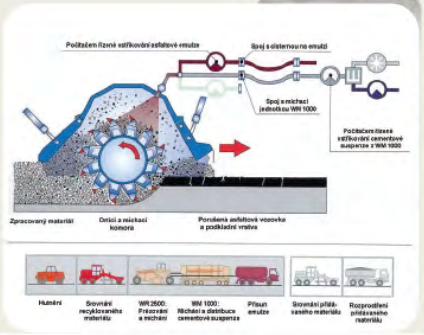
RAP is recycled as „aggregates“.

Pre-spread or injected

- cement (cement slurry)
- bitumen emulsion / foamed



COLD RECYCLING

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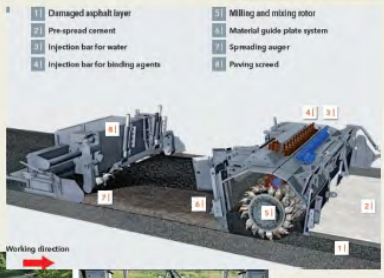
High performance screeds
- Cold recycle and paving screeds



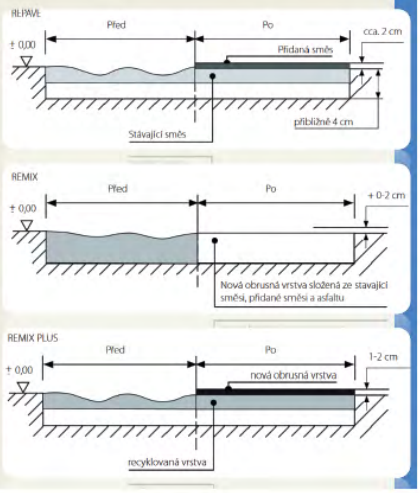
HOT RECYCLING

RAP is recycled as „aggregates and binder“.

- RESHAPE
- REPAVE
- REMIX
- REMIX PLUS

HOT RECYCLING

- **RESHAPE** - Existing asphalt surface is heated and scarified to a specified depth; scarified material is combined with aggregate and/or recycling agent; and recompacted. A new overlay or treatment is placed on surface.
- **REPAVE** - simultaneous combination of surface recycling with a HMA/WMA overlay placed and compacted at the same time.
- **REMIX** - Scarified RAP is combined with virgin HMA and mixed in a pugmill then placed and compacted as a single mix/lift
- **REMIX PLUS** – plus new surface in 2 steps



RELATED RESEARCH

The use of recycled concrete in a cement-bound sub-base layers of roads

- Experimental part describes tests of recycled concrete and aggregates including the production of test specimens and tests carried out on them, which are evaluated.
- In conclusion there are summarized and compared evalution results of the experiments.


RELATED RESEARCH
CONDEREFF Interreg Europe
European Union European Regional Development Fund
Topics
• Cold in-Place Recycling
• The use of recycled concrete in a cement-bound sub-base layers of roads
• The use of R-material in road pavement sub-base course
• The use of slag admixture in cold recycling receipt
• Etc.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THANK YOU FOR YOUR ATTENTION!

LECTURE VII - PRE-DEMOLITION AUDITS AS A TOOL FOR AN ECO-EFFECTIVE MANAGEMENT OF CDW

Paola Altamura (Sapienza University of Rome, Italy)

PRE-DEMOLITION AUDITS AS A TOOL FOR AN ECO-EFFECTIVE MANAGEMENT OF CDW

***Paola Altamura*[1]**

[1]*Sapienza University of Rome (Italy)*

ABSTRACT

The main objective of this speech is to explain the current Italian situation related to the energetic construction sector and expose the procedures for pre-demolitions audits, tools for estimating material typologies, and geo-location of recycling plants.

Italy has been making a very high resource consumption due to extraction of raw materials from quarries. As quarrying material is free, large share of CDW is produced. In order to reach a different approach, the Framework directive 2008/98/EC makes Re-use the most important strategy in recycling to lower use of energy in the processing of the materials. That is to say, that some environmental criteria must be adopted. For example: Mandatory use of min 15% recycling materials content or Mandatory pre-demolition audits, which is the target of this speech.

These are some of the strategies, which imply a very good knowledge of the existing building materials, that can be carried out:

- Optimizing technological design of materials in new buildings.
- Designing buildings with reused materials and innovating management construction, in order to reduce and prevent construction waste production.

Selective demolition process:

- Preliminary inspection: surveys to obtain an assessment on the existing building.
- Several actions allow us to quantify and characterize the materials in existing buildings that can be removed before, in order to identify the most appropriate demolition techniques and the best environmental options. 3 groups can be classified: hazardous materials, reusable-recycled materials, and inert waste. This means that share materials that go to landfill is limited.

Supporting tools:

- SMARTWaste Plan by BRE (UK) helps to forecast waste arising based on data that software has gathered in long years of use. It is useful when a pre-demolition audit has not been made.

Other tools help us to make surveys: drones, laser scanner, data about BIM (building information modelling)

- GIS MAP- Bremap: helps you finding existing plans for reclaim-reuse-recycling-recovery-disposal of different types of CDW.
- GISMAP – Harvest map: helps you to put down maps of the potential sources of reclaimed materials not only for building sector, also the industrial.
- SALVOWEB promote our materials that we 've gathered from demotion to sell them.

The Pre-demolition Audit identifies the types of the main materials that will be removed and quantify their volume and weight (also waste management). It helps in in the drafting of the Site Waste Management Plan. What is more, it must include: the savings and costs, CO2 emissions, the maximized recovery of Waste and the potential to acquire credits in environmental certification protocols. It can also be conducted by drawings and photographic documentation, with surveys to test the state of conservation of the materials and a quick estimation of the amount of C&D waste that can result from demolition.

In other words, the audit must be structured according to needs and express the estimates of the materials in volume and weight, savings, environmental impacts and estimate of the market value, technical and operational specifications

In the 3rd April CONDEREFF conference a case of study was exposed: a school building in the UK. The structure followed in the process was:

- Surveys for measuring dimensions and noting materials of technical elements and visible components
- Graphic restitution of the building survey with attribution of the materials
- Calculation of components and materials in terms of volume / weight
- Key Demolition Products (KDP) identification
- Analysis of potential reuse / recycling options for KDPs
- Final recommendations on potential channels for the sale / donation of reused components and on possible recycling solutions

- Target for reducing the volume of waste to be sent to the landfill and indications for drafting the SWMP (Site waste management plan).

To conclude it was underlined the importance of the audit for the preparation of an SWMP (Site Waste Management Plan), which accurately predicts times, costs, obtainable materials and their possible destination, draws the greatest environmental and economic benefits and chooses the most properly demolition techniques but also a careful organization of the site.

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UNIVERSITAT POLITÈCNICA DE VALÈNCIA 50 anys

International workshop RCDS demolition audits supervision and documentation
Universitat Politecnica de Valencia, 03.04.2019

PRE-DEMOLITION AUDITS AS A TOOL FOR AN ECO-EFFECTIVE MANAGEMENT OF CDW

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Sapienza University of Rome, Italy

CONDEREFF Interreg Europe

Contents

Context: consumption and waste of raw materials in the Italian building sector

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The management of building materials and waste in Europe: environmental issues

Passiv Houses, Nearly Zero Energy buildings, Plus-Energie Häusern... very good achievements concerning operational energy, but what about **embodied energy?**

Very high resource consumption:

- raw materials in the construction industry represent **50% of the excavated materials each year.**
- **10-15% of energy consumption in the construction sector** worldwide is due to raw **materials extraction.**

Huge waste production:

- **inert waste** make up **one third of the entire volume of waste** produced annually in EU, which means **one billion tonnes per year.**

Paola Altamura | "Sapienza" University of Rome (IT)

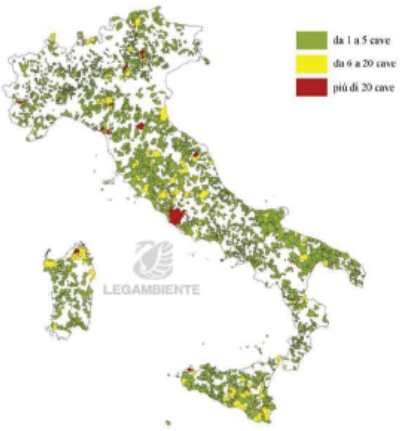
CONDEREFF Interreg Europe

Consumption and waste of building materials: the Italian reality

Materials extraction

Quarries:

- **130.000.000 cubic meters** of raw materials extracted in 2010 were **destined to the production of concrete** for the building sector
- **5.736 active quarries** in 2010
- **15.000 abandoned or disused quarries**
- **2.240** towns have at least one active quarry
- Very **low extraction fees**, in four regions there is no fee at all.
- Severe **injuries to the landscape**
- Severe risk of **hydro-geological instability**.



Distribution of quarries on the Italian territory.
Source: Rapporto cave, Legambiente, 2011

Consumption and waste of building materials: the Italian reality

Consumption and waste of building materials: the Italian reality

Causes:

Concession fees are very low or null

Regione	Canoni per sabbia e ghiaia (€/m³)
Abruzzo	Sabbia 1.42 Ghiaia 1.13
Veneto	0.62
Emilia-Romagna	0.57
Toscana	0.46
Lombardia	0.44
Umbria	0.375
Lazio e Valle d'Aosta	0.30
Basilicata, Calabria, Sicilia e Sardegna	Gratuita

Source: *Rapporto cave*, Legambiente, 2011

Consequences:

Deep changes to the landscape, hydrogeological risk

Orographic inversion due to a limestone quarry of Gravina in the Alta Murgia Park, Puglia.

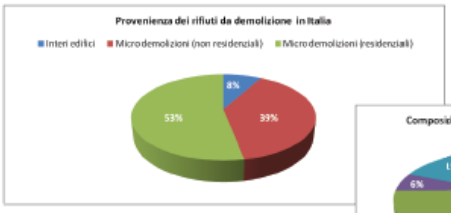
Consumption and waste of building materials: the Italian reality

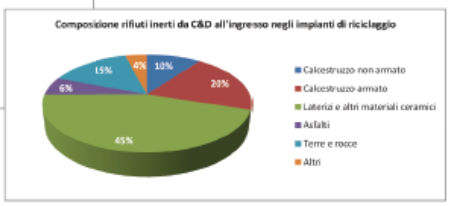
Paola Altamura | "Sapienza" University of Rome (IT)

Consumption and waste of building materials: the Italian reality

C&D waste production and management in Italy:

- **25%** in volume of the waste produced comes from the building sector
- **30%** of waste materials go to landfill, **70%** to **recycling plants**, unknown quantities are **fly-tipped**
- **75-85%** of C&D is inert waste





Consumption and waste of building materials: the Italian reality

Landfills and recycling plants:

Saturation of the plants storage space because of the poor sales of recycled aggregates, despite their high quality and CE certification.

Production of recycled aggregates with different particle sizes in the *Ecologica 2000 plant* in Rome.

Consumption and waste of building materials: the Italian reality

Paola Altamura | "Sapienza" University of Rome (IT)

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EU and Italian regulations fostering the circular approach

Closed-loop use of building materials in Europe: regulations

EU Directives and documents

- **Directive 2008/98/EC on waste (Waste Framework Directive):**

Article 11 states that 'by **2020**, the **preparing for re-use, recycling and other material recovery**, including backfilling operations using waste to substitute other materials, of non-hazardous construction and demolition waste excluding naturally occurring material defined in category 17 05 04 in the list of waste **shall be increased to a minimum of 70% by weight**'

EU Member States shall apply as a priority order the waste management hierarchy

Closed-loop use of building materials in Europe: regulations

Roadmap to a resource efficient Europe (COM/2011/0571):

by 2020 'significant improvements in resource and energy use during the life-cycle – with **improved sustainable materials, higher waste recycling, and improved design** – will contribute to a competitive construction sector and the development of a **resource efficient building stock**. This requires the active engagement of the whole value chain in the construction sector' [1].

'by 2020 the **renovation and construction of buildings and infrastructure will be made to high resource efficiency levels**. The **Life-cycle approach** will be widely applied; all new buildings will be **nearly zero-energy** (Directive 2010/31/EU) and **highly material efficient**, and policies for renovating the **existing building stock** will be in place (Art. 9, Directive 2010/31/EU) so that it is **cost-efficiently refurbished at a rate of 2% per year**'.

Closing the loop - An EU action plan for the Circular Economy (COM (2015) 614)

New rules on CDW eco-effective management of in Italy: GPP for public buildings

CAM (Minimum Environmental Criteria) of the National Action Plan for Green Public Procurement for Buildings

- Italy is the first EU Country to have made GPP (Green Public Procurement) **one hundred per cent mandatory in** some sectors, including **the building sector**
- The adoption of **CAM** (Minimum Environmental Criteria) of the National Action Plan for GPP **for Buildings** (**DM 24/12/2015** and updated version **DM 11/10/2017**) was made mandatory by the Italian Law 221/2015 and thereafter by the New Procurement Code (Legislative Decree 50/2016)
- Thanks to CAM for public buildings, an **articulated series of criteria promoting a closed-loop use of building materials** have been **mandatory** in public building projects **since 2015**

>> Selective demolition, CDW diversion from landfill, use of building products withe recycled content are becoming **mandatory and strategic in the tendering processes.**

Paola Altamura | "Sapienza" University of Rome (IT)

New rules on CDW eco-effective management of in Italy: GPP for public buildings

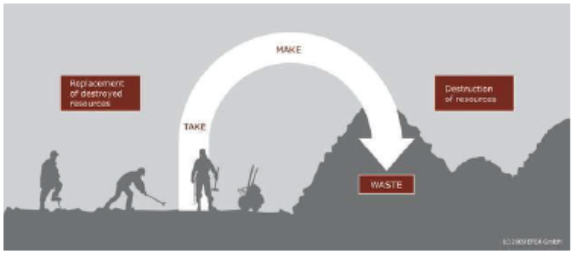
CAM (Minimum Environmental Criteria) of the National Action Plan for Green Public Procurement for Buildings

- These Criteria for interventions on public buildings, even though **not systematically applied yet**, establish a set of measures strictly related to the objective of Resource Efficiency, among the different energy and eco-compatibility targets:
  - use of a **minimum recycled content of 15% on the total weight of the materials used (5% for concrete elements)**
  - **reuse of stone masonry** and mixed (stone and bricks) for foundation and elevation works
  - **design for deconstruction** applied to at list **50%** of buildings components used in the intervention
  - **mandatory pre-demolition audits**
  - **mandatory selective demolition**
  - **70% diversion from landfill** of generated C&D waste.
- The mandatory recycled content is still a **limited target**, but is helping to start a **radical change** in the whole construction industry.

Paola Altamura | "Sapienza" University of Rome (IT)

Changing design and production model: a cradle to cradle approach

Cradle to Grave Design Paradigm



[Source: EPEA: http://epea-hamburg.org/index.php?id=198&L=0 (05/13)]

Flows of building materials within the building life cycle: the linear model.
[Source: Paola Altamura]

Closing the loop of production processes: the goal of eco-effectiveness

1972 | B. Commoner, ***The Closing Circle***
2002 | M. Braungart, W. McDonough, ***Cradle to Cradle: remaking the way we make things***

Main principles:

- **Waste = food**
- **From eco-efficiency to eco-effectiveness**

Eco-efficiency

one-way, linear flow of materials through industrial systems: eco-efficient techniques seek only to minimize the volume, velocity, and toxicity of the material flow system, but are incapable of altering its linear progression. Some materials are recycled, but often as an end-of-pipe solution, since these materials are not designed to be recycled. This process is actually **downcycling**, which limits usability and maintains the linear, cradle-to-grave dynamic of the material flow system.

Eco-effectiveness

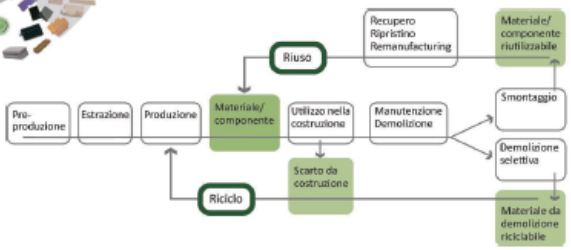
transformation of products and their associated material flows such that they form a supportive relationship with ecological systems and future economic growth. The goal is not to minimise the cradle-to-grave flow of materials, but to generate cyclical, cradle-to-cradle 'metabolisms' that enable materials to maintain their status as resources and accumulate intelligence over time (upcycling).

Paola Altamura | "Sapienza" University of Rome (IT)

Cradle to cradle design paradigm

"Waste equals food": each material is designed and used as a nutrient
[Source: C2C Network , *Perspective study: build theme*]

Closed-loop model for the building sector.
[Source: Paola Altamura]



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Translation into design and construction strategies

Materials of existing buildings

1_Preservation and adaptation of pre-existing buildings
2_Partial or total selective demolition of the existing building
3_Disposal of non-reusable C&D waste to recycling plants
4_Recycling of C&D waste on site
5_Recovery of components for reuse in other sites (sale or donation)
6_Reuse of demolition components on site for a new building

These strategies imply a very good knowledge of the existing building materials

Materials to be employed in the design project

7_Technological design optimization to reduce construction waste
8_Return surplus and construction waste to the manufacturer
9_Design for deconstruction and technological flexibility
10_Reuse of materials and / or reclaimed components from other construction sites or sources
11_Use of materials with recycled content
12_Use of environmentally friendly materials from certified / local supply chains

PRE-DEMOLITION AUDIT and coherent support tools

Building site management

13_ Innovative management of the construction site for waste and materials (monitoring, contracts, storage, etc ...)

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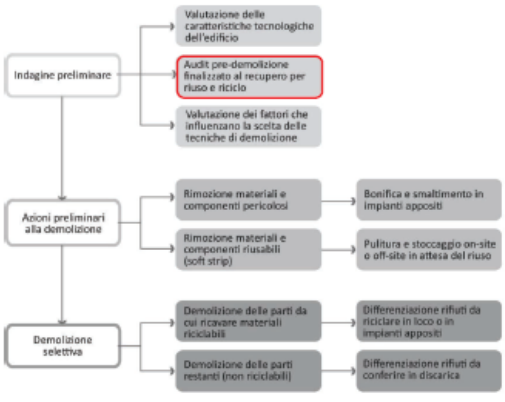
Procedures and support tools for implementing the circular approach

Procedures and support tools for implementing the circular approach

Selective demolition processes.



Procedures and support tools for implementing the circular approach

Pre-demolition audits: quantification and characterization of materials in existing buildings, in order to identify the most appropriate demolition techniques and the best environmental options

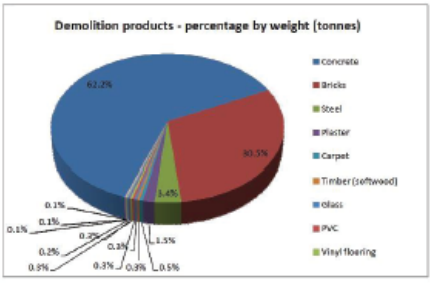
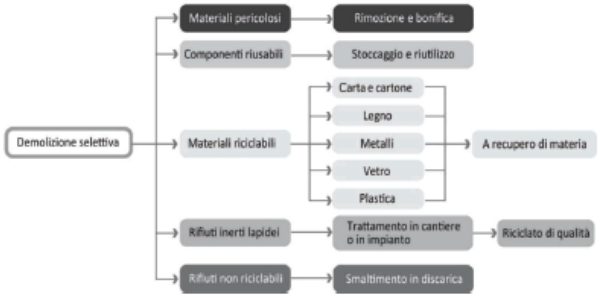


Chart 3: Demolition products in tonnes (percentages)

Demolition product	Volume (m^3)	Percentage
Concrete	1594.7	55.7%
Bricks	1104.2	38.6%
Plaster	129.5	4.5%
Timber (softwood)	44.7	1.6%
Bitumen	36.0	1.3%
Steel	26.5	0.9%
Vinyl flooring	13.3	0.5%
PVC	13.1	0.5%
Cement with 10% asbestos	10.6	0.4%
Glass	8.1	0.3%
Carpet	7.1	0.2%
Plastic containing asbestos	2.9	0.1%
Stone	2.8	0.1%
Total	2864.0	100.0%

Table 2: Key Demolition Products by volume in relation to other demolition products

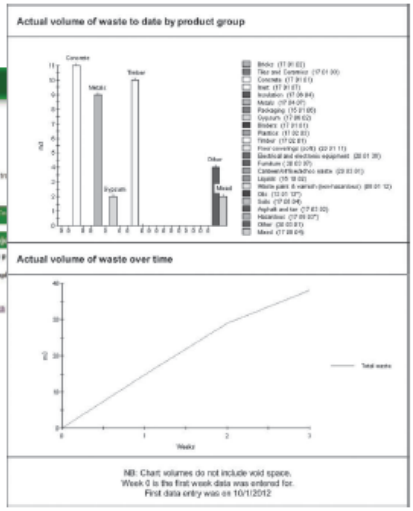
Procedures and support tools for implementing the circular approach



Procedures and support tools for implementing the circular approach

Web-based tools for the forecasting of waste arisings and for the management of C&D waste data in any construction project.

***SMARTWaste Plan* by BRE**



Instruments for surveying and estimating volumes and types of materials

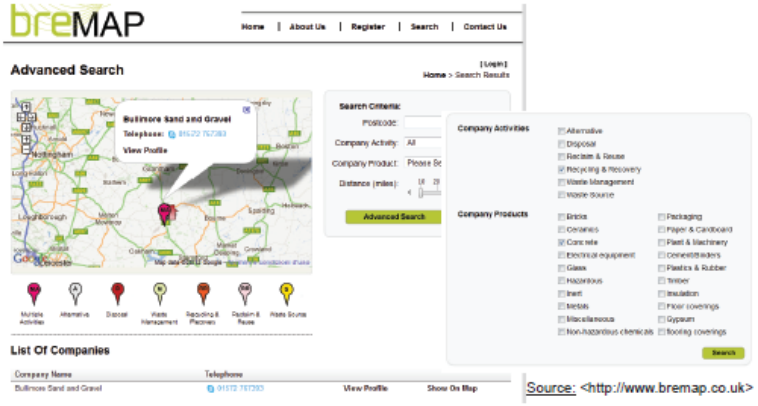
- Survey with drones, survey with laser scanner, manual survey
- Three-dimensional modeling with BIM (Building Information Modeling)
- Computing software interfaced with BIM
- IT services to support the development of C&D waste management plans (survey database for homogeneous portions of building stock)

Metior4 SMB [Source: Antonio Bottaro, Geoweb, 2016]

Procedures and support tools for implementing the circular approach

Web based GIS which map exsisting plants for the Reclaim-Reuse-Recycling-Recovery-Disposal of different types of C&D waste.

***BREmap* by BRE**

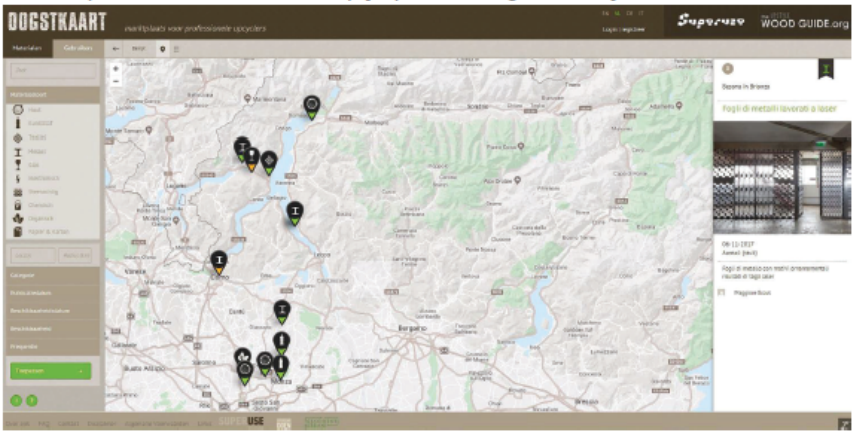


Source: <http://www.bremap.co.uk>

Procedures and support tools for implementing the circular approach

Web GIS maps for sharing local resource flows for architecture.

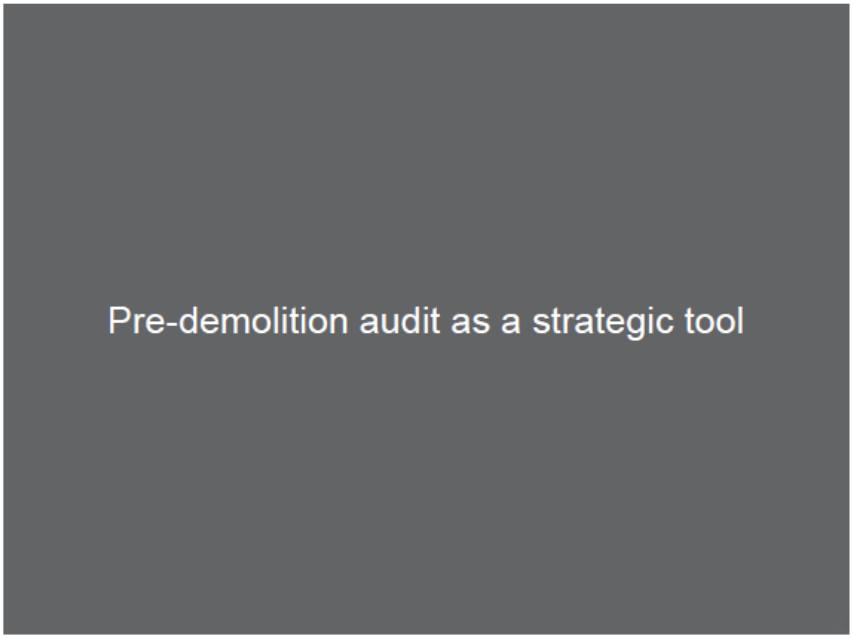
Superuse Studios' Harvest Map [https://www.oogstkaart.nl/]



Actions and tools for the promotion of an eco-effective management of waste

Platforms for the exchange/sale of reclaimed reusable materials and building components, which facilitate reuse through easy access to data.

Source: < http://www.salvoweb.com/ >



Pre-demolition audit: potentialities and contents

DEFINITION:

- analysis to be conducted on a building or infrastructure in order to estimate the quantities and types of materials present in view of a demolition or redevelopment project.

PURPOSE:

- To identify the main materials that will be removed and quantify their volume and weight, so as to allow the planning of the waste management options before the work starts.

POTENTIALITIES:

- It responds to both economic and environmental sustainability requirements, allowing the volume of waste to be sent to landfill to be reduced to a minimum.

CONTENTS:

- it is more useful if, in addition to quantifying the volume of materials that will be available at the end of the demolition, it also evaluates the potential for recovering materials for reuse / recycling.

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Pre-demolition audit: potentialities and contents

The pre-demolition audit aimed at reuse and / or recycling plays a decisive role in the effective design of the demolition process, since:

- It provides an overview of the materials and components available in the building
- It analyzes the relative potential for reuse / recycling / disposal
- It can direct the designer:
  - in understanding the potential of applying selective demolition to the specific building
  - in the choice of demolition techniques to be adopted
  - in the drafting of the Site Waste Management Plan.

Pre-demolition audit: potentialities and contents

The audit must contain and make clear to the client:

- the detailed analysis of the savings in raw materials, costs and CO2 emissions that can be obtained by diverting the demolition materials from landfill
- the strategies proposed to maximize the recovery of materials deriving from demolition
- The opportunities for reuse / recycling of the single demolition materials on site, in the case of refurbishment or demolition/re-construction, or the possibility of placing them in suitable local markets
- the identification of the potential to acquire credits in environmental certification protocols by implementing the proposed strategies
- the definition of maximum and minimum recovery targets (%) to be used in the demolition tender to select contractors and to verify the performance of the company on site
- The setting up of the Site Waste Management Plan.

Pre-demolition audit: methodology

The audit can be conducted:

- in an abstract way, analyzing drawings and photographic documentation of the building, calculating the quantities and types of materials that would be obtained with the demolition and identifying the alternatives for managing the different waste
- in a direct way, with surveys to test the state of conservation of the materials and provide a more documented evaluation of the practicable options and definition of the objectives actually achievable.
- making a quick estimate of the amount of C&D waste that can result from demolition, renovation or construction with the support of tools or real softwares.

The audit must:

- be structured according to the characteristics of the intervention
- express the estimates of the materials in volume and weight and the recovery thresholds in percentage.

Pre-demolition audit: output

The audit **output** provides detailed information on the recovery potential of the main materials deriving from the demolition.

In this way it is possible to identify strategies to reduce environmental impacts and the costs of landfilling waste, such as:

- special treatment in the case of hazardous waste
- reuse of components or materials with good residual performance
- recycling for materials capable of offering equivalent performance to a new material once reprocessed
- energy recovery or landfilling for materials that cannot be reused either in their original use or following a treatment.

Pre-demolition audit: output

If carried out in a complete way, the audit allows to quantify:

- savings achievable by reusing on site the recovered components and materials and / or the possible gain obtainable by selling them to third parties
- environmental impacts avoidable through reuse, recycling, etc.

To carry out this assessment, the auditor must:

- identify the potential market for recovered / recycled material
- provide an estimate of the market value of the component at local and national level
- quantify at least the energy / CO_2 embodied in the materials (or apply LCA methodology)
- offer technical and operational specifications for the separation of materials during demolition, and therefore on the techniques to be applied to ensure maximum recovery.

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Case study: pre-demolition audit of a school building in Hull (UK)

Pre-demolition audit case study: structure

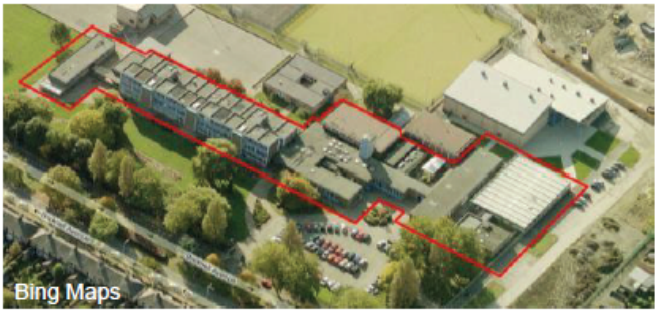
Pre-demolition audit carried out in the **United Kingdom in Hull, Yorkshire**, with the methodology developed by the **BRE** (Building Research Establishment) and Sapienza's contribution on a school building intended for total demolition.

Structure:

Step 1 - Surveys for measuring dimensions and noting materials of technical elements and visible components
Step 2 - Graphic restitution of the building survey with attribution of the materials
Step 3 – Calculation of components and materials in terms of volume / weight
Step 4 - Key Demolition Products (KDP) identification
Step 5 - Analysis of potential reuse / recycling options for KDPs
Step 6 - Final recommendations on potential channels for the sale / donation of reused components and on possible recycling solutions
Step 7 - Target for reducing the volume of waste to be sent to the landfill and indications for drafting the SWMP (Site waste management plan).

Pre-demolition audit case study: the building

The school building, object of the audit (4,500 square meters) is composed of three buildings with a reinforced concrete structure and brick facades and partitions.

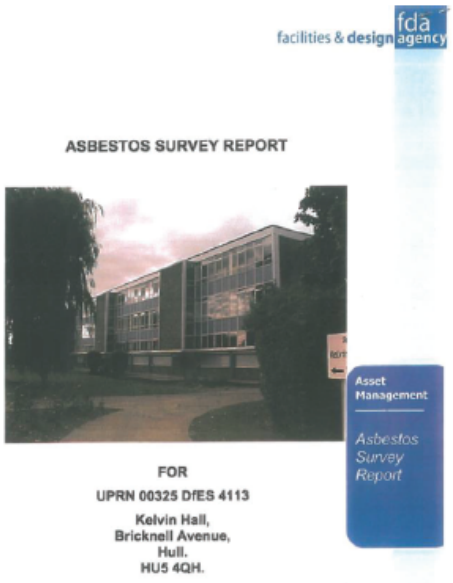


Case study available @ https://smartwaste.co.uk/_predemolition-and-prerefurbishment-audits
Published in the book Altamura P. (2015), *Costruire a zero rifiuti*, FrancoAngeli, Milano

Pre-demolition audit case study: asbestos survey report

The main building dates back to 1957, and is characterized, among other things, by the use on the façade of cement panels containing asbestos.
The widespread presence of hazardous materials and the small size of the building compared to the current school population, led the clients to opt for the total demolition and construction of a new school building.

Before the audit, a specific preliminary investigation was carried out to identify the components containing asbestos.



Pre-demolition audit case study: asbestos survey report

The Asbestos Survey Report identifies the presence of asbestos:

- in linoleum (vinyl-asbestos) tile floors, also present in the school canteen
- in the numerous facade panels in cement mixed with asbestos.

The audit refers to the Report for the treatment procedures of these dangerous components and confirms that, despite the good general conditions of the building, the transformation of existing buildings is risky for the environment and health due to asbestos, and the decontamination would have high costs..

Pre-demolition audit case study: STEP 1

Step 1 - *Surveys for measuring dimensions and noting materials of technical elements and visible components*

- Accurate dimensional and photographic survey, outside and inside the building
- Dimensional survey of all the different rooms and annotation of the dimensions and materials of the different technical elements and components (external frames, partitions, doors, etc.)
- Accurate survey of various equipment, furnishings, systems (still present since the building was still in use) detected by type and number of pieces, aimed at identifying the potential for reuse
- Measuring of external paved areas close to the facades
- Production of photographic documentation, in order to gather as much information as possible on the state of preservation of the components.

Pre-demolition audit case study: STEP 1

Example of products statistics for FLOORING

Figure 14: Carpeted classroom

Figure 16: Vinyl flooring in the first floor corridor

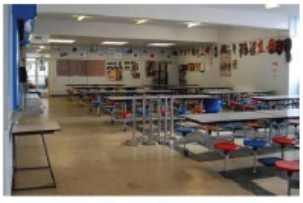


Figure 17: Vinyl flooring (contains asbestos)

Product statistics – Flooring

Element	Floor area covered (m^2)	Volume (m^3)	Tonnes	Percentage by weight
Carpet	1187.4	7.1	27.8	43.6%
Vinyl flooring	2685.0	13.3	18.0	28.2%
Concrete	156.0	4.7	11.2	17.6%
Thermoplastic tiles containing asbestos	574.1	2.9	4.0	6.3%
Timber (softwood)	676.7	5.4	2.7	4.3%
Total	**5259.2**	**33.4**	**63.7**	**100%**

Pre-demolition audit case study: STEP 2

Step 2 - *Graphic restitution of the relief of the building with attribution of materials*

- Realization of a CAD model of the buildings, in order to provide a good level of precision in quantifying the volumes of materials present
- Full estimate of the number and size of technical elements, including those that may have not been considered during the field surveys
- Organization of the model in levels corresponding to the different materials for an accurate estimate of all the waste that will be produced during the demolition.


Pre-demolition audit case study: STEP 3

Step 3 - *Calculation of components and materials in terms of volume / weight*

- Calculation of the main technical elements of the building, of which the dimensions were known following the survey or calculated by the CAD model
- Conversion, through the use of a table with the specific weights of the different materials, of the volumes in weight
- Drafting of a list of all detected components with indication of their material, weight and volume
- Identification of the main products that would be generated during the demolition, both in terms of volume and weight >>> the two data must always be compared in a pre-demolition audit, due to their different impact on waste management choices.

Reference	Location	Element/Component	Material	Number	Length	Depth	Height/Width	Square area	Volume	Conversion factor (tonnes/m³)=	Tonnes
Main building	Main Elevation	External wall - breastwork	Bricks	10	4,770	0,400	0,900		17,172	1,700	29,192
	Main Elevation	External wall - staircase	Bricks	3		0,300		40,910	12,273	1,700	20,864
	Main Elevation	External wall - S4 and S5	Bricks			0,300		48,590	14,577	1,700	24,781
	Main Elevation	External wall - administration	Bricks			0,300		21,270	6,381	1,700	10,846

Pre-demolition audit case study: STEP 3

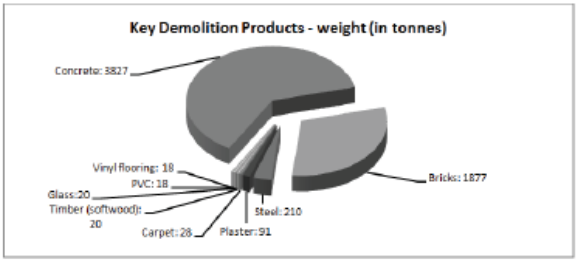
- Grouping of components based on the 14 materials identified in the buildings, with sum of weights and volumes
- Identification of the main products in terms of weight, as well as volume: concrete and bricks
- Estimate of the total materials available: 6,154 tons, equal to 2,864 mc.

Demolition product	Weight (tonnes)	Percentage	Demolition product	Volume (m³)	Percentage
Concrete	3827,25	62,19%	Concrete	1594,69	55,68%
Bricks	1877,18	30,50%	Bricks	1104,23	38,56%
Steel	210,07	3,41%	Plaster	129,51	4,52%
Plaster	90,66	1,47%	Timber (softwood)	44,69	1,56%
Carpet	27,79	0,45%	Bitumen	36,00	1,26%
Timber (softwood)	19,87	0,32%	Steel	26,50	0,93%
Glass	19,87	0,32%	Vinyl flooring	13,32	0,47%
PVC	18,29	0,30%	PVC	13,06	0,46%
Vinyl flooring	17,99	0,29%	Cement with 10% asbestos	10,63	0,37%
Cement with 10% asbestos	16,00	0,26%	Glass	8,08	0,28%
Bitumen	11,88	0,19%	Carpet	7,12	0,25%
Stone	7,02	0,11%	Plastic with asbestos	2,87	0,10%
Cast iron	5,97	0,10%	Stone	2,81	0,10%
Plastic containing asbestos	4,02	0,07%	Total	2864,00	100,00%
Total	6153,86	100,00%			

Pre-demolition audit case study: STEP 4

Step 4 - *Identification of Key Demolition Products (KDP)*

- Selection of 9 Key Demolition Products (KDP) from the analysis and comparison of the summary tables of weights and volumes: the 9 potential main products of the demolition were chosen based on the quantity of material in terms of weight and based on the recycling potential
- The graph below shows the weights of the following KDPs, in order of importance: concrete, bricks, steel, plaster, carpet, timber (soft wood), glass, PVC, vinyl flooring.



Pre-demolition audit case study: STEP 5

Step 5 - *Analysis of potential reuse / recycling options for KDPs*

- Analysis of the 9 KDPs and synthesis of the building components from whose demolition the material in question will derive, to understand the potential of reuse / recycling [in the table the analysis relative to the main KDP, concrete]

Concrete			
Element	Volume (m³)	Tonnes	Percentage by weight
Slabs	1004,28	2410,28	62,98%
Beams	251,16	602,79	15,75%
Pillars	121,36	291,26	7,61%
Underslav - screed	102,06	244,96	6,40%
Concrete paving	100,00	240,00	6,27%
Concrete fascia	9,14	21,95	0,57%
Floorcovering	4,68	11,23	0,29%
External wall - blockwork	1,19	2,85	0,07%
Concrete lintel	0,41	0,99	0,03%
Concrete step	0,39	0,95	0,02%
Total	1594,69	3827,25	100,00%


Pre-demolition audit case study: STEP 5

Step 5 - *Analysis of potential reuse / recycling options for KDPs*

- Identification, for each KDP, of solutions for reducing the volume of waste to be sent to landfill by reuse or recycling on site or off-site
- Detection of limited potential reuse and recycling on site of most materials (new school building already under construction)
- Identification of the only feasible recycling opportunity on site: recycling of concrete and bricks on site by means of crushing and use in place of natural aggregates for the arrangement of squares and outdoor spaces of the school (fillings, embankments and foundations)
- For steel elements, more than 70% of which are made up of the window frames of the extensive glass facades, recycling and not reuse is suggested, due to the inadequacy of the profiles to meet current performance standards.

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Pre-demolition audit case study: STEP 6

Step 6 - *Final recommendations on potential channels for the sale / donation of reused components and on possible solutions for the materials to be recycled*

- Identification of reference operators for the recycling / reuse of some products (for example, for PVC, Recovinyl was reported, one of the few facilities for recycling this product in the United Kingdom; for carpet, which represents 43.6% of school flooring, it was suggested to refer to Carpet Recycling UK)
- Identification of non-profit organizations and other public schools potentially interested in receiving furnishings and equipment in donation.


Pre-demolition audit case study: STEP 6

Step 6 - *Final recommendations on potential channels for the sale / donation of re-used components and on possible solutions for the materials to be recycled*

- Indication of platforms specialized in the sale of reclaimed building components (Salvo Web and Salvo MIE - Material Information Exchange) to find possible buyers for reusable products (such as the approximately 60 working cast-iron radiators) not intended for the new school building or for organizations not -profit
- For the direct identification of operators in the reclamation sector, it was suggested to use the Salvo operators directory and the mapping available on the BREMap (web tool that maps all the structures that deal with waste management - recycling plants, reclamation yards, landfills, etc.).

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Pre-demolition audit case study: STEP 7

Step 7 - *Target for reducing the volume of waste to be sent to the landfill and indications for drafting the SWMP*

The pre-demolition audit report shows a wide potential for recycling the main KDPs:

- possibility to recycle both the concrete deriving from the structures and the bricks of the facades on site with a mobile crushing plant, to be reused in the large garden of the school
- for all the other identified materials, which represent less than 7% by weight, recycling has been suggested in specialized plants.

The possibilities of reuse are limited to furnishings and plant components due to several factors:

- age and conservation status of some components;
- poor quality of the materials used, which does not make it feasible for example to reclaim bricks if not for the purposes of crushing and recycling
- impossibility to reuse the recoverable components in a new building.

Pre-demolition audit case study: final recommendations

In summary, given the particular conditions of the building:

- it was not possible to consider reuse on site
- the off-site reuse of the furnishings and some internal equipment in good condition was proposed
- a high percentage of recycling that can be achieved through on-site and off-site treatment was estimated
- it was estimated that **95% of the waste**, equal to about 5,900 tons. of the 6,154 present in the building, can be diverted from the landfill:
  - the mere separation of concrete and bricks during the demolition, to be used for recycling, would make it possible to avoid the transfer to landfill of **93% of materials by weight**
  - a further **2%** would be obtained by differentiating steel and sending it to recycle
  - the remaining **5%** consists of the dangerous components containing asbestos and bitumen.

Pre-demolition audit case study: final recommendations

Finally, the following recommendations were provided:

- In order to achieve this level of recycling, it was pointed out the need to use suitable roll-off boxes on site, to correctly differentiate the materials as they are removed.
- In addition to concrete, bricks and steel, the importance of the differentiation of glass and wood is indicated, whose separation from other fractions, in addition to permitting recycling, would improve the quality of the recycled materials obtainable from the 3 main materials.
- It is suggested to identify a shared recycling target between client and contractor before starting demolition work, which could realistically achieve the recovery of 90% of demolition waste in terms of weight.
- It was underlined the importance of the audit for the preparation of an SWMP (Site Waste Management Plan).

Conclusions

Conclusions

The remarkable variability

- of the architectural, construction, plant engineering features of buildings
- of the conditions in which the construction site is located (dimensions of the work subject to demolition, location and logistics)

implies the need for a procedure that leads to its in-depth knowledge.

PRE-DEMOLITION AUDIT

- accurately predicting times, costs, obtainable materials and their possible destination
- evaluating multiple alternative intervention scenarios
- drawing the greatest environmental and economic benefits possible from the operation.

Conclusions

The process of selective demolition, given its complexity, requires:

- The protection of the integrity of the elements removed from the building, depending on the level of recovery (material or component) to be obtained.
- The commitment of all operators to carefully demolish, effectively differentiating progressively removed materials, and then stocking them separately
- Proper demolition techniques but also a careful organization of the site.

This complexity implies:

- A clear definition of the objectives of the intervention (**Client**)
- An in-depth design based on estimates, analysis, surveys (**Designer**)
- The integration of the skills of the actors involved (**Designer**, **Contractors**)
- **The use of adequate support procedures and tools.**

Conclusions

Pre-demolition audits are strategic tools, especially if they clearly aim at:

- reusing
- re-manufacturing
- recycling.

The recovery chain, indeed, the different recovery chains, mostly on a local scale, must be organized coherently and with a clear potential for the enhancement of the fractions removed by selective demolition, also because space and time are needed to be able to identify of potential users.

In order to identify a market for recovered materials, the demand for recovered components and recycled materials must be certain, structured, known and continuous.

Thank you for your attention

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LECTURE VIII – MANAGEMENT OF RUBBLE AFTER THE EARTHQUAKE OF AMATRICE E ACCUMULI. METHODS USED TO DEMOLISH THE DAMAGED BUILDING AFTER THE EARTHQUAKE

Alessandro Drago and Moreno Tuccini

(Regione Lazio)

MANAGEMENT OF RUBBLE AFTER THE EARTHQUAKE OF AMATRICE E ACCUMULI. METHODS USED TO DEMOLISH THE DAMAGED BUILDING AFTER THE EARTHQUAKE

Alessandro Drago[1] and Moreno Tuccini[2]

[1]Regione Lazio

[2]Regione Lazio

ABSTRACT

After the 2016 earthquake in the Lazio region, the need to respond for housing for the displaced persons appeared. So, in order to restart the daily life of residents as soon as possible, various coordinating interventions of an economic and social nature and for the removal of rubbles and the reconstruction of new residences were started. Two tenders were launched:

1. Transport and processing of the public rubble (from public buildings)
2. Waste Separation Services, Loading and Transport, Recovery and Disposal of Rubble in the municipalities of Accumoli and Amatrice.

In the presentation, it has been reported the experience of a company, GARC Spa, that has been awarded contracts for lots of both tenders. For the first tender the CARG Spa installed a line processing at the processing sites while for the second tender installed two lines for the materials' enhancement similar to that used in the previous tender.

The main targets to be achieved in the management of emergencies were:

- Timeliness of intervention:

The current legislation the day after an earthquake concerning the waste management was the same than before and no derogation was made after, as could be in the emergency cases.

- Material recovery:

The waste that is generated by catastrophic events such as an earthquake can be a resource. Construction and demolition waste are materials - from construction and

demolition activities from building construction, from civil engineering and road and bridge construction-. However, 90% of those materials result from demolition work and only 10% appear when building new constructions.

- Reduction of the environmental impact of the work:

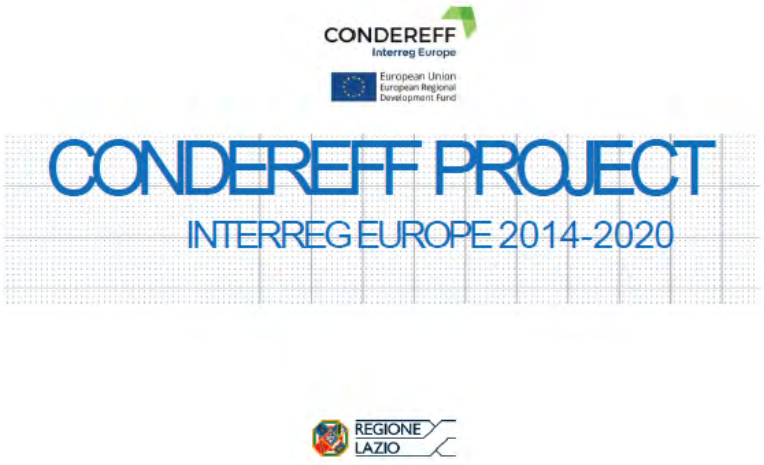
The distance between rubble deposit sites and reuse sites takes on fundamental significance in relation to the presence on the territory of plants authorized to manage waste. It must be mentioned that seismic events occur in territories that are not structured to receive quantities of waste equal to those generated because of collapses. For this reason, there are no immediately available solutions. It is necessary to provide special operations designed for the special conditions in which it operates.

In the disgrace of the event, a value is generated: the resource of the rubble. We need to think about how to enhance it on the territory. Although it should be remembered, that before the event happens otherwise the tight schedule and the interests of the individual make it impossible to manage these phases efficiently.

- Valorization of human resources present:

This is perhaps the most delicate issue but also, for us, more exciting. The situation of territories hit by earthquakes is complex for a number of reasons: Among these there is absolutely also the sense of strong disorientation that the people who live in those places have to face the radical change that their life habits undergo. This loss is evident and present in the depths of those affected. The reasoning then is that if there are conditions to enhance the people present and insert them in the industrial sector that created at the time of processing aimed at recovering the rubble, life, dignity and strength will be restored to local communities. From our experience started in October 2016, about 50 people have found insertion paths in the industrial waste recovery sector. We work with engineers, surveyors, administrative employees, operators of earth-moving machines, drivers, and specialized operators. These people have learned new topics related to environmental sensitivity, the value of materials, compliance with regulations, corporate responsibility.

We believe that the path we have made has nevertheless allowed those communities to understand the value of work that is linked to the value of the materials we are managing. We like to think that the company has a strong responsibility in civil society, we can say how this approach elevates the value of the company and people.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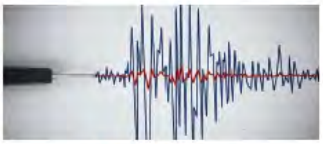
Interreg Europe
European Union
European Regional Development Fund
CONDEREFF PROJECT
INTERREG EUROPE 2014-2020
REGIONE LAZIO


CONDEREFF
Interreg Europe
MANAGEMENT OF RUBBLE FROM THE EARTHQUAKE OF 24 August 2016 AND SUBSEQUENT EVENTS
COMPLETION SEPARATION OF WASTE SERVICES, LOADING, TRANSPORTATION, RECOVERY AND DISPOSAL RUBBLE
MUNICIPALITY OF AMATEUR - LOT A - AMATRICE CENTER
REGIONE LAZIO
Rapporteur: geom. Moreno Tuccini

August 24 2016: THE EARTHQUAKE THAT

CONDEREFF Interreg Europe

EARTHQUAKE IN NUMBERS:
299 DEAD PEOPLE - 388 WOUNDED
4 REGIONS -131 AFFECTED MUNICIPALITIES


REGIONE LAZIO

CONDEREFF Interreg Europe

Decree Law October 17, 2016, n. 189, converted into Law n. 229 of 15 December 2016, entitled "Urgent measures in favor of populations affected by the earthquake of 2016," and its modifications and additions;

Compiled with the aim of:

1. to provide the technical and operational tools for better management of the rubble caused by the collapse and demolition;
2. identify the necessary resources and coordinate all the activities to be undertaken for the more rapid removal of debris, indicating the completion of the interventions times;
3. ensuring, through the proper removal and debris management, the possibility of recovering the original historical and cultural roots of collapsed buildings;
4. operate interventions of selective type demolition which take into account the different types of material, in order to promote the specific treatment of prepared heaps, maximizing the recovery of the debris and reducing the costs of intervention;
5. limit the volume of waste by recovering the materials that can be usefully employed as a new raw material to be made available for the reconstruction consequent to damage caused by the earthquake in Article 1, and if not used the proceeds of their sale is transferred as a contribution to the city from which the materials originate.";

REGIONE LAZIO

LAZIO REGION : OK Determination n. G07943 of 06.06.2017

CONDEREFF Interreg Europe

The Lazio Region approves the elaborate set out in Resolution no. G07943 of 06/06/2017, called "Earthquake August 24, 2016 - the rubble Management Plan and materials from the demolition of buildings and from emergency interventions and reconstruction of DL February 9, 2017, n. 8 converted with Lire 7 April 2017 n. 45 ", related to the amateur and Accumoli municipalities pursuant to art. 28, paragraph 2 of Law Decree October 17
2016 n. 189, converted by Law 15 December 2016,
n. 229, as amended by Article 7, paragraph 2, letter a) of Legislative Decree February 9, 2017, n. 8, converted withLaw April 7, 2017, n. 45.

REGIONE LAZIO

REGIONE LAZIO

LAZIO REGION : CUSTODY OF WORK COMPLETION OF SERVICE SEPARATION OF WASTE, LOADING, TRANSPORTATION, RECOVERY AND DISPOSAL RUBBLE - LOT A - AMATEUR CENTER

The Lazio Region relies ATI "Semar Procurement Ltd. - Marcost Ltd. - PrimaPorta80 Ltd.» lot A (AMATRICE HISTORICAL CENTER) after a public tender.

AMATEUR DOWNTOWN - A LOTTO
AMOUNT BASE CALL:
2.000.000,00 excluding VAT
(1.200.000,00 service + € 800.000,00 demolitions €)

REGIONE LAZIO

DEMOLITION OF BUILDINGS

- Demolition of buildings, following the ordinances and Public notices
- strategic dates Indications enterprise, often acting in derogation, in front of necessity requiring a resolution immediate

REGIONE LAZIO

MANAGEMENT OF RUBBLE

CONDEREFF Interreg Europe

1. SEPARATION WASTE FROM RUBBLE
2. LOAD ON TRANSPORTATION
3. TRANSPORTATION AT AUTHORIZED PLANTS
4. RECOVERY AND DISPOSAL OF RUBBLE

REGIONE LAZIO

SEPARATION OF WASTE FROM RUBBLE

CONDEREFF Interreg Europe

Operators on the ground that separate from the rubble (1):

- bulky waste CER200307
- Wood CER200138

Rougher mechanized system (2) with tape on workers who are separating waste from rubble

3 Plastic CER170203
4 Iron CER170405
5 Paper CER150101
6 Textiles CER200111

At the end of the process there remain only inert, characterized with CER 170904 and transported to the R10 environmental recovery (7).

REGIONE LAZIO

LOAD ON THE MEDIA I

CONDEREFF Interreg Europe

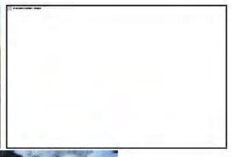
REGIONE LAZIO

TRANSPORTATION SYSTEMS AT AUTHORIZED PLANT

CONDEREFF Interreg Europe

All waste, separated from the inert rubble, they are analyzed and characterized by the company with a suitable code
European CER. They are then allocated to approved facilities at their disposal, all over the territory.





RECOVERY AND DISPOSAL OF RUBBLE

CONDEREFF Interreg Europe

The inert materials, after the step of sorting and separation from the waste contained therein, are analyzed and characterized with by the EWC code 170904 (from demolition material) and intended to authorized facilities.

Transport, for example, to the system of Villa Mazza (Pizzoli-L'Aquila) of Marcost srl

final machining with volumetric reduction, cleaning and physico-chemical analysis

The material is intended to RECOVERY ENVIRONMENTAL R10

REGIONE LAZIO

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REGIONE LAZIO

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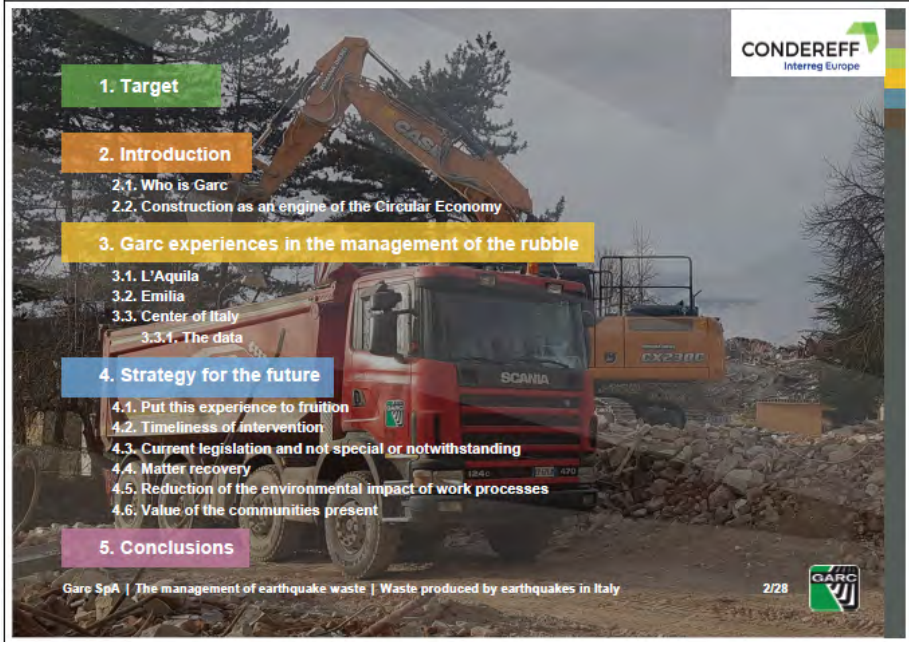
THANKS FOR YOUR ATTENTION

REGIONE LAZIO


GARC
CONDEREFF
Interreg Europe
European Union
European Regional
Development Fund
REGIONE
LAZIO
Waste produced by earthquakes in Italy
Garc's experience from 2009 to today
Moreno Tuccini
Alessandro Drago


CONDEREFF
Interreg Europe
1. Target
2. Introduction
2.1. Who is Garc
2.2. Construction as an engine of the Circular Economy
3. Garc experiences in the management of the rubble
3.1. L'Aquila
3.2. Emilia
3.3. Center of Italy
3.3.1. The data
4. Strategy for the future
4.1. Put this experience to fruition
4.2. Timeliness of intervention
4.3. Current legislation and not special or notwithstanding
4.4. Matter recovery
4.5. Reduction of the environmental impact of work processes
4.6. Value of the communities present
5. Conclusions
Garc SpA | The management of earthquake waste | Waste produced by earthquakes in Italy
2/28
SCANIA
GARC


GARC
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European Union
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REGIONE
LAZIO
Waste produced by earthquakes in Italy
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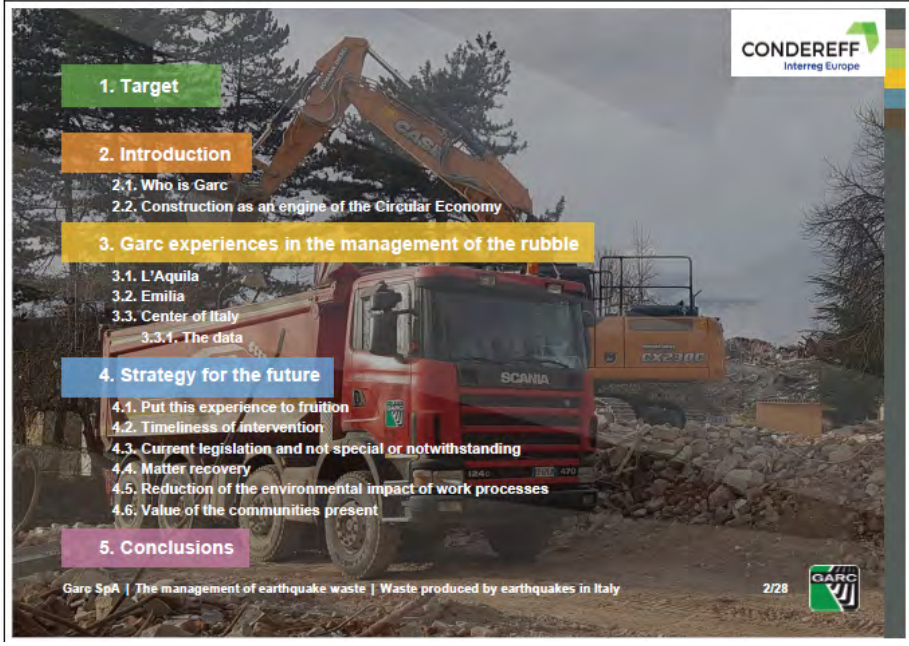
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Garc SpA | The management of earthquake waste | Waste produced by earthquakes in Italy
2/28
SCANIA
GARC


CONDEREFF
Interreg Europe
2. Who is Garc
Construction
Garc SpA | The management of earthquake waste | Waste produced by earthquakes in Italy
5/28


CONDEREFF
Interreg Europe
2. Who is Garc
Environment
Garc SpA | The management of earthquake waste | Waste produced by earthquakes in Italy
6/28


2. Who is Garc
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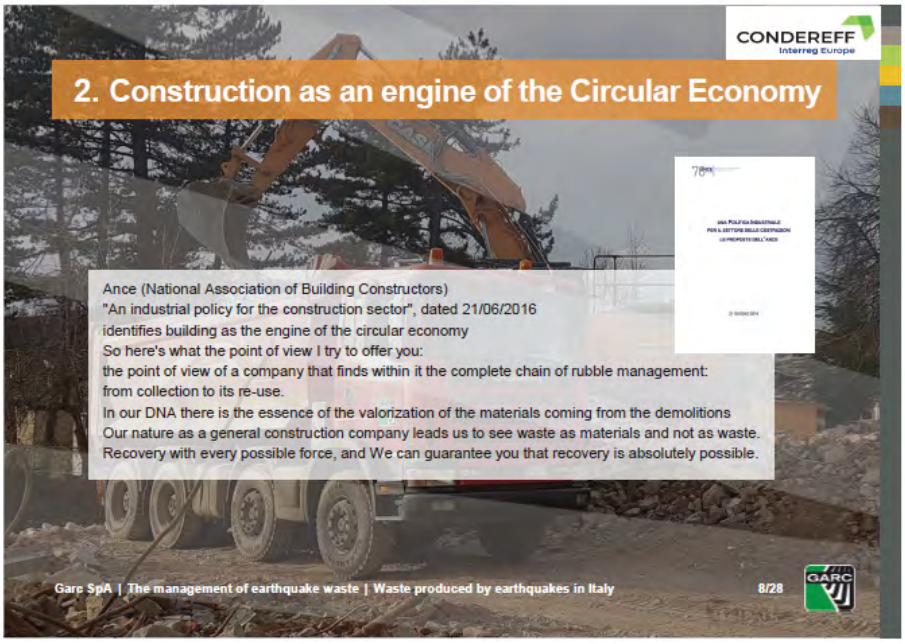
Carpi
(headquarters)
Parco Regionale Veneto del Delta del Po
San Marino
Piediripa
Assisi
Parco Nazionale dei Monti Sibillini
Amatrice
Parco Nazionale
210
160
147
131
70
55
40
38
Employees
Production Value (Million Euros)
Garc SpA | The management of earthquake waste | Waste produced by earthquakes in Italy
7/28


CONDEREFF Interreg Europe
2. Construction as an engine of the Circular Economy
Ance (National Association of Building Constructors)
"An industrial policy for the construction sector", dated 21/06/2016
identifies building as the engine of the circular economy
So here's what the point of view I try to offer you:
the point of view of a company that finds within it the complete chain of rubble management:
from collection to its re-use.
In our DNA there is the essence of the valorization of the materials coming from the demolitions
Our nature as a general construction company leads us to see waste as materials and not as waste.
Recovery with every possible force, and We can guarantee you that recovery is absolutely possible.
Garc SpA | The management of earthquake waste | Waste produced by earthquakes in Italy
8/28

CONDEREFF Interreg Europe

3. Garc experiences in the management of the rubble

3.1 Activity performed by Garc L'Aquila

In the crater of the earthquake of 2009, in L'Aquila, we worked for about a year with our teams and we demolished about 75,000 cubic meters of buildings, from which we produced about 85,000 tons of rubble.

The design of the Strip Out, the management of materials in the construction site and the logistics planning allowed us to send all these to recovery.
The only fractions sent for disposal were the materials insulators. In these cases the recovery cycle ended in third-party plants.

CONDEREFF Interreg Europe

3. Garc experiences in the management of the rubble

3.2 Activity performed by Garc Emilia

In 2012, in Emilia, for these experiences, acting as General Contractor, we were able to impose ourselves as a leading company in post-earthquake management thanks to the added value represented from our ability to treat and enhance the materials deriving from demolitions. Starting from the first months after May 2012, we produced around € 100 million of reconstruction work. Among these, the main interventions are:

OEB SRL	CAMPOSANTO (MO)
WAM GROUP	CAVEZZO (MO)
ABL SPA	CAVEZZO (MO)
C.O.C. FARMACEUTICI SPA	ROVERETO (MO)
COMAL SRL	NOVI (MO)
CERAMICA SANT'AGOSTINO SPA	SANT'AGOSTINO (FE)
NUOVA OMAG SRL	SAN POSSIDONIO (MO)
CHIMAR SPA	LIMIDI (MO)
COMAL SRL	NOVI DI MODENA (MO)

In all these interventions we have been able to enhance the materials produced by the demolitions directly on the production site.

CONDEREFF Interreg Europe

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CONDEREFF Interreg Europe

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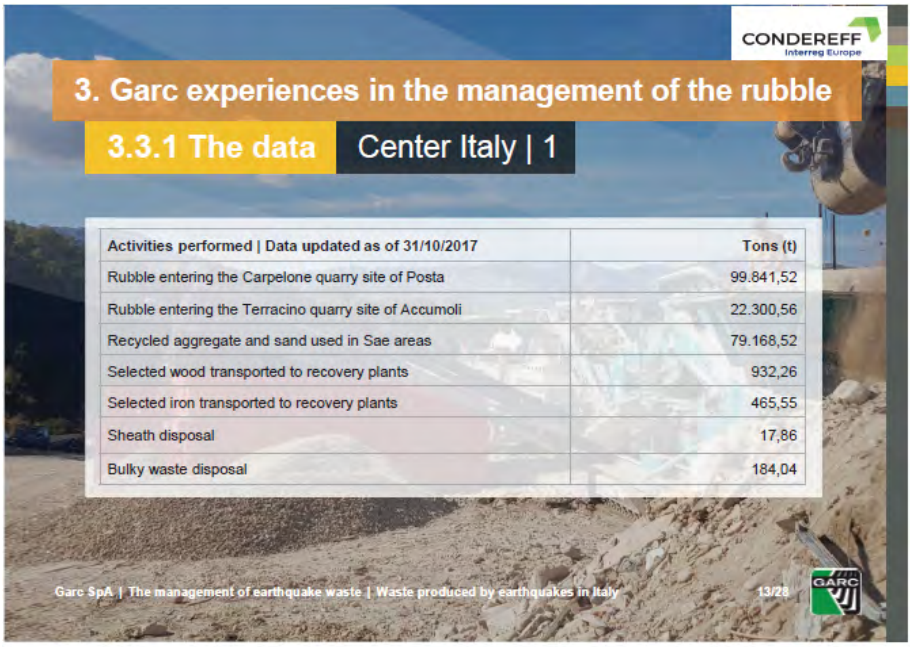
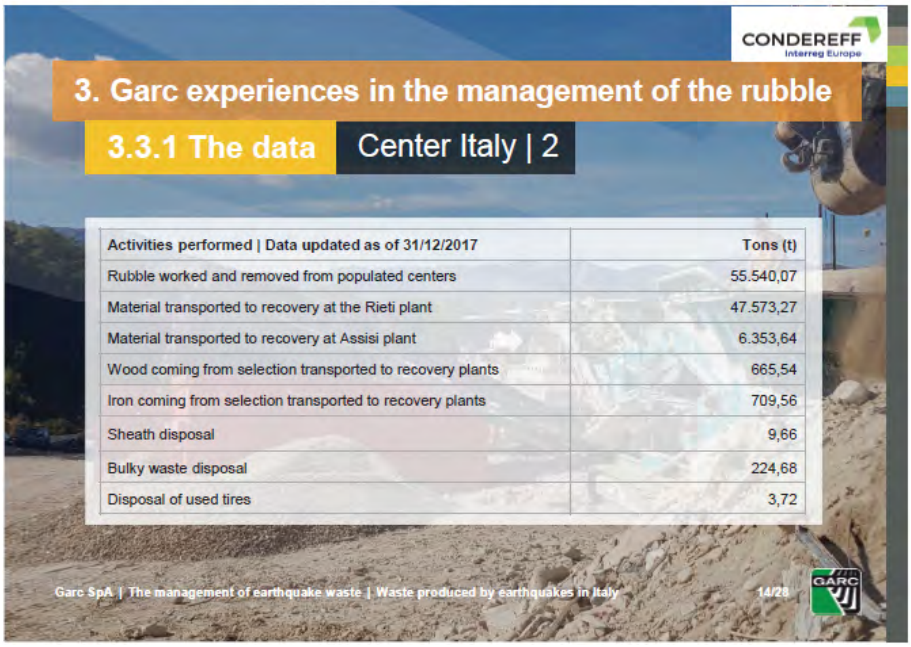


Activities performed | Data updated as of 31/10/2017	Tons (t)
Rubble entering the Carpelone quarry site of Posta	99.841,52
Rubble entering the Terracino quarry site of Accumoli	22.300,56
Recycled aggregate and sand used in Sae areas	79.168,52
Selected wood transported to recovery plants	932,26
Selected iron transported to recovery plants	465,55
Sheath disposal	17,86
Bulky waste disposal	184,04



Activities performed | Data updated as of 31/12/2017	Tons (t)
Rubble worked and removed from populated centers	55.540,07
Material transported to recovery at the Rieti plant	47.573,27
Material transported to recovery at Assisi plant	6.353,64
Wood coming from selection transported to recovery plants	665,54
Iron coming from selection transported to recovery plants	709,56
Sheath disposal	9,66
Bulky waste disposal	224,68
Disposal of used tires	3,72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4. Strategy for the Future
4.1 Take advantage of this experience
These are the main targets to be achieved in the management of emergencies
• Timeliness of intervention
• Material recovery
• Reduction of the environmental impact of the work
• Valorisation of human resources present
Garc SpA | The management of earthquake waste | Waste produced by earthquakes in Italy
15/28


CONDEREFF
Interreg Europe
4. Strategy for the Future
4.2 Timeliness of intervention
Census*
Collection
Transport
Temporary Deposit
Treatment
Recovery / Reuse
*of the rubble: From collapses / From successive demolitions (in Emergency or Planned)
Garc SpA | The management of earthquake waste | Waste produced by earthquakes in Italy
16/28


CONDEREFF
Interreg Europe
4. Strategy for the Future
4.3 Current Regulations and...
What is the current legislation the day after an earthquake?
Exactly the one in force at all other times, ie the one in force
normal conditions
and not legislation in force
emergency cases.
Garc SpA | The management of earthquake waste | Waste produced by earthquakes in Italy
17/28


CONDEREFF
Interreg Europe
4. Strategy for the Future
4.3 ...not Special or in Derogation
Decree of the President of the Council of Ministers of 24 August 2016 "Declaration of the exceptional risk of compromising primary interests due to the earthquakes that have affected the territory of the provinces of Rieti, Ascoli Piceno, Perugia and L'Aquila on 24 August 2016 , pursuant to article 3, paragraph 1, of the decree-law 4 November 2002, n. 245, converted, with amendments, by law December 27, 2002, n. 286".
Resolution of Council of Ministers 25 August 2016 "Declaration of the state of emergency as a result of the exceptional earthquake that struck the territory of the regions of Abruzzo, Lazio, Marche and Umbria on 24 August 2016".
Ordinances of the Head of the Civil Protection Department "Urgent civil protection interventions resulting from the exceptional earthquake that hit the territory of the Lazio Region, Marche, Umbria and Abruzzo on 24 August 2016" from no. 388 to n. 431".
Plan of Management of the Rubble drawn up from the Integrated Cycle of the Waste Area and approved with Determination G12689 of the 28/10/2016Ordance of the Head of the Department of Civil Protection n ° 391 of 01 September 2016 ....etc
Garc SpA | The management of earthquake waste | Waste produced by earthquakes in Italy
18/28


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4. Strategy for the Future
4.4 Matter recovery
The picture described is normally generated without taking into account a fundamental aspect:
The waste that is generated by catastrophic events such as an earthquake can be a resource. With regard to this statement, I would like to dwell on the concept of resource for a moment.
For us resource is to be understood with this meaning (from dictionary Garzanti):
[...] means by which a need is satisfied, a necessity: available means; what constitutes a source of wealth.
Garc SpA | The management of earthquake waste | Waste produced by earthquakes in Italy
19/28


CONDEREFF
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4. Strategy for the Future
4.5 Reduction of the environmental impact
We believe we all agree that if on the one hand we intend to be a fixed point the recovery of matter on the other we can not disregard an assessment of what the overall environmental impact of the recovery activities is.
With respect to this theme, the issue of distance between rubble deposit sites and reuse sites of the same takes on fundamental significance, also in relation to the presence on the territory of plants authorized to manage waste.
Also on this issue we must start from a fact: seismic events occur in territories that are not structured to receive quantities of waste equal to those generated as a result of collapses.
For this reason there are no immediately available solutions. It is necessary to provide special operations designed for the special conditions in which it operates.
In the disgrace of the event a value is generated: the resource of the rubble. We need to think about how to enhance it on the territory but ... It should be remembered cold and before the event happens otherwise the tight schedule and the interests of the individual make it impossible to manage these phases efficiently.
Garc SpA | The management of earthquake waste | Waste produced by earthquakes in Italy
20/28


CONDEREFF
Interreg Europe
4. Strategy for the Future
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Garc SpA | The management of earthquake waste | Waste produced by earthquakes in Italy
19/28


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Garc SpA | The management of earthquake waste | Waste produced by earthquakes in Italy
20/28


4. Strategy for the Future
4.6 Value of Local Communities
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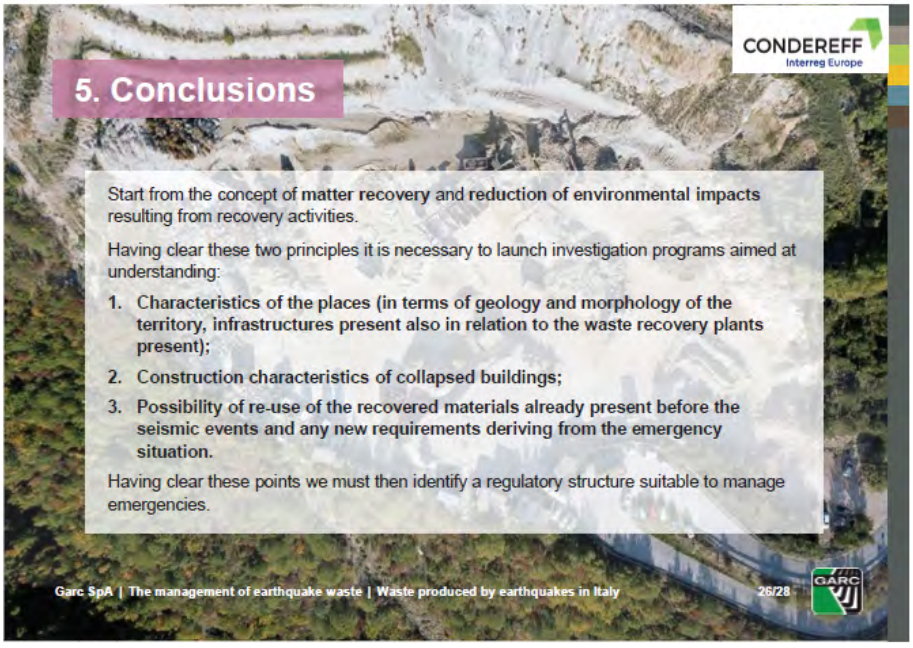
Garc SpA | The management of earthquake waste | Waste produced by earthquakes in Italy
23/28


4. Strategy for the Future
4.6 Value of Local Communities
CONDEREFF
Interreg Europe
Garc SpA | The management of earthquake waste | Waste produced by earthquakes in Italy
24/28


CONDEREFF
Interreg Europe
4. Strategy for the Future
4.6 Value of Local Communities
Garc SpA | The management of earthquake waste | Waste produced by earthquakes in Italy
25/28
GARC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5. Conclusions
Start from the concept of matter recovery and reduction of environmental impacts resulting from recovery activities.
Having clear these two principles it is necessary to launch investigation programs aimed at understanding:
1. Characteristics of the places (in terms of geology and morphology of the territory, infrastructures present also in relation to the waste recovery plants present);
2. Construction characteristics of collapsed buildings;
3. Possibility of re-use of the recovered materials already present before the seismic events and any new requirements deriving from the emergency situation.
Having clear these points we must then identify a regulatory structure suitable to manage emergencies.
Garc SpA | The management of earthquake waste | Waste produced by earthquakes in Italy
26/28
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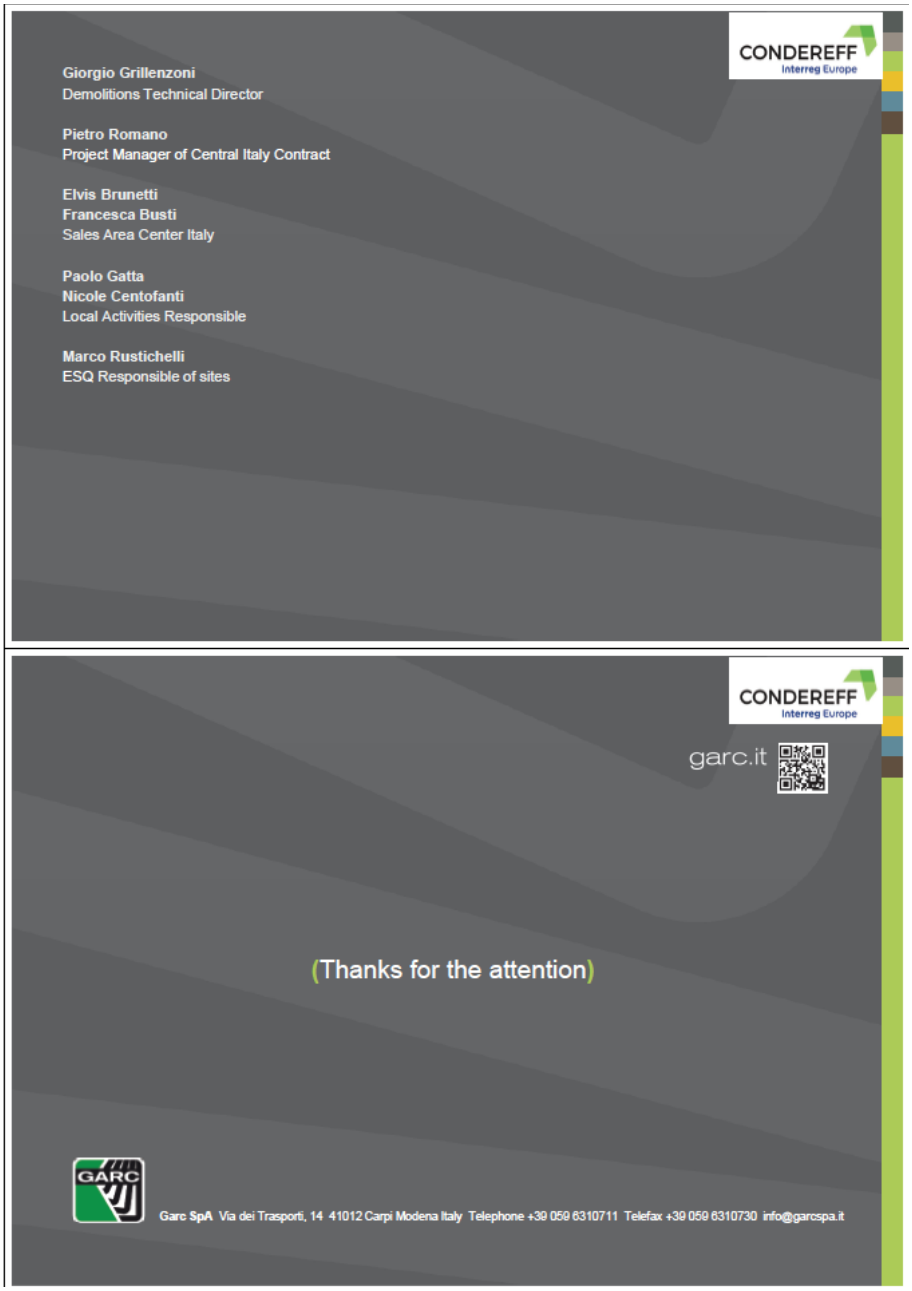
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Giorgio Grillenzoni
Demolitions Technical Director
Pietro Romano
Project Manager of Central Italy Contract
Elvis Brunetti
Francesca Busti
Sales Area Center Italy
Paolo Gatta
Nicole Centofanti
Local Activities Responsible
Marco Rustichelli
ESQ Responsible of sites
CONDEREFF
Interreg Europe
garc.it
(Thanks for the attention)
GARC
Garc SpA Via dei Trasporti, 14 41012 Carpi Modena Italy Telephone +39 059 6310711 Telefax +39 059 6310730 info@garcspa.it

LECTURE IX - STATE OF ART OF THE PRE-DEMOLITION AUDITS IN FRANCE

Mathieu Bazaud

(AURA – EE)

STATE OF ART OF THE PRE-DEMOLITION AUDITS IN FRANCE

Mathieu Bazaud

(AURA – EE)

ABSTRACT:

This note depicts at a glance the situation in France when addressing the issue of the pre-demolition audit, to understand the need for effective audit practices and the main forces at play hindering the implementation of recycling and re-use practices.

The regulatory framework in place since 2011 will be reviewed in 2019, to enlarge the perimeter, dematerialize the system, strengthen competencies and train professionals.

The main barriers in France when talking about wastes audit are:

- Low level of knowledge of the regulation among local authorities.
- An urgent need to train auditors, initiatives are marginal, who is supporting the costs.
- Contracting authorities are the cornerstone and must be trained to prescribe recovery solutions in tenders, behavioral change is needed.
- Tracking system is to be developed and must stem from a common agreement between value chain actors, what, when, how, who.
- A taxe system to ease the secondary use of C&D materials, currently evolving to make recycling materials more competitive.

The presentation listed also the main levers identified from different perspectives, as quoted in the OREE's report released in 2018 on the deconstruction:

At national level

- Spread the scope of the pre-demolition audit to renovation.
- Uplift labels recognition to better apply circular economy principles.
- Ease the end of waste regulatory status, as quoted in the measure 37 of the FREC.

For contracting authority

- Regard wastes as resources, consider urban mines.
- Train itself and prime contractor to recycling and recovery techniques.
- Put in place best practices and sign charter, communicate to spread the use of best practices.
- Maximize potential value, incentivize actors in the tenders, pay attention to skills.
- Create dedicated work package for secondary use of materials.
- Deepen responsibilities, risks coverage and warranty issues.

For prime contractor, train participants and raise awareness to re-use techniques and potential.

For auditors

- Train and get certifications such as OPQTECC or OPQIBI.
- Perform a dynamic inventory and meet stakeholders able to provide complementary information.

For company, train to waste sorting and management techniques to better meet customer expectations.

For local authority, create at regional / city level a teamwork dedicated to coordinate scheduling and link supply and demand between C&D sites.

For the whole, make use of data to quantify and qualify potential for recovery and exchange information with actors.

Waste management to be successful is at the first order a behavioral matter, the commitment and role of the contracting authority is of paramount importance. To ensure a complete recovery of the materials and wastes, the challenge is now to work in collaboration with all the value chain actors in order to define a reliable, effective and shared document of traceability.

Auvergne Rhône-Alpes Énergie Environnement

CONDEREFF Interreg Europe

European Union European Regional Development Fund

Pre-demolition audits in France – an overview of the current best practices

Mathieu Bazaud

1st INTERNATIONAL WORKSHOP

CDW's DOCUMENTATION AUDITS & SUPERVISION. DEMOLITION AND NEW CONSTRUCTION MANAGEMENT CHALLENGES

Universitat Politècnica de València, 2nd & 3rd of April 2019

- What is the pre-demolition audit for ?
- What change does imply its integration in the demolition process ?
- What are the current best practices in France ?
- What are the main levers and barriers to massify practices, what's at stake to go further ?

Who are we and what we aim at ?

Auvergne Rhône-Alpes Énergie Environnement

Our mission:

- Resource center supporting territoires in transition
  Transition as driving force for the territories' sustainable development and structuring
- Focus at Regional level with cooperation activities at National and European levels
- With the support of:

La Région Auvergne-Rhône-Alpes

And its members

Our services:

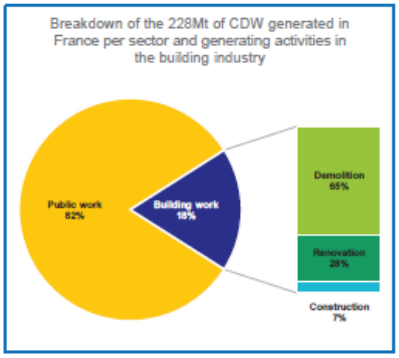
CLIMATE
Renewable Energies
Building Sector
MOBILITY
CIRCULAR ECONOMY
NEW ECONOMIC MODELS

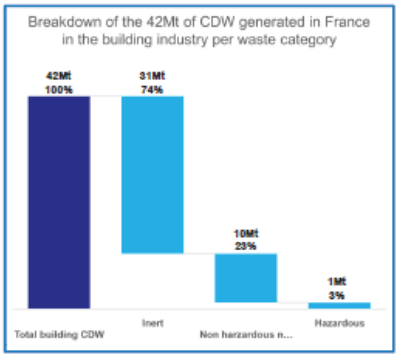
Talking wastes, what are we dealing with ?

	FRANCE	AURA REGION
C&D activities	€150bn (2018) • Building => €105bn (70%) • Public works => €45bn (30%) http://www.actionbtp.com/chiffres-clefs.html	€20.7bn (2016) (14% FR) • Building=> €15.7 bn (76%) • Public works => €5bn (24%)
CDW	1st waste stream - 228Mt (2014) => 67% of total ! • Building => 42Mt (≈20%) • Public works => 186Mt (≈80%) https://www.ademe.fr/sites/default/files/assets/documents/fiche_-_technique-dechets-batiment-2017-09.pdf	1st waste stream - 27Mt (2016) • Building=> 5t (≈20%) • Public works => 22Mt (≈80%)
Public procurement	€37,7bn (2017) (Cde du BTP) • Building=> 17.8Mds € (17% of sales) • Public works => 19.9Mds € (44% of sales) https://www.lemoniteur.fr/article/collectivites-locales-les-depenses-btp-repartent-enfin-a-la-hausse.1985479	€5bn (2016) (13% FR; 24% AURA) • Building=> 2.4Mds € (15% of sales) • Public works => 2.6Mds € (52% of sales) Source: FRPGD

With a share of hazardous wastes between 2% and 3% of total CDW, the potential for recovery is extremely high, hence the need for audit competencies and specific inventory !

Today 42Mt of CDW are generated in France in the building industry with a recovery rate of about 60%, including around 11Mt of finishing work wastes with a recovery rate of 46% (5Mt)[1]





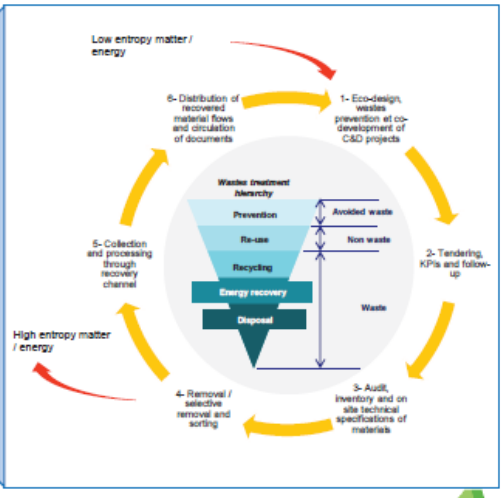
[1] Recovery rate of finishing work was recorded below 35% in 2016 and has increase up to 46% in 2018. This can be assigned to a better tracking of wastes and to endeavors devoted since then to develop recovery throughout the value chain

Source:
DEMOCLES https://www.democles.org/ - 2018
REPAIRE final report 2018 (based on SOeS data 2014)

From the outside, audit and specific inventory appear as a key step towards closing the loop for a circular economy, facing nonetheless some barriers

Targeting re-use is the most eco-friendly way of doing, a mean to an end when the necessity to build does appear. This recovery option entails several challenges:

- **Organizational**: creation of new partnerships, behavioral change, responsibilities and ethic, trust and warranty
- **Technical**: with no or new standards to be defined, practices mostly empirical based on savoir-faire
- **Logistical**: collaboration, shared planning and equipment, storage area, containers and collection process
- **Cultural**: new project structure, new work package and allotment, local distribution channels showcasing local resources



Source: http://www.bellastock.com/philharc-iv/ 2018

The regulatory framework in place since 2011 will be reviewed in 2019, to enlarge the perimeter, dematerialize the system, strengthen competencies and train professionals

Decree n° 2011-610 of May 2011 the 31st relating to the audit for waste management arising from demolition of building categories

- Art. R. 111-43. - Pre-demolition audit is **mandatory for building exceeding 1000m² of surface** or having hosted farming, industrial or business activities and having been used as storage, manufacturing or distribution area for hazardous materials as describe in the article R. 4411-6 du code du travail
- Art. R. 111-44. - A building demolition is an operation aiming at destroy at least a majority part of a building structure
- Art. R. 111-45. - The contracting authority has to realize an audit focusing on wastes stemming from an operation of demolition and **previously to the permit application** if the operation is submitted or previously to quotation acceptance or procurement procedure
- Art. R. 111-46. – The audit mentioned provides the type, quantity and location within the perimeter inherent to the operation of demolition and considering the materials, construction products and components part of the building, and **giving priority to alternatives for re-use on-site, and if not possible, information and alternatives on recovery channel with type, quantity and recovery potential or disposal**
- Art. R. 111-47. – For the audit, **the contracting authority calls on a professional who has subscribed to an insurance policy** specific to this kind of operation. **The professional must not be linked to the contracting authority, neither to a company likely to realize the operation** (entirely or partially) and which present a potential threat to its independence and impartiality
- Art. R. 111-48. – The contracting authority has to hand over the audit to whom is in charge of the operation of demolition
- Art. R. 111-49. – Once the work is achieved, **the contracting authority has to draw up an inventory check form**, informing about the will of the different volumes of materials and waste, **the form is handed over to the national agency** of the environment "ADEME" who is in charge of reporting to the ministry of construction every year

Source: CERC données 2016

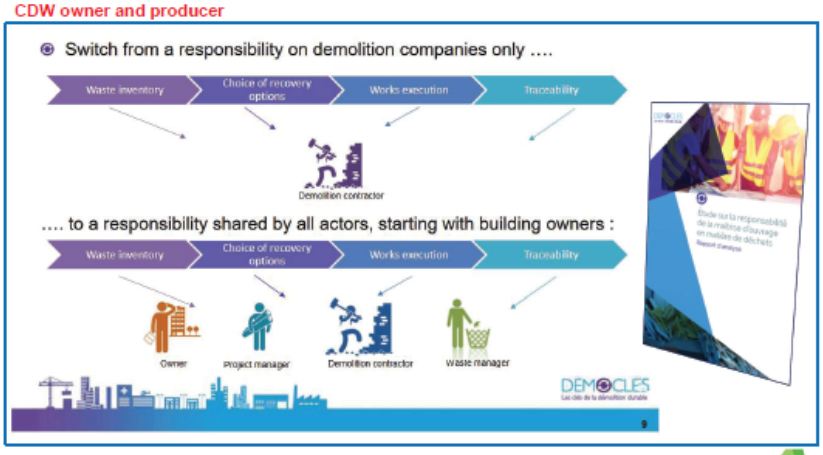
What is the state of the art in France ?

Sample of usable best practices		
DÉMOCLÈS Les clés de la démolition durable	Center of resources on responsibilities, tenders, recovery channels	
ROOT OPALIS	Center of resources for re-use, materials audit and inventory, removal operations	
REPAR #2	Project providing data on re-use, technical specifications and inventory sheets, local sector	
BAZED	Center of resources providing solutions for zero waste buildings and renovation	
MATABASE, CoRecyclage, cycle up	Supply-demand online platforms	

Source:
https://www.democles.org/
https://opalis.be/fr
http://www.bellastock.com/fr/repar-2
http://www.bazed.fr/
http://www.matabase.fr/ ; https://www.corecyclage.com/ ; https://www.cycle-up.fr/

Waste management to be successful is at the first order a behavioral matter ! The commitment and role of the contracting authority is of paramount importance !

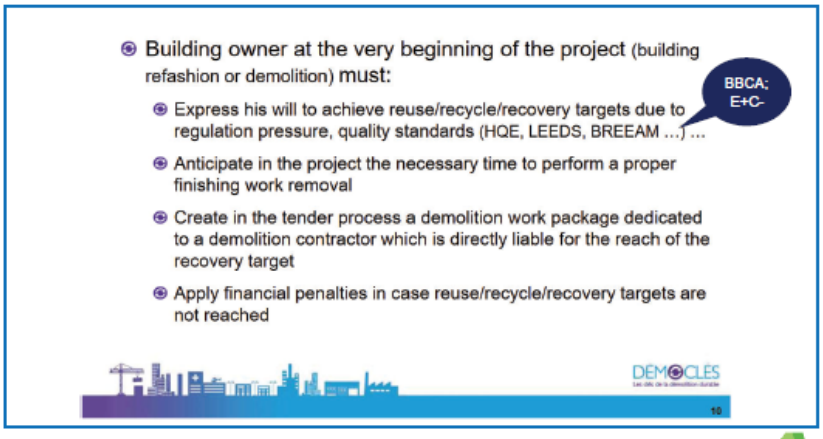
Audit step #0 - DEMOCLES conclusions define as a starting point to clarify actors responsibilities, in particular those of the contracting authority which, as a cornerstone, is the CDW owner and producer



Source: DEMOCLES «Improving management of construction and demolition waste» - 2016

Effort starts from the definition of the needs, requires sharped knowledges of the value chain actors and activities, and uncommon planning skills going far beyond construction site

Audit step #1 – Recovery potentials and material outflows should be, if not planned at that stage, at least been considered. This induces sourcing, cooperation and co-development times.



Source: DEMOCLES «Improving management of construction and demolition waste» - 2016

DEMOCLES, an on-the-shelf toolbox to prepare bills of specifications, trigger wastes reduction and recovery solutions and reduce environmental impacts

Audit step #2 - To be effective, the set of clauses goes along with well defined selection criteria and should be goal-oriented (bonus-malus system)

1. Pre-demolition audit
2. Reduction of wastes volume
3. Reduction of wastes hazardousness
4. Wastes technical specification
5. Wastes selective removal and sorting
6. Logistics
7. Processing methods to prioritize
8. Wastes recovery
9. Requirements expected from wastes contractor
10. Wastes tracking
11. Wastes management and prevention

Source: DEMOCLES https://www.recyfurn.com/assets/democles/guide-des-clauses-cctp-v2018.pdf - 2018

DEMOCLES (1/4) – Prime contracting bill of specifications must include a chapter on pre-demolition audit, specifying the regulatory framework to comply with and the different steps of the process (stakeholders, documents, timeline)

Topics	Topic 1 : PRE-DEMOLITION AUDIT
Tender(s) concerned	Prime contractor
Legitimacy (for clause presence)	The audit is a pre-requisite to anticipate and control waste prevention, generation and management. It does concern all type of wastes.
Stakeholder(s) concerned and accurate description of the approach to be undertaken	As part of its answer to the call for tenders of project contracting, the latter realizes a wastes audit which has to comply with specific regulatory framework conditions regarding pre-demolition audit (29).
Project stage	Response to call for bids, prime contracting work package.
Follow-up tool(s) and document(s)	Pre-demolition audit delivered by the contracting party.
Main dedicated clause(s) / tender	Clauses from topics 3 to 8.
Example of clause and wording	

"Obligation of wastes audit or of its verification", to be included in the bill of specifications concerning the prime contracting assignment

As part of the scope of the prime contracting, the contracting party must realize a pre-demolition audit of the work site, in compliance with the conditions of the decree n° 2011-61 of the 31st of May 2011 and of the CERFA form n° 14498*01 regarding the required pre-demolition wastes audit mandatory for particular building categories.

With this aim in mind, the contracting authority (or its representative) should pass on all the documents relevant in its possession and will allow the working company to access to the site so that to take note of the location and of the materials be present in the site. The visit of the site is mandatory and is part of the response procedure.

Source: DEMOCLES https://www.recyfurn.com/assets/democles/guide-des-clauses-cctp-v2018.pdf - 2018

DEMOCLES (2/4) – Prime contracting bill of specifications must include a chapter on pre-demolition audit, specifying the regulatory framework to comply with and the different steps of the process (stakeholders, documents, timeline)

Topics	Topic 2 : REDUCTION OF WASTES QUANTITY
Tender(s) concerned	Prime contractor
Legitimacy (for clause presence)	Cope with regulatory framework objectives.
Stakeholder(s) concerned and accurate description of the approach to be undertaken	• The prime contractor will find out re-use solutions so that to reduce the number of tons of wastes (32). • Alternatives for recovery and re-use should be reported in tender documents.
Project stage	Response to call for bids, preparation of demolition operations.
Follow-up tool(s) and document(s)	• Technical file of the prime contractor mentionning the measures undertaken to make re-use of materials on-site. • Final check-up will compare the effective re-use of materials.
Main dedicated clause(s) / tender	Clauses of topics 3 and 11.
Example of clause and wording	

"Reducing of the quantity of wastes generated", to be included in the bill of specifications

In conformance with the regulatory framework, the prime contractor will promote the re-use of materials directly on-site. The actions undertaken will be reported once the operations achieved.

Source: DEMOCLES https://www.recyfurn.com/assets/democles/guide-des-clauses-ccdp-v2018.pdf - 2018

CONDEREFF Interreg Europe 13

DEMOCLES (3/4) – Prime contracting bill of specifications must include a chapter on pre-demolition audit, specifying the regulatory framework to comply with and the different steps of the process (stakeholders, documents, timeline)

Topics	Topic 3 : REDUCTION OF WASTES NOXIOUSNESS
Tender(s) concerned	Working company.
Legitimacy (for clause presence)	Cope with regulatory framework objectives.
Stakeholder(s) concerned and accurate description of the approach to be undertaken	The working company must identify precisely the different CDW categories being present on site and pay attention to do not mix them. The company has to take appropriate measures to sort the different CDW streams.
Project stage	Removal and storage steps.
Follow-up tool(s) and document(s)	SOGED mentionning the measures taken to avoid mixing inert, hazardous and non hazardous non inert wastes.
Main dedicated clause(s) / tender	Clauses of the topic 8.
Example of clause and wording	

"Reducing of the noxiousness of the wastes", to be included in the bill of specifications (promote flexibility through several levels of requirement)

In conformance with the article L541-7-2 of the Code of the environment, the tenured company in charge of performing the deconstruction will take all the measures necessary to do not mix hazardous wastes between them or with non hazardous wastes. Preventive measures when removing materials or equipment should be taken, as long as during storage and logistic steps. The company will take care of reporting all the measures taken in the SOGED.

Source: DEMOCLES https://www.recyfurn.com/assets/democles/guide-des-clauses-ccdp-v2018.pdf - 2018

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DEMOCLES (4/4) – Prime contracting bill of specifications must include a chapter on pre-demolition audit, specifying the regulatory framework to comply with and the different steps of the process (stakeholders, documents, timeline)

Topics	Topic 4 : WASTES CHARACTERIZATION
Tender(s) concerned	Working company.
Legitimacy (for clause presence)	Cope with regulatory framework objectives.
Stakeholder(s) concerned and accurate description of the approach to be undertaken	The working company must identify the wastes per category (inert, hazardous, non hazardous non inert) and pass on the information to third parties allowed to carry out wastes thereafter. In case of hazardous wastes, a Certificat d'Acceptation Prealable (CAP) is mandatory for each type of hazardous waste, and is valid during maximum one year. For certain kinds of outlet like ISDND (32), a CAP certificate is required before transfer. It is the same for ISDI (34) and equivalent. In any other case, the wastes owner will ask to the outlet its bill of specifications to verify compliance between inputs and treatment capacity.
Project stage	Removal and storage steps.
Follow-up tool(s) and document(s)	Certificat d'Acceptation Préalable (CAP) and any other document required per intermediary and final recovery steps.
Main dedicated clause(s) / tender	Clauses of topics 4, 7, 8, 9 and 10.
Example of clause and wording	

"Wastes characterization"

In conformance with the article L541-7-1 of the Code of the environment, the tenured company in charge of performing the operations will ensure that all of the following steps are done properly:

- Characterization of wastes based on their nature, before transfer towards intermediary or final treatment plant allowed to take in charge and paying a particular attention to hazardous wastes.
- Take all the necessary measures required in terms of storage, labeling and logistic.
- Transmit the certificates (CAP) that are mandatory and any other document coming from others outlets so that to pass them on to the contracting authority or prime contractor.

Source: DEMOCLES https://www.recylum.com/assets/democles/guide-des-clauses-ccbp-v2018.pdf - 2018

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Wastes audit should be turned into technical specifications and material inventory to scale up trickle-down effects, paving the way to high recovery potentials

Audit step #3 – Identify potentials for re-use and recovery, in conformance with the EU methodology, to couple volume and 2nd life function of materials and components (structural, diverted use, backfilling)

- Age and history of the building / infrastructure
- Design documents, architectural plans and drawings
- Maintenance and renovation documents, description of production and storage activities (hazardous substances, exploitation permit
- Surroundings, accesses and local facilities

- Take pictures and edit a catalog (quantity, quality, dimension, removal easiness)
- Ask for advice (distributors, architects, product manufacturers, waste managers, …)

Define a strategy based on sampling analysis, inventory and discussions with local players:
- Re-use on-site / off-site, backfilling
- Find a buyer and sell materials (distributors, architects, product manufacturers, …)
- Donation of materials
- Landfill

Report steps and details
- Scope of the project, summary, history, location
- Wastes audit synthesis, volumes arising, documents
- Inventory of materials and elements per category (Hazardous, Inert, NINH)
- Recovery recommendations, type of outlet and management of the different streams

Make technical specifications validated by a relevant authority

Source: DEMOCLES https://www.recylum.com/assets/democles/guide-des-clauses-ccbp-v2018.pdf - 2018

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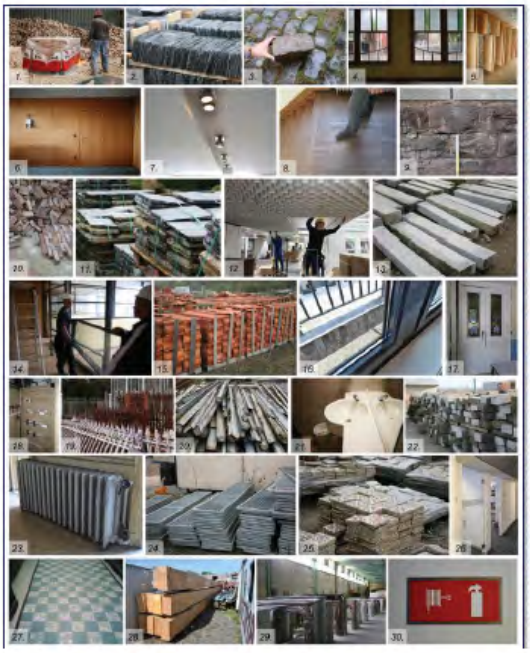


1. Briques pleines;
2. Ardoises ;
3. Pavés de voirie ;
4. Châssis de fenêtres ;
5. Armoires encastrées
6. Lambris des années '70 ;
7. Luminaires contemporains ;
8. Parquet ;
9. Moellons en pierre ;
10. Klinkers en terre cuite ;
11. Sol en pierre ;
12. Plafond suspendu alvéolaire,
13. Seuils de fenêtre en pierre bleue ;
14. Cloisonnement modulaire
15. Tuiles ;
16. Double vitrage récent ;
17. Porte ancienne ;
18. Tableau électrique ;
19. Ferronneries ;
20. Profils en acier ;
21. Équipements sanitaires ;
22. Bordures de voirie ;
23. Radiateur en fonte ;
24. Caillebotis métallique ;
25. Carrelage début 20ème siècle ;
26. Portes vitrées ;
27. Carrelage céramique années '50 ;
28. Poutres en lamellé-collé ;
29. Cheminées en marbre ou pierre ;
30. Signalétique

Before removal and preparation for re-use

Fiche 3

Matériau pour Composant d'Ouvrage :	Béton pour muret en pierre de béton maçonné
Accès au gisement	
Localisation sur le site?	Démolition / abattage effectif / déconstruction
Matériau : état d'admissibilité	
Localisation sur le site?	Dalle de compression/ façade, inst. d'béton. Privilégier le béton non armé
Sollicitations environnementales visées	Région de vent 1 à 4 selon NF EN 1991 Eurocode Autres sollicitations (risques de carbonatation, gel/dégel, sels de déverglaçage, attaques chimiques) déterminées selon NF EN 206-1 Béton - Partie 1 : spécification, performances, production et conformité
Exigences géométriques attendues	Moins de 25kg (pour manutentions)
Exigences mécaniques attendues (résist. mécanique, valeur rechercher)	2,3 T/m3 <ρ< 2,5 T/m3
Diagnostics autres	Amiante, plomb
Expertises attendues	
Autocontrôle(ment par le diagnostiqueur	Fissuration au stade visuel à l'abattage
Autocontrôle exécuté par l'entreprise	Non fissuré, état visuel
Contrôle le cas par l'ouvrage en parasitif	Non
Contrôle par BC ou laboratoire indépendant	Non

Photos d'un matériau type
AVANT DÉCONSTRUCTION ET PRÉPARATION

After preparation for re-use and integration

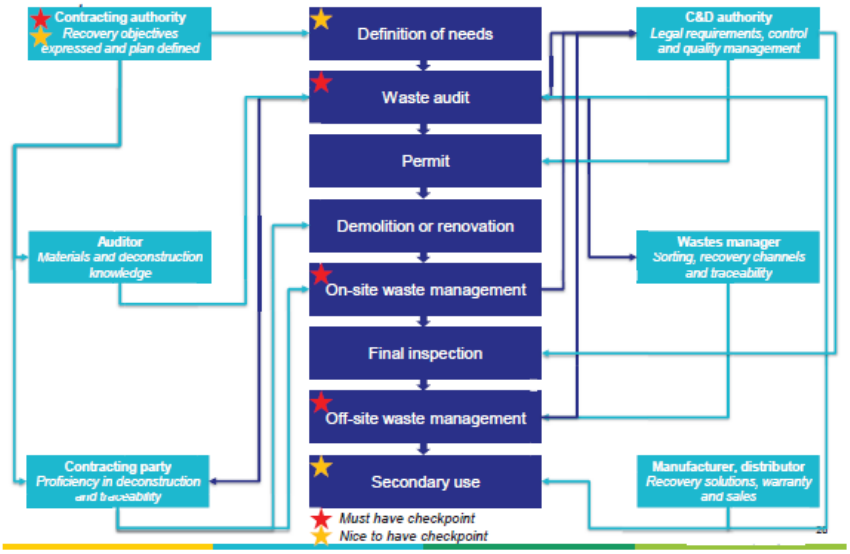
Fiche 3

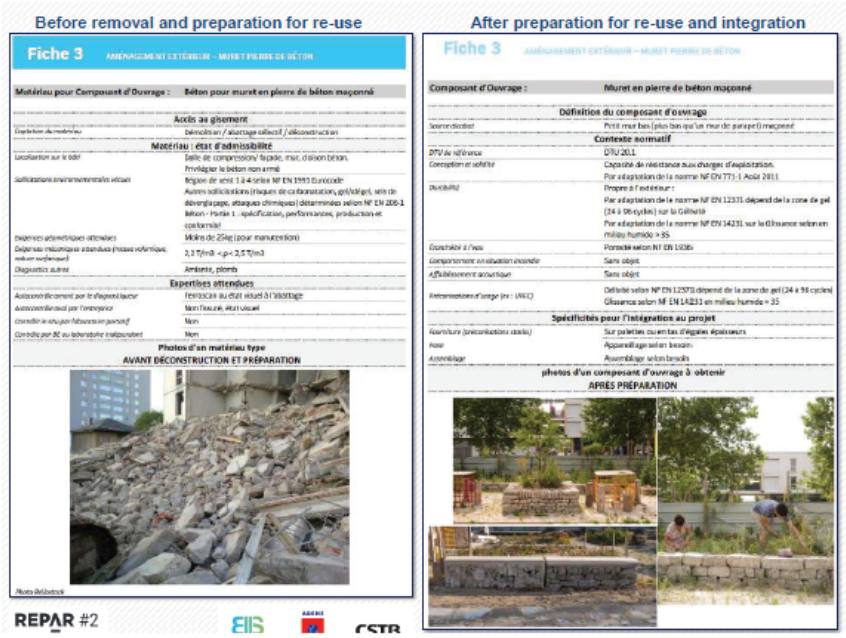
Composant d'Ouvrage :	Muret en pierre de béton maçonné
Définition du composant d'ouvrage	
Source d'inertie	Petit mur bas (plus bas qu'un mur de parapet) maçonné
Contexte normatif	
DTU de référence	DTU 20.1
Conception et solidité	Capacité de résistance aux charges d'exploitation. Par adaptation de la norme NF EN 771-1 Août 2011
Durabilité	Propre à l'extérieur : Par adaptation de la norme NF EN 12371 dépend de la zone de gel (24 à 56 cycles) sur la Gélivité Par adaptation de la norme NF EN 14231 sur la Gélivité en milieu humide > 95
Étanchéité à l'eau	Porosité selon NF EN 1936
Comportement en situation incendie	Sans objet
Affaiblissement acoustique	Sans objet
Préconisations d'usage (ex : UNEC)	Définie selon NF EN 12371 dépend de la zone de gel (24 à 56 cycles) Gélivité selon NF EN 14231 en milieu humide > 95
Spécificités pour l'intégration au projet	
Fourniture (préconisations stocks)	Sur palettes ouvertes d'égales épaisseurs
Pose	Appareillage selon besoin
Assemblage	Assemblage selon besoin

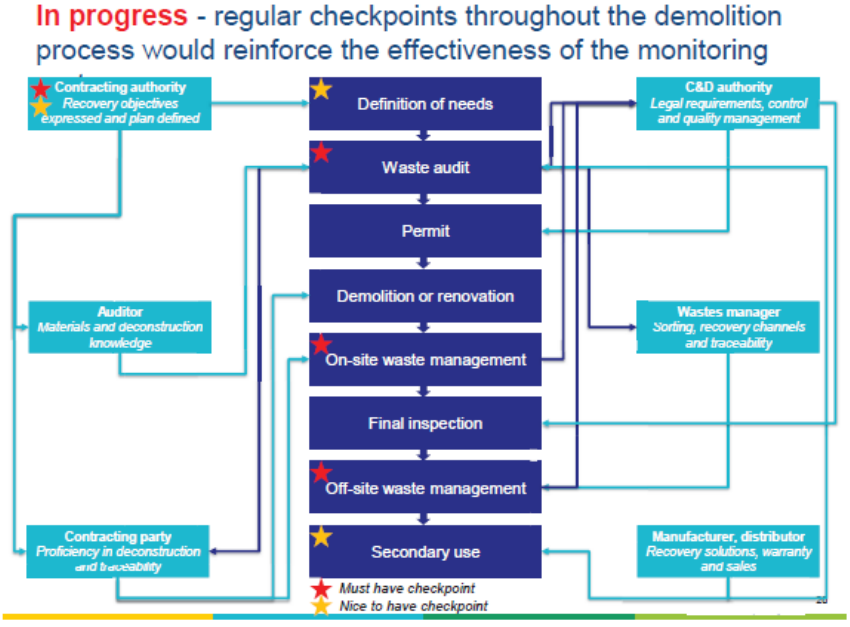
photos d'un composant d'ouvrage à obtenir
APRÈS PRÉPARATION

REPAR #2

In progress - regular checkpoints throughout the demolition process would reinforce the effectiveness of the monitoring




Before removal and preparation for re-use
After preparation for re-use and integration
Fiche 3
Matériau pour Composant d'Ouvrage : Béton pour muret en pierre de béton maçonné
Accès au gisement
Matériau : état d'admissibilité
Expertises attendues
Photos d'un matériau type
AVANT DÉCONSTRUCTION ET PRÉPARATION
Fiche 3
Composant d'Ouvrage : Muret en pierre de béton maçonné
Définition du composant d'ouvrage
Contexte normatif
Spécificités pour l'intégration au projet
photos d'un composant d'ouvrage à obtenir
APRÈS PRÉPARATION
REPAR #2


In progress - regular checkpoints throughout the demolition process would reinforce the effectiveness of the monitoring
Contracting authority
Recovery objectives expressed and plan defined
Definition of needs
C&D authority
Legal requirements, control and quality management
Waste audit
Permit
Demolition or renovation
Auditor
Materials and deconstruction knowledge
Wastes manager
Sorting, recovery channels and traceability
On-site waste management
Final inspection
Off-site waste management
Contracting party
Proficiency in deconstruction and traceability
Secondary use
Manufacturer, distributor
Recovery solutions, warranty and sales
Must have checkpoint
Nice to have checkpoint

In progress - question territories about the use of the EU templates and provide feedback for a continuous improvement

10. Recommended template for waste traceability

Waste audit	Week 1	Week 2	Week 3
Waste stream			
Waste code (EWC and EURAL)			
Type of material			
Previewed in waste audit			
Sorting			
Need to separate			
Generated			
Deviations			
Management			
Reuse			
Valorisation			
Disposal			
Managed			
Deviations			
Justifications and supporting documents			

Final step – completion of inventory check form - too few audits are performed according to CERFA returns (ADEME), AURA-EE will host a workshop in May to discuss areas of improvement

En tonnes			Diagnostic préalable	Prévention	Valorisation					Elimination			
			Quantités estimées dans la synthèse	Réemploi sur site	Réutilisation sur un autre site	Envoi vers centre de regroupement et/ou de tri[4]	Envoi vers centre de valorisation matière	Envoi vers centre de valorisation énergétique	Reprise des déchets à un éco-organisme filière d'un agrément REP [5] (préciser obligatoirement l'organisme en fin du présent tableau)	Stockage en ISDI	Stockage en ISDND	Stockage en ISDD	Autre filière d'élimination (à préciser obligatoirement en fin du présent tableau)
Matériaux ou déchets inertes (DI)	Mélanges bitumineux (sans goudron)												
	Terres (hors terre végétale) non polluées												
	Béton et pierre												
	Tuiles et briques [1]												
	Céramique (carrelage, faïence et sanitaires)												
	Verre sans menuiserie												
	Mélanges de DI listés ci-dessus sans DND (à détailler éventuellement en fin du présent tableau)												
	Autres déchets inertes (à détailler obligatoirement en fin du présent tableau) [3]												
Matériaux ou déchets non dangereux (DND)	Plâtre	Plaques et carreaux											
		Enduit + support inerte											
		Complexes plâtre + isolant											
	Bois	Non traités											
		Faiblement adjuvantés											
	Fenêtres et autres ouvertures vitrées												
	Métaux (à détailler éventuellement en fin du présent tableau)												
	Plastiques (à détailler éventuellement selon type de plastiques ; ex : PVC) [2]												
	Isolants	Laines minérales											

Which barriers in France ?

- Low level of knowledge of the regulation among local authorities ?
- An urgent need to train auditors, initiatives are marginal, who is supporting the costs ?
- Contracting authorities are the cornerstone and must be trained to prescribe recovery solutions in tenders, behavioral change is needed !
- Tracking system is to be developed and must stem from a common agreement between value chain actors, what, when, how, who
- A taxe system to ease the secondary use of C&D materials, currently evolving to make recycling materials more competitive

Source: http://www.bellastock.com/rebean-3/ 2018

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Which levers ?

At national level
- Spread the scope of the pre-demolition audit to renovation
- Uplift labels recognition to better apply circular economy principles
- Ease the end of waste regulatory status, as quoted in the measure 37 of the FREC

For contracting authority
- Regard wastes as resources, consider urban mines
- Train itself and prime contractor to recycling and recovery techniques
- Put in place best practices and sign charter, communicate to spread the use of best practices
- Maximize potential value, incentivize actors in the tenders, pay attention to skills
- Create dedicated work package for secondary use of materials
- Deepen responsibilities, risks coverage and warranty issues

For prime contractor, train participants and raise awareness to re-use techniques and potential

For auditors
- Train and get certifications such as OPQTECC or OPQIBI
- Perform a dynamic inventory and meet stakeholders able to provide complementary information

For company, train to waste sorting and management techniques to better meet customer expectations

For local authority, create at regional / city level a teamwork dedicated to coordinate scheduling and link supply and demand between C&D sites

For the whole, make use of data to quantify and qualify potential for recovery and exchange information with actors

Source: OREE -COMMENT MIEUX DÉCONSTRUIRE & VALORISER LES DÉCHETS DU BTP ? 2018

24


CONDEREFF
Interreg Europe
European Union
European Regional
Development Fund
Thank you!
Questions welcome
Project media

Ingeniería y Tecnología

3ciencias