Aggregates from Construction and Demolition Waste in Europe
Objectives:
- To underline the importance of waste recovery within the framework of the sustainable use of natural resources
- To identify the models and the leverages for recovery of Construction and Demolition waste.

Report carried out:
- At the request of Didier Audibert, President of UEPG
- By Hafedh Ben arab, Director, Holcim Group

Acknowledgments
- European Aggregates Association (UEPG)
- European actors working in the recovery of Construction and Demolition waste
- Investigations and recent studies relating to the recovery of Construction and Demolition waste

Revision
- The report will be updated on a regular basis to take into account new developments
Reference: UEPG annual report 2005

1) including crushed gravel and marine aggregates* (*: except when specified in (5))
2) excluding crushed gravel
3) coming from Construction & Demolition Waste used in aggregates market
4) industrial & extraction by-products for Building and Civil Works
5) source ZEEGRA and EMSAGG Conference February 2006

(ZEEGRA and EMZAGG are Belgium and European marine aggregates associations)
The proposed revised **Waste Framework Directive (COM 2005) 667 final** is expected to be adopted by end 2006

[link](http://europa.eu.int/comm/environment/waste/strategy.htm)

It will repeal the **Council Directive 75/442/EEC** on waste.

[link](http://europa.eu/scadplus/leg/en/lvb/l21197.htm)

The new proposal aims at:

- clarifying a number of *definitions* \(^{(1)}\)
- taking in account latest developments in EU environment law
- simplifying current legal provisions
According to information published by the *Environment Statistics*, Eurostat, the total production of waste* in EU 25 is increasing and represent approximately 3 tons of waste/person/year.

### Waste total (hazardous and non–hazardous waste) by sectors; year 2002

<table>
<thead>
<tr>
<th>Agriculture and forestry</th>
<th>Mining and quarrying</th>
<th>Manufacturing and industry</th>
<th>Energy prod., Water Purification &amp; Distribution</th>
<th>Construction</th>
<th>Other</th>
<th>Municipal waste</th>
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<td>Kg/person</td>
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<td>17 329</td>
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Construction waste represents an average of 1 ton/person/year in EU 25

* : covering manufacturing industry, energy prod., water purification & distribution, construction and municipal waste

Construction materials “Life Cycle”

1. Planning
2. Construction
3. Use
4. Demolition
5. Recycling

Recycled material = Secondary material

Construction waste
Waste from renovation
Demolition waste

Demolition waste

Quality management

Raw material
Construction waste

Waste from renovation
Materials from inert construction & demolition waste are secondary materials since:

- their use does not have an overall negative environmental impact
- there is an existing market for these materials, especially in areas with scarce natural resources

Remark: the two above criteria are those defined in Article 11 of the revised Waste Framework directive
Secondary materials can be produced:

• In a recycling platform

• Directly on the construction site

• As part of the manufacturing process \( \text{link} \)\(^{(2)} \)

Production figures from construction sites and manufacturing processes are generally less accessible. Therefore official recycling figures are often under-estimated.

\( \text{Recovery performance} \)\(^{(3)} \)
... but recovery follows the same value chain

Renovation
Demolition
Construction

Transport

Sorting

Transport

Treatment

Transport

Disposal

Transport

Recovery

The proposed Commission text for a revised Waste Framework Directive defines "Treatment" as the operations of Disposal and Recovery.
EU uses nearly 7 tons of aggregates per inhabitant
Studies shows that recycled aggregates are used in several segments:

- Filling
- Foundation
- Asphalt
- Concrete

The use in ready-mixed concrete is embryonic in spite of the many studies referring to it:

- Mirian thesis 96 (4),
- Roumiana thesis 98 (5)
Environmental benefits

- Saving natural resources
  - Voluntarist policy to limit the exploitation of alluvial in the overexploited areas (France, Belgium...)
  - Voluntarist policy to preserve the deposit for future generations (GB)

- Reducing landfill sites
  - The recovery of construction waste leads to the reduction of disposal (NL,...)

- Reducing harmful effects of transport
  - Waste to be recovered is located in urban areas which are also the most significant consumption areas;
  - Quarries are in theory located outside the centres of urban areas and tend to move away;

Therefore, the consumption of recycled aggregates leads to a significant reduction in transport and thus in the harmful effects related.
When natural materials are in abundance or present, recycled materials can compete only if their quality is equivalent to that of natural aggregates.

Standards for recycled aggregates are expected to be issued in 2007.

- Proposed amendments for recycled aggregates\(^{(6)}\)
- Classification test for the constituents of coarse recycled aggregate\(^{(7)}\)
The profit margin on recycled aggregates depends on:

- **Perception**: a better acceptability of recycled materials enhances their economic value and thus their margin.

- **Localisation**: to compensate for their production cost which is higher than for natural materials, the recycled materials are in fact intended for a local market.

- **Tax incentives**: high landfill taxes support recycling tipping fees (direct improvement of the margin) and induce more volumes towards recycling sites (indirect improvement of the margin; reduction in the production costs by the volume effect).

☞ *Taxes* (8)
Profitability

- Production cost
- Logistics cost to the market
- Tipping fees recycling plants or tax on natural materials
- Profit margin

*: 15 km around production site

€/T

Market price for natural materials

Market price for recycled materials*

Natural materials

Recycled materials
The market price variation \( \Delta \) between recycling and natural aggregates (1 to 2 € per ton) is closely related to customer confidence in an area given to recycled materials. This confidence is all the more random as, in the majority of countries, there is no compulsory quality standard for recycled materials.

The price of recycled materials is sometimes subject to significant fluctuations related to the management of incoming stock of recycling sites.

Recycling cost & micro markets (9)
### Pros & Cons

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<tbody>
<tr>
<td>• Recycling represents an additional source of aggregates</td>
<td>• Attraction of “non-professional recycling companies”</td>
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<tr>
<td>• Supported by the European Commission</td>
<td>• Reluctance of certain building designers &amp; managers</td>
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<td>• Existing national recommendations and regional guidelines</td>
<td>• Lack of support from public procurement</td>
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<td>• Standardisation under development</td>
<td>• Low acceptability of recycled products</td>
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<td>• Positive perception of “recycling”</td>
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Conclusions

- Construction waste is a significant renewable source of recycled aggregates.

- Recycled aggregates from inert C&D waste qualify as secondary materials.

- Thanks to the continuous improvement of the legal framework, incentives from competent authorities and technical innovation, some countries have achieved a high recovery rate of construction waste.

- Before entering the recycling business, it is essential that operators examine carefully local conditions.
Annexes

1. Definitions
2. Concrete plant
3. Recovery performance
4. Mirian thesis
5. Roumiana thesis
6. Proposed amendments for recycled aggregates
7. Classification test for the constituents of coarse recycled aggregates
8. Taxes
9. Recycling cost & micro markets
10. The industry of recycling
11. The French case study
12. The Netherlands Case study
13. The Belgium case study
14. The United Kingdom Case study
15. The German Case study
<table>
<thead>
<tr>
<th>Country</th>
<th>Institution/addresses</th>
<th>Web site</th>
<th>Contact person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>FEDIEX, FEREDECO, VVS</td>
<td><a href="http://www.feredeco.be">www.feredeco.be</a></td>
<td>Michel Lerat, Marc Regnier, Willy Goossens</td>
</tr>
<tr>
<td>Germany</td>
<td>BKS, MIRO</td>
<td><a href="http://www.bks-info.de">www.bks-info.de</a>, <a href="http://www.by-miro.org">www.by-miro.org</a></td>
<td>Hans-Peter Braus, Prof. Ulrich Hahn</td>
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<td>The Netherlands</td>
<td>BRBS</td>
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<tr>
<td>UK</td>
<td>QPA</td>
<td><a href="http://www.qpa.org">www.qpa.org</a></td>
<td>Simon van der Byl, Jerry McLaughlin</td>
</tr>
</tbody>
</table>
Sources

- EU summary on waste disposal

- EC Study on waste generated and treated in Europe

- Study on raw materials policy and supply practices in north western Europe
  - [www.international.bouwgrondstoffen.info](http://www.international.bouwgrondstoffen.info)
Thanks

To:
- W.J. van Bentum, BRC
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