Seminar: Towards Recycling of Building Glass in Europe

25 November 2016
Thon Hotel Brussels City Centre
Brussels, Belgium

Welcome in the heart of Europe!
Ulrich Ix – President FERVER
Welcome word
Nicolas Scherrier
Representative of Minister Céline Frémault
Session 1:
Why is it important?
A Circular Economy Approach for the Construction Sector

Gunther Wolff
Policy Officer
European Commission
DG Environment
A Circular Economy approach for the construction sector

Gunther Wolff
European Commission
DG Environment

Brussels, 25/11/2016
Results: CDW 2014
Figure 1
Human Population Throughout History, A.D. 1 to 2020

A.D. 1
150 million

1350
300 million

1700
800 million

1800
900 million

1900
1.6 billion

1950
2.4 billion

1985
5 billion

2020
8 billion

Exponential growth since 1950

(a) Population, Total Real GDP, Foreign Direct Investment, Damming of Rivers, Water Use, Fertilizer Consumption, Urban Population, Paper Consumption, McDonald’s Restaurants
Resources are scarce – and not in Europe
It is not enough to recycle more:
We need to use resources more efficiently!

#CircularEconomy
Circular Economy Strategy:
From a linear economy...
... to a circular economy
The Circular Economy Package

- Adopted by the Commission on 2nd December 2015

- Action Plan
- Communication
- List of Follow-up Initiatives (Annex)
- Legislative proposals on waste
Legislative proposal on waste

Waste in general:

- **Recycling targets 2030:**
  - Municipal waste > 65 %
  - Packaging: > 75 %
  - reducing landfilling: <10 %

- **Measures to promote waste prevention**
- **Clearer rules (preparation for reuse, by-products and end-of-waste status)**
- **Separate collection of bio-waste**
- **Minimum requirements for EPR**
Legislative proposal on waste

CDW:
- Waste prevention in the construction sector
- Sorting systems for CDW: wood, plaster, glass, metal and aggregates
- New definition: backfilling
Action plan: Main areas

- Production
- Waste management
- Innovation, Investment and Monitoring
- Secondary raw materials
- Consumption
Circular economy: Outlook

- Growth and job creation up to + 7 % of GDP
  - +600 M EUR annual turnover
  - savings of 8 % for EU companies
  - 170,000 direct jobs in the sectors of waste management

- Boosting competitiveness and ensure security of supply
- Economic and environmental resilience
- Promotion of innovation
- Reduce greenhouse gas emissions by 2-4 % annually
CDW: Current situation

- Low level of regulation at EU level: Art. 11 WFD
  - material recovery: at least 70 % (by 2020)
  - Including backfilling
- Accuracy and reliability of statistics is an issue
- High potential for recycling activity of CDW in principle, but differently used by MS
- Introduction of the 70 % recovery target has led to an improvement
- Implementation problems:
  - Identification and treatment of hazardous waste
  - In some MS: Illegal landfills
Basis:
- Legislative proposal
- Circular economy action plan

Individual measures:
- Study on CDW at EU level (2016)
- CDW management protocol (2016)
- Pre-demolition audit (2017)
- Business models and financing of recycling facilities (2017)
- Quality standards for secondary raw materials (?)
- Interface Chemicals/product/waste legislation
Long-term: Possible measures

Statistics
- Harmonisation and improvement

Legislation/Transposition
- New recycling targets (material specific?)
- Backfilling (better definition/restriction)
- Improving implementation

Design and prevention
- Eco-design and design for dismantling
- Prevention and reuse
Long-term: Possible measures

**Infrastructure**
- Network of recycling facilities (EU funds)

**Products/markets**
- Labelling and information
- Quality standards
- GPP (minimum content of recycled materials)

**Long-term challenges**
- High quality recycling
- Taking into account strategic aspects (raw materials)
More information:
http://ec.europa.eu/environment/waste/index.htm
http://ec.europa.eu/environment/circular-economy/

Thanks for your attention/
Gracias por su atención!

Gunther Wolff [at] ec.europa.eu
Economic Study on Recycling of Building Glass in Europe

Mathieu Hestin
Director Sustainable Development
Deloitte
Building glass recycling in the EU
Study for Glass for Europe
Towards recycling of building glass in Europe – November 2016 - Brussels
Contents

Quantification of building glass waste in the EU

Case studies

Evaluation of environmental benefits of building glass recycling

Cost-benefit analysis
Quantification of building glass waste in the EU

An estimated 1,5 Mt of glass waste arising in the EU, from the renovation and demolition of buildings.

83% Renovation
17% Demolition

- Residential
- Tertiary
Case studies
Building glass recycling in 6 EU countries
Examples: France
Partnership for building glass closed-loop recycling

**AGC, GTM Bâtiment, Veka Recycling, Veolia propreté, Isel**: « Revalo » window dismantling and recycling pilot

**Saint-Gobain, Lapeyre, Paprec**: experimentation of take-back at retail shops.
Impacts of increased flat glass recycling

Environmental impacts

Recycling flat glass waste in the EU could lead to:

- **Reduction of 900,000 tons of waste landfilled**
- **1.2 million tonnes of raw materials** (mainly sand) saved
- **~250kg CO₂ eq / tonne** GHG emissions reduction
Impacts of increased flat glass recycling

Economic impacts

An economic balance yet to be found (Options 1&2: dismantling and recycling; Option 3: BAU)

<table>
<thead>
<tr>
<th>Glass waste</th>
<th>OPTION 1</th>
<th>OPTION 2</th>
<th>OPTION 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light renovations of residential buildings/houses (€/tonne of glass)</td>
<td>+~80 €/t</td>
<td>+~113 €/t</td>
<td>+~397 €/t</td>
</tr>
<tr>
<td>Large renovations of residential or tertiary sites (€/tonne of glass)</td>
<td>+~92 €/t</td>
<td>+~101 €/t</td>
<td>+~409 €/t</td>
</tr>
<tr>
<td>Demolition of residential and tertiary buildings (€/tonne of glass)</td>
<td>+~80 €/t</td>
<td>+~101 €/t</td>
<td>+~409 €/t</td>
</tr>
</tbody>
</table>

Gap difference with costs of option 3:
- Option 1: +~113 €/t
- Option 2: +~409 €/t
- Option 3: +~101 €/t

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Impacts of increased flat glass recycling

Economic impacts

Filling the gap: positive price for high quality glass cullets, optimising logistics and raising landfill taxes

Option 1

Option 2

- Default production costs
- Production costs with reverse logistics
- Production costs with reverse logistics minus revenues from cullets (65 €/t)
- Costs option 3 (current EU average landfill tax at 80 €/t)
- Costs option 3 with landfill tax at 140 €/t (option 1) and 120 €/t (option 2)
Key take-aways

A clear environmental benefit from increasing flat glass recycling

An economic balance yet to find, but a potential net competitive advantage in the case of renovations (which account for 83% of the waste arising)

A large gap in the case of demolition activities, which need to be addressed taking into account the whole building, and incentivized through predemolition audits / selective demolition requirements

Local infrastructures are key to the development of building glass recycling (the economic balance is highly influenced by transportation costs).
Thank you!
Mathieu Hestin – mhestin@deloitte.fr
Towards recycling of building glass in Europe – November 2016 - Brussels
Nicolas Scherrier
Project Manager
Bruxelles Environnement
The Circular Economy Regional Program applied to construction wastes

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Seminar: Towards recycling of building glass in Europe
25 Nov. 2016 - Brussels, Belgium
Info & Registration: click here
PREC – Regional Programme of Circular Economy

**PREC**
- A tool for economic stimulation
- Oriented towards economic activities and job creation
- Adopted on March 10th 2016 (3 ministers and 4 regional administrations involved)

[Link to website](http://www.circularprojects.brussels/?page_id=14&lang=fr)
PREC – Sectorial Approach
In Brussels: no C&D material production nor C&D waste recycling facilities. Economy & jobs related to material production and waste management are outside Brussels.
CIRCULAR APPROACH OF C&D MATERIALS VIA REUSE

Economy and jobs related to selective deconstruction, recycling, and material reuse are in Brussels and can hardly be delocalized. Environmental impact on resources, waste management, and transport are lower in a circular approach.
5 MEASURES ON CONSTRUCTION AND DEMOLITION WASTE / MATERIAL

RW 13: **STIMULATION** of the construction sector via a Call for Project:
- Selective deconstruction and material reclaim
- Material reuse

RW 14: **INNOVATION** on waste management and on site sorting via pilot projects.

RW 15: **ACTIVATE** entrepreneurship on **REUSE** of construction material

RW 16: **STIMULATION** of **RECYCLING** of construction wastes

RW 23: **SUPPORT** selective deconstruction in calls for tender
STIMULATION via a Call for Project

9 retrofiting projects received, based on:

- Well thought constructive hierarchy
- Maintaining existing building blocks
- Maximisation of material reclaim
- Design for deconstruction
- Integrated management
- Rentability - Reproducibility

Source: E. Gobbo, Déchets de construction, matières à conception, UCL, 2015
All actors active in Reuse of construction material (identified so far) plan to work together and with the construction sector in 2017 in order to:

1. Coordinate and animate the « Reuse Network »

2. **Communicate** around this network and its actions

3. Prepare **business models to further develop the network** and its actions

4. Identify and document **inspiring projects of Reuse** and the **professionals** who made it possible

5. Further develop [www.opalis.be](http://www.opalis.be) as a numerical portal on Reuse
MADE IN BELGIUM

All pictures from Rotor (www.Opalis.be)
BXL : OFFICES ELEMENTS

All pictures from ROTOR (www.Opalis.be)
INNOVATION on waste management and on site sorting

- 11+ pilot projects
- Lead by the Belgian building research institute (CSTC/WTCB) and the construction confederation (CCCB/CBBH)

Procedure is as follows:

- Diagnosis of each project (including evaluation of the production of waste per waste stream)
- Identification of major issues and possible solutions
- Waste management plan

So far, projects are in the analysis phase, future steps include:

- Implementation of the waste management plan
- Data collection, analysis, recommendations
STIMULATION of RECYCLING of CDW

- Ongoing study on **EoW criteria for concrete**, (and other inert CDW) to promote their recycling. The new law (BRUDALEX, work in progress) will allow the Region to edict such EoW criteria.
- A study has identified **active recyclers of Brussels’ CDW** and a repository has been developed.
- Actions on the **recycling of specific waste streams** (such as flat glass, gypsum, hazardous products) by Go4Circle will be supported.
SUPPORT selective deconstruction in calls for tender

- Long term action
- So far: vademecum on how a public owner can direct specific material to reuse (ready to use technical and legal documents), made by ROTOR.

4 routes have been developed:

SERVICE TENDERS

SALE

DONATION

OBLIGATION OF MEANS (for the general contractor)

http://rotordb.org/project/2015_Vademecum_Deconstruction
Thank you for your time

More info:

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http://www.environnement.brussels

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Chris Holcroft
Senior Technologist
Glass Technology Services

&

Valli Murthy
Environmental Advisor
British Glass
Recycling of Building Glass in Europe

Project overview

Chris Holcroft and Valli Murthy

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 642154.
Project Overview

• Horizon 2020 funded project ~€11M
• 27 European Partners from 9 countries
• Project aims to close loop recycle all types of construction waste.
  • Glass
  • Wood
  • Ceramic
  • Plastics
  • Rubber
• British Glass and GTS are leading on glass to increase recycling for both remelt and higher value alternative uses in particular Ecocement products.
• Sept 2015 – Feb 2020
Glass Supply Chain
Project Plan

2015

- Review of markets
  - availability
  - stakeholders
  - current levels
- Collection and recycling processes
  - Case studies
  - Interviews
  - Barriers
  - Legislation and regulations

2020

- Design for deconstruction and recycling
- Environmental assessments
- Technology
  - Previous work
  - Lab trials
  - Pilot trials
- Dissemination and education
- Software tool
- Living Labs
Benefits of Recycling Glass

- Saves 1.2 tonne raw materials
- Energy: Saves 322 kWh
- CO2: Saves 185 kg batch + 61 kg fuel
- Air emissions: Reduces dust and other pollutants
<table>
<thead>
<tr>
<th>Recyclers</th>
<th>Glass manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>• A “blueprint” for recycling is needed</td>
<td>• Many different people and contractors on a construction site; co-ordination and communication are challenging</td>
</tr>
<tr>
<td>• Explaining the importance of closed loop recycling</td>
<td>• Motivation i.e. persuading people to act on knowledge, is also a challenge.</td>
</tr>
<tr>
<td>• Individual companies and managers have strong personal preferences.</td>
<td></td>
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<tr>
<td>• If they can’t be bothered, it is difficult to recover good glass.</td>
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<tr>
<td>• Site managers are important to influence</td>
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<tr>
<td>• Education is important</td>
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</table>

<table>
<thead>
<tr>
<th>Other interested parties</th>
<th>Construction and demolition</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Lack of information is a big barrier to recycling more flat glass.</td>
<td>• Demolition contractors don’t know where to recycle the glass.</td>
</tr>
<tr>
<td>• There is a perception that glass is ‘difficult to recycle’. People are confused about contamination, and it is difficult to find places that accept glass.</td>
<td>• General assumption is that it is not cost effective, it is not normal practice.</td>
</tr>
<tr>
<td>• More concrete information to help them with this.</td>
<td>• ‘If you ask a demolition contractor if they recycle glass, they will say they don’t know where to do it or who will take it.’</td>
</tr>
<tr>
<td>• We need to raise awareness.</td>
<td>• The client has a big influence in how things are done because they specify the results. A client putting closed loop glass recycling as a condition in their contract would make things happen – especially in cases where it isn’t commercially viable to recycle glass which is believed to be the majority of instances.</td>
</tr>
<tr>
<td>• Many people just do what they have always done; it is young people who change things.</td>
<td></td>
</tr>
<tr>
<td><strong>Recyclers</strong></td>
<td><strong>Glass manufacturers</strong></td>
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</tbody>
</table>
| • Construction sites may not have the man power to separate windows  
• At the end of the day, it is down to the people on site – if they can’t be bothered, it is difficult to recover good glass.  
• Storage - Space on site is a big barrier. A project may only have space for 3 skips for all waste materials.  
• Some glaziers don’t have any space at all for skips and have to store old windows in their vans.  
• H&S – Processing glass on their site may not make sense once you factor in H&S and cost of PPE.  
• Construction sites may not have the man power to separate windows  
• 1 person would have to break glass units all day to get a tonne of glass. | • Operational obstacles and making it pay will be barriers. There are lots of different people and contractors on a construction site; co-ordination and communication are challenges. |
| • Other interested parties  
• We try to make recommendations on material disposal in pre-demolition audits. Glass is more difficult to deal with than other materials.  
• Time and space constraints often cited as reasons for not separating glass | • Construction and demolition  
• In their demolition projects, windows are removed manually with a crowbar.  
• If the project is on the ground floor, it may be possible to take it to a skip.  
• Even if it is 1 storey up, there will be a drop zone/shaft to drop heavy things, like windows, and this is where the glass gets smashed. The process is rough but it doesn’t matter because they are not reused and their value doesn’t change.  
• Have to designate a dedicated area, separate the glass, transport the glass etc. It doesn’t have enough value. |
<table>
<thead>
<tr>
<th>Recyclers</th>
<th>Glass manufacturers</th>
</tr>
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<tbody>
<tr>
<td>• Got to treat it like a high value product, but it isn’t worth that level of treatment’</td>
<td></td>
</tr>
<tr>
<td>• Very high quality standards from flat glass manufacturers</td>
<td></td>
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<tr>
<td>• Individual companies and managers have strong personal preferences on quality</td>
<td>• Quality is more important than volume is their experience.</td>
</tr>
<tr>
<td>Recyclers</td>
<td>Glass Manufacturers</td>
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<td>--------------------------------------------------------------------------</td>
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<tr>
<td>• Need legislation banning from landfill</td>
<td>• Motivation i.e. persuading people to act on knowledge, is also a challenge.</td>
</tr>
<tr>
<td>• Regulations need to be enforced to work</td>
<td></td>
</tr>
<tr>
<td>• Definitions: UK is the only country in EU which describes glass to aggregates as ‘recycled’.</td>
<td></td>
</tr>
<tr>
<td>• If there was an incentive to recycle</td>
<td></td>
</tr>
<tr>
<td>• Landfill ban of glass</td>
<td></td>
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<tr>
<td>• Putting clauses that glass must be recycled into the contract would be good</td>
<td></td>
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<tr>
<td>Recyclers</td>
<td>Glass manufacturers</td>
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<tr>
<td>--------------------------------------------------------------------------</td>
<td>----------------------------------------------</td>
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<tr>
<td>• Got to treat it like gold, but it doesn’t have the value of gold’</td>
<td>• Motivation</td>
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<tr>
<td>• Putting clauses in contracts that glass must be recycled</td>
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<td>to level the playing field for companies doing the right thing</td>
<td></td>
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<tr>
<td>• Transport cost is key</td>
<td></td>
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<tr>
<td>• H&amp;S – Processing glass on their site may not make sense for WT</td>
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<tr>
<td>once you factor in H&amp;S and cost of PPE.</td>
<td></td>
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<tr>
<td>• Low value of glass compared to time required for processing – 1 person</td>
<td></td>
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<tr>
<td>would have to break glass units all day to get a tonne of glass.</td>
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<td>• Space and time constraints</td>
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<tbody>
<tr>
<td>• Solutions must be cost neutral, easy and quick.</td>
<td>• They want us to split it into 2 panes and</td>
</tr>
<tr>
<td>Construction companies need to be efficient with costs and time, and</td>
<td>it is not profitable to do this.</td>
</tr>
<tr>
<td>often hire one waste management contractor to do everything.</td>
<td>• It all comes down to cost</td>
</tr>
<tr>
<td>• There needs to be a financial benefit,</td>
<td>• We sell the metal. We want someone to</td>
</tr>
<tr>
<td>• Lack of value – If the demolition industry see a value for glass, they</td>
<td>take the glass off us for money.’</td>
</tr>
<tr>
<td>will take it out.</td>
<td>• A client putting closed loop glass recycling</td>
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<tr>
<td>• Lack of market a barrier</td>
<td>as a condition in their contract would make</td>
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<td></td>
<td>things happen – especially in cases where</td>
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<td>it isn’t commercially viable</td>
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<td>• Glass is a very small percentage of the</td>
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<td>crushed material and doesn’t need to be</td>
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<td>there – there is just nothing better to do</td>
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<td>with it at the moment that is convenient</td>
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<td>and financially viable.</td>
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<td>• When he has spoken to recyclers, they say</td>
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<td>they will take it for nothing. But he has</td>
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<td>to designate a dedicated area, separate the</td>
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<td>glass, transport the glass etc. He won’t</td>
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<td>recycle glass under these circumstances – it</td>
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<td>doesn’t have enough value.</td>
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<td></td>
<td>• It is not economically viable to recycle</td>
</tr>
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<td></td>
<td>glass unless there is a credit value for it</td>
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<tr>
<td></td>
<td>or the client asks for it and bears the cost.</td>
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</tbody>
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<table>
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</thead>
</table>
| - Construction sites may not have the man power to separate windows | - It is difficult to find places that accept glass | - If you ask a demolition contractor if they recycle glass, they will say they don’t know where to do it or who will take it.  
- We don’t recycle because we don’t know where. |
Barriers

• Lack of knowledge
• Contamination levels
• Lack of data
• Low price of finished material
• Cost of processing
• Lack of regulation/enforcement of regulation

Opportunities

• Education/guidance programs
• Better/new regulation
• Infrastructure development
• New technology
Contact

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Valli Murthy - British Glass - v.murty@britglass.co.uk

http://fissacproject.eu/en/
Any questions?

Now’s the time to ask them!
Time for some coffee!
- 30 minute break -

After the break:
Session 2: What works and what doesn’t?
Session 2: What works and what doesn’t?
Collecting and Recycling of Sheet Glass – a Step Forward to a Circular Economy

Cor Wittekoek
Director
Vlakglas Recycling Nederland
Collecting and recycling of sheet glass - a step forward to a Circular Economy
Structure of Vlakglas Recycling Nederland (VRN)

2002: funding of Vlakglas Recycling Nederland, voluntary initiative of the Dutch Glass Industry
Reason: to meet the producer Responsibility (EPR)
Foundation: Non-profit
Board
Office: Zoetermeer, the Netherlands
Structure of VRN in 2015

- **Network of 403 collection points**
  - Located at/near: sheet-glass manufacturers, sheet-glass processing companies, sheet-glass wholesalers, container firms
  - Free disposal of sheet-glass waste
  - Collection points have no costs

- **Rental locations at/near +/- 326 companies**
  - For their own use - monthly fee is payable

- **531 temporary locations per year**
  - At demolition or renovation sites - a monthly fee is payable

- **192 collection points at waste park**
  - Located at municipal waste disposal points
  - Free disposal of sheet glass waste
Financing

Recycling levy is €0.40 for every $m^2$ of insulated glass

- Produced in or imported into the Netherlands
- Introduced by the Ministry of Housing, Spatial Planning and the Environment
- Around 277 participants
- A few foreign manufacturers (8) who pay the levy as a gesture to and on behalf of their customers
Financing

- Levy collected by independent firm of accountants
- Confidentiality
- Random checks at ten companies conducted every year by our accountant
- Legal enforcement by VRN
Recycling and re-use of sheet glass waste

Results

2014: 69,415 ton sheet glass cullet collected
2015: 69.998 ton sheet glass cullet collected

Destination of the waste sheet glass
Average result 2013-2015, re-used in:

- Sheet glass industry 11%
- Insulation products 19%
- Packaging industry 69%
- Others 1%
## Collection results (ton)

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</tr>
</thead>
<tbody>
<tr>
<td>Combination glass</td>
<td>58,890</td>
<td>57,670</td>
<td>60,277</td>
<td>66,809</td>
<td>70,179</td>
<td>60,860</td>
<td>75,065</td>
<td>67,506</td>
<td>69,263</td>
<td>63,113</td>
</tr>
<tr>
<td>Laminated glass</td>
<td>6,114</td>
<td>6,259</td>
<td>7,674</td>
<td>9,121</td>
<td>10,239</td>
<td>17,178</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Float glass</td>
<td>4,740</td>
<td>5,110</td>
<td>6,452</td>
<td>8,978</td>
<td>7,812</td>
<td>7,688</td>
<td>6,918</td>
<td>5,341</td>
<td>4,257</td>
<td>1,544</td>
</tr>
<tr>
<td>Green houses glass</td>
<td>170</td>
<td>32</td>
<td></td>
<td>423</td>
<td>369</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Mirror</td>
<td>32</td>
<td>231</td>
<td>339</td>
<td>301</td>
<td>159</td>
<td>47</td>
<td>40</td>
<td>121</td>
<td>252</td>
<td>800</td>
</tr>
<tr>
<td>Contaminated (dirty) glass</td>
<td>52</td>
<td>113</td>
<td>79</td>
<td>381</td>
<td>339</td>
<td>658</td>
<td>467</td>
<td>462</td>
<td>294</td>
<td>205</td>
</tr>
<tr>
<td><strong>Totaal</strong></td>
<td><strong>69,998</strong></td>
<td><strong>69,415</strong></td>
<td><strong>74,821</strong></td>
<td><strong>85,590</strong></td>
<td><strong>89,151</strong></td>
<td><strong>86,000</strong></td>
<td><strong>82,490</strong></td>
<td><strong>73,460</strong></td>
<td><strong>74,044</strong></td>
<td><strong>65,662</strong></td>
</tr>
</tbody>
</table>
CO2- reduction through recycling and re-use of waste sheet glass

- VRN received the Lean and green Award and the Lean and Green Star award: 20% CO$_2$-reduction through the transport of waste sheet glass.

- In 2015 VRN transported +/- 40,347 ton by vessel. Two locations in the Netherlands to where waste sheet glass is shipped by vessels.
CO2- reduction through recycling and re-use of sheet glass

Result recycling of sheet glass waste
In 2015 VRN collected **69.998 ton** of sheet glass waste. This results in a CO$_2$ reduction of 8.120.000 kilogram.
Collection and recycling of waste sheet glass from C&D projects
Collection and recycling from waste sheet glass from C&D

- VRN participates together with other branch organisations in a project.

- Aim of the project: collect and recycle more window frames including sheet glass from demolition and renovation.

- Each year estimative 5,000 to 10,000 ton sheet glass waste is not collected from demolition projects (figures 2011).
Collection and recycling from waste sheet glass from C&D

In 2014: change of the Dutch Building Decree

• Article 4.1: sheet glass with or without window frame is now also mentioned on the list of waste streams that have to be separately collected at demolition sites, to be recycled afterwards.

• No good law enforcement / control yet available.
Collection facilities – also available at C&D sites

Dimensions: 6 x 2 x 1.10 m
Height is appropriate for safe disposal of glass

Volume 0.5; 1; 2m³

Closed container: safe for the surrounding area and reduces the chance of contamination
Other developments/projects

- Research into setting up collection structure in other countries

- Research into collecting and recycling glass grit
Communication channels

- Newsletter
- Flyer
- Training
- Website
- Annual report
- Participation at trade fairs
- Twitter
Insights on the Recycling of Flat Glass and Flat Glass Recycling Activities of FERVER members

Marc Uphoff
General Manager
Reiling Glas Recycling
Insights on the recycling of flat glass and flat glass recycling activities of FERVER members

Marc Uphoff

Reiling Glas Recycling GmbH & Co. KG
GERMANY
Current activities of FERVER members

Why (flat) glass recycling?

Types of flat glass and flat glass collection

Challenges in flat glass processing

Main processing steps in flat glass recycling

Main applications for processed flat glass

Quality demands of glassworks

Outlook and conclusions
Current activities of FERVER members

Members have:
- NO activity in collection / processing
- Activities in collection
- Activities in collection and processing
- No FERVER members, not specified

42 Members

79 Recycling plants
- Packaging glass: 40
- Flat glass: 8
- Both: 31

Recycling of
70% of European glass waste

= 8.6 Mio tons
- Packaging glass: 6.8 Mio tons
- Flat glass: 1.8 Mio tons
### FLAT GLASS RECYCLING makes SENSE!

**It protects the environment!**

- Saving energy
- Conserving resources
- Reducing CO\(_2\)-emissions
- Reducing further emissions

Towards recycling of building glass in Europe - November 25; 2016 - Marc Uphoff; Reiling Glas Recycling GmbH & Co. KG
FLAT GLASS RECYCLING makes SENSE!

- Saving energy ...costs!
- Reducing emission ...costs!
- Increasing productivity („pull“)!
- Extending the lifetime of furnaces!
CLEAN FLOAT GLASS
- Pre-consumer glass waste
- Glass producers
- Best cullet quality

LAMINATED SAFETY GLASS
- Pre-consumer glass waste
- Glass producers
- A challenge: the removal of the PVB-foil!
In terms of quality...

- Only specialised companies should collect the glass!
- Glass recyclers should do the inspection of the glass!
- Glass recyclers should decide further processing and use!

**CAR WINDSCREEN GLASS**

- Pre- and post-consumer glass waste
- "Greenish" glass type (ferric oxide)
- A challenge: PVB-foil and rubber!

**MIXED FLAT GLASS** (Isomix)

- Pre and post-consumer glass waste
- Biggest volume in flat glass recycling
- A challenge: a lot of different impurities!

And...
We don´t want . . .

**LANDFILL FLAT GLASS**!

- Quality can be destroyed by wrong handling!
- This glass is **lost** for the recycling loop!

“**TOP 4**” of contaminants in collected flat glass waste:

- c.s.p.
- glass ceramics
- metals (f, nf)
- plastic, wood, ...
It's a hard job anyway . . .

from

feedstock quality

to

cullet quality

FLAT GLASS PROCESSING LINE
Main processing steps in flat glass recycling

1. Visual inspection
2. Fraktioning
3. Visual inspection
4. Homogenisation
5. Foil and paper removal
6. Metal sorting
7. Glass ceramics removal
8. C.S.P. sorting
9. Plastics / rubber removal

- feedstock control
- shredder, sieves
- manual handpicking (option)
- mill, sieves
- exhausting device
- magnets, eddie current devices; inductive separators
- XRF-sorter
- visual separators (CCD camera)
- visual separators (CCD camera)
Main applications for processed flat glass

- FLAT GLASS
- GLASS BEVERAGES (bottles)
- FIBERGLASS (e.g. insulation)
- OTHER (Foamglass, etc.)
Main applications for processed flat glass

- **PACKAGING GLASS**
  - + 30%

- **FIBERGLASS**
  - + 50%

- **FLAT GLASS**
  - + 20%

- **PROCESSED FLAT GLASS**
  - Ca. Cullet share in production processes
  - + 50%

- **FOAMGLASS** and suchlike
  - + 50%
quality demands for recycled flat glass

- **HIGH**
  - **FLAT GLASS INDUSTRY**
    - Floatglass
  - **PACKAGING GLASS INDUSTRY**
    - Bottles, jars
  - **INSULATION GLASS INDUSTRY**
    - Fiberglass
  - **FOAMGLASS INDUSTRY, etc.**
    - Foamglass and suchlike

- **LOW**
  - **ALTERNATIVE USE**
    - Roadworks, Abrasives, etc.

- **NO RECYCLING !**
  - Landfill (?)

- “one way“ Recycling“ !
Outlook and conclusions

- Flat glass recycling makes sense!
- Experience and recycling capacities are sufficient!
- Better eco-design for windows!
- Collection has to be done by specialised companies!
- Recycling companies should decide the applicability of waste glass!
- Rubbish In – Rubbish Out!
THANK YOU!

Marc Uphoff

Reiling Glas Recycling GmbH & Co. KG
GERMANY
Two Brussels’ Initiatives:
1. Windows Frame and Flat Glass Recycling in Brussels-Capital Region

Alexandre Halbrecq
Manager High 5 & Minerale
SUEZ
Windows frame and flat glass recycling in Brussels-Capital Region

25 November 2016
1. Project City Green Glass & Windows

In November 2014, project "Collection and sorting of windows frames & flat glass" launched by Go4Circle with a view to setting up a selective deconstruction system or collection or sorting of the windows and flat glass wasteflow in Brussels.

Suez and Minerale get approved !!

1. Initial characteristics and achievements

- March 2015: Market study has demonstrated the interest and the feasibility

- April 2015 Development of an operational zone at the SUEZ Laeken allowing the sorting and recycling of windows frames.

- From June 2015 Organize administratively, operationally and commercially the collection and direct deliveries from customer to recycling site.

- Data collection to feed outcome indicators
1. Project City Green Glass & Windows

2. Objectives:

• The identification and centralization of data on the potential market

• The development of selective collection and thus actively participate in a new recycling activity in the Brussels-Capital Region

• To offer the various market players an integrated solution for the collection, sorting and maximization of recycling.

• To allow Minerale S.A. to develop its flat glass recycling business to meet the constant and increasing demand for flat glass for the glass industry.
3. Advantages for the market:

- optimization of recycled waste quantities

- financial saving (reduction of the processing costs generated).
2. Sorting and recycling of windows frames and flat glass

1. Dismantling of frames in 4 recyclable fractions

2. Recycled or recovered fractions
   - Flat glass
   - Wood
   - PVC
   - Metal
   + residual fraction

3. Sorting result in %

<table>
<thead>
<tr>
<th>Waste streams</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>49.34%</td>
</tr>
<tr>
<td>Wood</td>
<td>39.30%</td>
</tr>
<tr>
<td>Metal</td>
<td>0.20%</td>
</tr>
<tr>
<td>PVC</td>
<td>2.43%</td>
</tr>
<tr>
<td>Residual</td>
<td>8.73%</td>
</tr>
</tbody>
</table>
3. Figures

- Chassis IN 2015: 745T sorted
- Chassis IN 2016 YTD: 1.281 T sorted
- Number input 2015: 153
- Number input 2016 YTD: 305
4. Flat glass treatment Minéraile

The extracted glass is transported to Minéraile located near Charleroi.

1. Pre-treatment site: 140,000 tons/year
   - 80,000 T bottle glass
   - 60,000 T flat glass

   Partnership: 50% Sibelco Europe - 50% Suez

2. Sorting line for flat glass:
   - Screening
   - Ferrous separation - nonferrous
   - Cyclonic aspiration of light fractions
   - Optical sorting
   - Sales to glass industry (insulation, bottles, …)
4. Conclusion

- It works in Laeken. Suez will start 2 other sites: Antwerp/Gent

- Obstacle:
  - The lack of space at customer location is a major obstacle for sorting.
  - Direct input to a sorting center can be a solution for the windows frames companies.

- Geographical area: Not only Brussels!
  - Companies located the most outside Brussels, “transfer/take back" their waste to their headquarters in Flanders or Wallonia.
  - With larger companies located in or near Brussels, our business approach has been more successful.

- The financial incentive for customer is essential (sorting vs mixing all wastes)
- But also the “recycling/green” image of this activity for the big customers.
4. Conclusion

➢ The demolition companies active in Brussels do not carry out the selective dismantling of the windows frame/glass.
  ➢ These are collected as a mixture in construction and demolition waste. According to several companies, it is not profitable for them to proceed otherwise.
  ➢ BUT for big buildings/towers, it should be possible!

➢ The feasibility and profitability of the collection and selective sorting of the windows frame is demonstrated.

➢ A sorting obligation, a strict recommendation or a targeted information campaign by the competent authorities would have a positive impact on increasing the volume of flat glass and chassis waste.
Two Brussels’ Initiatives:
2. Non-destructive Reuse of Glass Products and Windows

Lionel Billiet
Project Manager
ROTORE
Non-destructive reuse of glass products and windows

Towards Recycling of building glass in Europe
25 November 2016

Lionel Billiet
Rotor, Brussels
1. Window frames
2. Glass partitions
DURÉE DES LOYERS (3)
- $h_c \leq 1,50m$ et $h < 0,90 m$.
- verre de classe 1C- ou 2B2
- ou verre recuit avec garde-corps permanent placé côté risque de choc
3. Point-fixed glass façade
Thank you for your attention!

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www.rotordc.com

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Any questions?

Now’s the time to ask them!
Debate: How to Improve the Recycling of Building Glass?

- **Moderator:**
  - Jan Maarten de Vet – Director, Ecorys

- **Panelists:**
  - Vincent Basuyau – Policy Officer, European Commission - DG Internal Market, Industry, Entrepreneurship and SME’s
  - Nicolas Scherrier – Project Manager, Bruxelles Environnement
  - Ulrich Ix – President, FERVER
  - Bertrand Cazes – Secretary General, Glass for Europe
  - Jose Blanco – Secretary General, European Demolition Association
  - Cor Wittekoek – Director, Vlakglas Recycling Nederland
Debate:
How to Improve the Recycling of Building Glass?
Conclusions

Jan Maarten de Vet
Director
Ecorys
Many thanks for your attention!

Enjoy a well-deserved lunch in the restaurant

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