Brussels Circular Economy Transition
BRUCETRA
(2016-2020)

WP4 Stream Selection
Scientific Report
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Summary

This milestone report presents the results of the work package (WP) 4 of the BRUCETRA project, the selection of waste streams. The objective of this WP is to prioritize Brussels’ waste streams concerning its potential for a circular economy valorization and to finally select waste streams that are analyzed in more detail in WP 5 and 6. The selection and prioritization of flows is implemented based on a collective participatory exercise consisting of three steps: (i) Pre-selection of streams (ii) an online survey and (iii) bilateral meetings.

The outcome of the pre-selection of waste streams was a shortlist of six waste categories that were identified as waste streams with a high circular economy valorization potential for Brussels. The pre-selection of waste streams was based on the analysis of the previous WPs results (WP1 and WP3), an internal discussion within the project team and a small stakeholder meeting for validation. Paper and cardboard, food, plastic, inert, bulky waste and WEEE were identified as priority flows.

The pre-selected waste streams were further examined by additional stakeholders, implemented with an online survey. In this survey, the respondents were asked to rank the six waste flows according to their valorization potential in a circular economy. The answers, representing the opinions from 56 respondents, showed that food waste and WEEE were considered as the two flows with the highest valorization potential. The third highest evaluation was given for paper and cardboard waste. However, the maximal difference between the ranking of inert, plastic, bulky and paper and cardboard waste was only 3%. In addition to the ranking, the respondents were asked to motivate their ranking choices. Different motives were given to rank a specific waste highly. For each flow, the respondents identified niche flows, which are sub-flows of a specific waste stream that might be particularly interesting in terms of valorization potential.

In parallel to the online survey, 19 bilateral meetings were carried out in order to collect more detailed information from stakeholders regarding the waste management in BCR, their vision on the circular economy and their opinion on the valorization potential of the pre-selected waste streams. The outcome of the bilateral meetings indicated a priority for bulky waste, food waste, WEEE and construction and demolition waste (C&D) from a political point of view. The evaluation of a specific valorization potential (for example for plastics, paper and cardboard) and the preference for a certain
valorization option (for example for food waste) varied among the diverse stakeholders. But, almost all stakeholders agreed on bulky waste and WEEE as highly interesting in terms of their potential for the circular economy model. Combining results from both surveys shows a common trend regarding WEEE and food waste, which are identified as waste streams with highest valorization potential for Brussels. Regarding the other waste streams different priorities have been set in the two surveys. When considering all relevant aspects, such as the political desirability, the potential of each waste flow from a circular economy point of view and practical considerations, food waste, WEEE and bulky waste appeared as the waste streams with the highest valorization potential for a circular economy in Brussels. These three waste streams will be analyzed in detail in the following WPs of the project.
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1 Introduction

1.1 Overall context

The general aim of this project is to analyze the economic and environmental potential of waste streams for a transition towards a circular economy of materials’ management in the Brussels-Capital Region (BCR). Work packages 1 to 3 enabled a solid

- knowledge of actors and stakeholders involved in Brussels’ waste management,
- characterization (amount, composition) of the different waste streams (domestic and professional) collected and their treatment modes (WP1),
- benchmarking of the current waste/recycling/material policies and processing infrastructure in BCR against top performing regions in the EU (WP2)
- and the analysis of the material flow and waste metabolism in BCR (WP3).

The results of WP1 and WP3 directly feed into the first step of WP4, namely the pre-selection of the waste streams that will be analyzed in more detail in the next WPs of the project (WP5 and WP6).

1.2 Objectives of tasks reported (WP4)

As described in the proposal, the objective of this work package is to make an hierarchization of the BCR waste streams concerning the feasibility (technical), desirability (political), viability (economic and environmental) for waste collection and treatment and valorization in BCR.

The stream selection exercise has to be done for the current flows and for the anticipated flows through the following tasks:

- Pre-selection of streams based on results of WP1 and 3, the analysis of current waste streams, current management practices and future waste streams
- Online survey to ask the opinion of stakeholders on the pre-selected streams prioritization
- Bi-lateral meetings to get additional insights from stakeholders.

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1 In later discussions of the project, the term ‘circular economy valorization’ was introduced and is used in this report.
1.3 Position in the project

The stream selection directly determines the next steps of the project, namely the work packages 5 and 6 where life cycle evaluations of waste management scenarios will be performed together with an optimization of routing scenarios. The object of WP4 is thus to select a rational amount of priority streams for which scenarios can be defined and analyzed in WP5 and that correspond to stakeholders and political vision.

1.4 Report structure

The report is structured in the following way:

Section 2 presents the results of the pre-selection of streams.

In section 3, the results from the online survey are given.

Section 4 gives an overview of results from the bilateral meetings.

The report ends with the presentation of conclusions that were drawn from previous results.

2 Pre-selection of streams

2.1 Methodology

The pre-selection of waste streams is the first step in the selection process. The aim is to prioritize and preselect the waste streams. To do this, three steps were executed: the analysis of the previous WPs results, an internal discussion within the project team and a meeting with the stakeholders.

➢ Previous results from WPs (1 and 3):

First, the previous WPs results were presented in systematic way highlighting for each waste stream:

- WP1: economy-wide estimation of waste collection and treatment
  - The amount collected
  - The source: household and economic activities
  - The collection type: separate or mixed
  - The treatment types
- WP3: waste stream projection
  - Based on macroeconomic and waste prevention scenarios.
Internal discussion

Second, a pre-selection was made based on a collective participatory exercise within the project team. Three categories have been created for the pre-selection namely: excluded flows, priority flows and potential priority flows. The first category refers to the waste streams which can be excluded for the following project phase, because they are already well-managed, or because the potential of improvement is considered to be low. The second category is a flow with a clear (high) potential for improved valorization. The third category is a flow where we see partially a potential for improved valorization.

Based on this range of information per waste stream obtained from the analysis in the 1st step, the waste streams were classified into one category (excluded, priority and potential priority flow) during a collective participatory discussion within the project team.

Stakeholders discussion

At last, a meeting with the stakeholders was held in order to present and discuss the outcome of the internal meeting, namely the categorization of waste streams. The stakeholders present at the meeting were: arp-gan, Bruxelles Environnement, Brussels’ statistical office (BISA/IBSA) and the cabinets. The aim was to discuss and validate the results of that pre-selection exercise.

2.2 Results

2.2.1 Results from WP 1 and 3

Table 1 presents the results of the total amount of waste collected in 2014 in Brussels. It has to be mentioned that the amount of waste from professional activities have been updated after the meeting based on new data sources for professional activities that were made available (RECYDATA 2017). The amount of collected waste is separated according to its collection-type with a source distinction into households and professional. The full documentation of data, methodology and results from WP1 is given in (Towa et al. 2017).

Table 1- Table 10 are presented to support the specific explanation and justification for the chosen categorization. The aim is not to describe the current waste management practices for each waste, but to point out the adequate arguments that have led to the categorization.
Table 1: Total amount of waste collected (2014)

<table>
<thead>
<tr>
<th>Waste stream</th>
<th>Domestic (t)</th>
<th>Professional (t)</th>
<th>Waste stream</th>
<th>Domestic (t)</th>
<th>Professional (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residual waste</td>
<td>207,451</td>
<td>222,650</td>
<td>Wood</td>
<td>6,989</td>
<td>29,592</td>
</tr>
<tr>
<td>Packaging PMC</td>
<td>11,696</td>
<td>531</td>
<td>Inert</td>
<td>4,776</td>
<td>639,960</td>
</tr>
<tr>
<td>Paper/Cardboard</td>
<td>32,375</td>
<td>88,610</td>
<td>WEEE</td>
<td>4,697</td>
<td>290</td>
</tr>
<tr>
<td>Glass (packaging)</td>
<td>19,945</td>
<td>5,926</td>
<td>Textile</td>
<td>3,983</td>
<td></td>
</tr>
<tr>
<td>Glass (flat)</td>
<td>176</td>
<td>3,244</td>
<td>Bulky</td>
<td>24,337</td>
<td>2,336</td>
</tr>
<tr>
<td>Organic (green)</td>
<td>14,589</td>
<td>10,403</td>
<td>ELV</td>
<td></td>
<td>13,712</td>
</tr>
<tr>
<td>Organic (food)</td>
<td>179</td>
<td>4,145</td>
<td>Tires</td>
<td>1,863</td>
<td>196</td>
</tr>
<tr>
<td>Plastic</td>
<td>203</td>
<td>2,282</td>
<td>Edible oil and fats</td>
<td>219</td>
<td>1,860</td>
</tr>
<tr>
<td>Metal</td>
<td>5,538</td>
<td>163,837</td>
<td>Street cleaning residues</td>
<td></td>
<td>14,502</td>
</tr>
<tr>
<td>Total</td>
<td>339,051</td>
<td></td>
<td></td>
<td>1,201,473</td>
<td></td>
</tr>
</tbody>
</table>

In addition to the amount of waste that is currently collected and its current treatment option, it also important to consider the future size of this stream. As part of WP3, a projection of streams was carried out based on the developed waste input-output tables (Zeller et al. 2017) and developed macroeconomic and waste prevention scenarios. The projection of waste flows started with the amounts\(^2\) analyzed for 2010 and 2014 and projected waste flows until 2050 in four different scenarios. The results of the projection are presented in Figure 1.

\(^2\) without garden and unspecified mixed waste
Figure 1: Total waste quantities collected in Brussels 2010-2050 in the different waste prevention scenario (BAU: Business as usual; Prev+= prevention plus; TPP= theoretical prevention potential)

For all scenarios the projection shows a continuous increase of total waste amounts resulting from population, income and production growth. Without specific prevention measures (no prevention scenario) the projection shows an increase of waste from 1.4 mn ton of waste in 2010 up to 2.1 mn ton in 2050. In the most ambitious scenario that considers theoretical waste prevention targets for specific flows, the total amounts increase up to 1.5 mn ton. More specific developments per waste streams that could influence the prioritization of a specific waste flows are given in the following.

**Paper & cardboard:**

Table 2: Amount and treatment of paper and cardboard waste (data summary)

<table>
<thead>
<tr>
<th>Waste fraction</th>
<th>Source</th>
<th>Quantity (t)</th>
<th>Incineration</th>
<th>Recycling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep. collection</td>
<td>Economic activities</td>
<td>88,610</td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Mixed waste</td>
<td></td>
<td>28,952</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Sep. collection</td>
<td>Household</td>
<td>32,174</td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Mixed waste</td>
<td></td>
<td>12,484</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>
Current situation:

- Considerable amount of paper & cardboard in the mixed fractions especially on the professional side
- Potential of improving the sorting at source and after the collection
- Most of paper and cardboard waste is sent out of Belgium for recycling.

Results of the projection:

- Compared to the other waste flows, the projection for paper and cardboard waste shows one of the lowest growth rate per year (0.66% per year) in the scenario without specific prevention policy.
- Since paper and cardboard is a waste stream that is targeted in current prevention policies and is assumed to remain in the focus of prevention policies, the size of this waste stream can decrease significantly in the future (until 1.6% per yr in TPP scenario).

⇒ Potential priority waste flow

Plastics:

*Table 3: Amount and treatment of plastic waste (data summary)*

<table>
<thead>
<tr>
<th>Waste fraction</th>
<th>Source</th>
<th>Quantity (t)</th>
<th>Incineration</th>
<th>Recycling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep. collection</td>
<td>Economic activities</td>
<td>2,784</td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Mixed waste</td>
<td></td>
<td>49,208</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Sep. collection</td>
<td>Household</td>
<td>8,821</td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Mixed waste</td>
<td></td>
<td>18,397</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>

Current situation:

- Large amount of plastics in the mixed fraction
- Potential of improving sorting at source and after the collection
- Most of plastics waste is sent out of Belgium for recycling, especially to China.
Results of the projection:

- The projection shows one of the lowest growth rate per year (0.63% per year) for plastic waste in the scenario without specific prevention policy.
- Since plastic waste is a waste stream that is targeted in current prevention policies and is assumed to remain in the focus of prevention policies, the size of this waste stream can decrease significantly in the future (-1% per yr).

⇒ Priority waste flow

Glass:

Table 4: Amount and treatment of glass waste (data summary)

<table>
<thead>
<tr>
<th>Waste fraction</th>
<th>Source</th>
<th>Quantity (t)</th>
<th>Incineration</th>
<th>Recycling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep. collection</td>
<td>Economic activities</td>
<td>9,201</td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Mixed waste</td>
<td></td>
<td>4,898</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Sep. collection</td>
<td>Household</td>
<td>20,090</td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Mixed waste</td>
<td></td>
<td>4,908</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>

Current situation:

- Well managed in general
- Completely recovered in Belgium.

Results of the projection:

- The projection shows a growth rate of 0.73% per yr for plastic waste in the scenario without specific prevention policy.
- Since glass waste is not in the focus of current prevention policies, the size of this waste stream is the same in all scenarios. (growth rate of 0.73% per yr)

⇒ Excluded waste flow
Food waste:

Table 5: Amount and treatment of food waste (data summary)

<table>
<thead>
<tr>
<th>Waste fraction</th>
<th>Source</th>
<th>Quantity (t)</th>
<th>Incineration</th>
<th>Biogas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep. collection</td>
<td>Economic activities</td>
<td>4,145</td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Mixed waste</td>
<td>Economic activities</td>
<td>48,995</td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Sep. collection</td>
<td>Household</td>
<td>179</td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Mixed waste</td>
<td>Household</td>
<td>104,616</td>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

Current situation:

- Large amount of food waste in the mixed fractions: incinerated
- High potential on separate collection and better valorization.

Results of the projection:

- In comparison to the other waste fractions, the projection shows the lowest growth rate per year (0.59% per year) in the scenario without specific prevention policy.
- Since food waste is a waste stream that is targeted in current prevention policies and is assumed to remain in the focus of prevention policies, the size of this waste stream can decrease significantly in the future (-2% per yr).

➡ Priority waste flow

Green waste:

Table 6: Amount and treatment of green waste (data summary)

<table>
<thead>
<tr>
<th>Waste fraction</th>
<th>Source</th>
<th>Quantity</th>
<th>Incineration</th>
<th>Comp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep. collection</td>
<td>Economic activities</td>
<td>10,403</td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Mixed waste</td>
<td>Economic activities</td>
<td>4,453</td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Sep. collection</td>
<td>Household</td>
<td>14,791</td>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>
Mixed waste | 11,658 | 100%

Current situation:
- Well managed in general: all composted
- The amount collected is relatively stable over time
- The valorization together with food waste could be an option
- Low quality of the output from industrial composting.

Results of the projection:
- No projection result for this waste stream available, because this category does not exist in waste IO data.

⇒ Potential priority waste flow

Metals:

Table 7: Amount and treatment of metal waste (data summary)

<table>
<thead>
<tr>
<th>Waste fraction</th>
<th>Source</th>
<th>Quantity</th>
<th>Incineration</th>
<th>Recycling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep. collection</td>
<td>Economic activities</td>
<td>163,949</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Mixed waste</td>
<td></td>
<td>8,352</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Sep. collection</td>
<td>Household</td>
<td>7,751</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Mixed waste</td>
<td></td>
<td>3,004</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>

Current situation:
- Well managed in general
- Important activity of metal recovery in Brussels
- Metal has an important economic value: metal waste is important for metal recovery operators

Results of the projection:
- The projection shows a growth rate of 1% per yr for metal waste in the scenario without specific prevention policy.
• Since metal waste is not in the focus of current prevention policies, the size of this waste stream is the same in all scenarios (growth rate of 1% per yr).

→ Excluded waste flow

**Wood:**

*Table 8: Amount and treatment of wood waste (data summary)*

<table>
<thead>
<tr>
<th>Waste fraction</th>
<th>Source</th>
<th>Quantity (t)</th>
<th>Incineration</th>
<th>Recycling</th>
<th>Not determined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep. collection</td>
<td>Economic activities</td>
<td>29,592</td>
<td>9%</td>
<td>66%</td>
<td>25%</td>
</tr>
<tr>
<td>Mixed waste</td>
<td></td>
<td>13,359</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sep. collection</td>
<td>Household</td>
<td>6,989</td>
<td></td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Mixed waste</td>
<td></td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Current situation:

• Well managed in general, especially the professional fraction
• For 25% of wood waste the treatment is not determined (part is recycled, another part reused)
• Treated wood is recycled and a part of untreated wood is incinerated
• Completely recovered in Belgium.

Results of the projection:

• The projection shows a growth rate of 0.75% per yr for wood waste in the scenario without specific prevention policy.
• Since wood waste is not in the focus of current prevention policies, the size of this waste stream is the same in all scenarios (growth rate of 0.75% per yr).

→ Excluded waste flow
Inert waste:

Table 9: Amount and treatment of inert waste (data summary)

<table>
<thead>
<tr>
<th>Waste fraction</th>
<th>Source</th>
<th>Quantity (t)</th>
<th>Incineration</th>
<th>Recycling</th>
<th>Landfill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep. collection</td>
<td>Economic activities</td>
<td>416,866</td>
<td>87%</td>
<td>13%</td>
<td></td>
</tr>
<tr>
<td>Mixed waste</td>
<td></td>
<td>220,095</td>
<td>87%</td>
<td>13%</td>
<td></td>
</tr>
<tr>
<td>Sep. collection</td>
<td>Household</td>
<td>4,776</td>
<td></td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Mixed waste</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Current situation:

- Waste fraction that shows highest amount
- Completely recycled out of Brussels, but in Belgium
- High recycling rate, but the technique is mainly a downcycling
- Large amount of mixed inert collected
- Potential of improving separate collection and sorting at source and after the collection.

Results of the projection:

- Compared to the other waste fractions, the projection shows the highest growth rate for inert waste, with a rate of 1.3% per yr in the scenario without specific prevention policy.
- Since inert waste is not in the focus of current prevention policies, the size of this waste stream is the same in all scenarios (growth rate of 0.13 % per yr).

⇒ Potential priority waste flow
WEEE:

Table 10: Amount and treatment of WEEE (data summary)

<table>
<thead>
<tr>
<th></th>
<th>Reuse</th>
<th>Recycling</th>
<th>Energy recovery</th>
<th>Incin.</th>
<th>Landfill</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Big appliance</td>
<td>6.6</td>
<td>81.0</td>
<td>5.0</td>
<td>0.5</td>
<td>6.9</td>
</tr>
<tr>
<td>Refrigerators</td>
<td>1.8</td>
<td>81.5</td>
<td>14.0</td>
<td>0.6</td>
<td>2.2</td>
</tr>
<tr>
<td>Lamps</td>
<td>0.0</td>
<td>90.2</td>
<td>5.0</td>
<td>0.0</td>
<td>4.9</td>
</tr>
<tr>
<td>Other electronic appliances</td>
<td>3.5</td>
<td>75.0</td>
<td>8.7</td>
<td>1.1</td>
<td>11.7</td>
</tr>
<tr>
<td>Television and monitors</td>
<td>0.4</td>
<td>88.0</td>
<td>5.0</td>
<td>0.6</td>
<td>5.9</td>
</tr>
<tr>
<td>Total average mean (based on the amount)</td>
<td>3.2</td>
<td>80.2</td>
<td>8.2</td>
<td>0.8</td>
<td>7.6</td>
</tr>
</tbody>
</table>

Current situation:

- Around 47% of EEE in EoL collected by Recupel compared to the quantity of EEE on the market in 2011
- Fraction non-collected by Recupel: unknown (wrongly sorted, exports, ‘black market’, etc.)
- Potential of increasing the collection rate
- Repair and reuse: 3%; dismantling/separation to recover material: 80%; Incineration: 8%; Landfill: 9%
- Potential of increasing the material recovery.

Results of the projection:

- The projection does not contain a specific category of WEEE, since most waste composites are decomposed into material fractions that can be aligned to economic activities. With an average composition of 56% metals, 20% plastics and 24% of others, the trend of metal waste can be taken as indicator (1% per yr).

⇒ Potential priority waste flow
Textile:

Current situation:

- Collected and handled by the social economy initiatives (e.g. Les Petits Riens, Oxfam);
- Textiles from households in acceptable condition are repaired and reused and represent 39%
- 36% of textiles is exported in Africa and 16% is recycled

Results of the projection:

- The projection shows a growth rate of 0.84% per yr for textile waste in the scenario without specific prevention policy.
- Since textile waste is not in the focus of current prevention policies, the size of this waste stream is the same in all scenarios (growth rate of 0.84 % per yr).

⇒ Excluded waste flow

Bulky waste:

Current situation:

- The bulky and clandestine waste in question refers to the stream of bulky without separately collected fractions of metal, WEEE, wood, etc. The latter have previously been already accounted separately.
- That stream strongly heterogeneous and very often composed of mattresses, old bikes, degraded furniture (broken and old) and gardening tools, games and entertainment tools, etc.
- Most of bulky is collected by private and public collector and via container parks: 50% of that fraction is recycled, while 5% is reused and the rest is incinerated
- Less than 10% of bulky is collected by social economy initiatives, and in that fraction around 60% is reused, 16% is recycled and 24 is incinerated.
- There might be a potential of extracting resources/materials within that heterogeneous stream. However, a composition analysis of that bulky waste is not monitored and inexistent
-Handled by private subcontractors.

Results of the projection:
The projection does not contain a specific category of bulky waste, since mixed waste are decomposed into material fractions that can be aligned to economic activities. Considering that the materials of this waste fraction are a mix of metals, wood and plastic, the trend of these waste materials can be taken as indicator.

**Potentially priority waste flow**

**ELV:**
- Under the control of Febelauto: well-managed
- 95% of recycling in general including: 24% reuse, 66% material recovery; 5% energy recovery
- ELV non-covered by the Febelauto system: unknown

**Tires:**
- Under the control of Recytyre: well-managed
- 80% of material recovery and recycling and 20% of incineration with energy recovery

**Edible oil and fats:**
- Handled by the Valorfrit system: well-managed
- 98% is valorized in biofuel and 2% in material applications (manufacture of soaps, cosmetics, pharmaceuticals)

**Street cleaning residues:**
- Collected and handled by Bruxelles-Propreté
- The majority is incinerated

**Excluded waste flow**
2.2.2 Results of the pre-selection

The results of the pre-selection of waste streams is shown in Table 11. It synthetizes the choices made during the internal meeting and validated in the stakeholders meeting.

*Table 11: Results of the preselection of waste streams*

<table>
<thead>
<tr>
<th>Waste streams</th>
<th>Excluded flow</th>
<th>Priority flow</th>
<th>Potential priority flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper &amp; cardboard</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Plastic</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Food waste</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Green waste</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Glass</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inert</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Metals</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wood</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Textile</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Edible oil and fats</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WEEE</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Bulky</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>ELV</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tires</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Street cleaning residues</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 12 summarizes the pre-selected waste flows in a shortlist.

*Table 12: Shortlist from the pre-selection*

<table>
<thead>
<tr>
<th>Paper &amp; cardboard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastic</td>
</tr>
<tr>
<td>Food waste</td>
</tr>
<tr>
<td>Inert</td>
</tr>
<tr>
<td>WEEE</td>
</tr>
<tr>
<td>Bulky</td>
</tr>
</tbody>
</table>
3 Online survey

3.1 Introduction

This chapter summarizes the output of the online survey. The main aim of this survey is to better understand the relative importance of what we called the “circular economy valorization potential” of our shortlist of six waste and material flows (i.e. food waste, inert waste, plastic waste, paper and cardboard, waste electrical and electronic equipment (WEEE) and bulky waste). The survey consisted of three main questions. The exact formulation of the questions can be found in the appendix at the end of this report. The first question asked the respondent to rank six waste flows according to their valorization potential in a circular economy. The second question of the survey asked for a brief motivation as to why the respondent valued his top three flows as the ones with the highest potential. As the 6 flows from the shortlist are rather general flows in the sense that they can be composed of several smaller flows (or niche flows), the final question asked the respondents to identify niche flows (if any) which might be particularly interesting in terms of valorization potential.

The first wave of emails inviting people to complete the survey was sent in July 2017 to a list of 161 potential respondents. This list was the result of a stakeholder mapping exercise which was part of the first working package. In August a first reminder was sent. Around the same time a second wave was sent to a new list containing 143 potential respondents suggested by the institutional sponsors of our project (i.e. the godfathers). Note that both lists contained only email addresses of stakeholders of the Brussels Capital Region’s (BCR) waste and materials management. The list included people working in the public sector, representatives of interest groups and people working in the private sector. Upon closing the survey (beginning of October) 92 surveys had been started, 56 of which contained valid responses. Note that the number valid responses from respondents working in the private sector are disproportionately low in this survey. It is therefore important that the results of this survey should be interpreted with sufficient caution.

3 Note that due to some concerns expressed by one or more anonymous stakeholders concerning the number of emails linked our project, we decided not send a reminder to this group.
3.2 Data from the first question (ranking)

3.2.1 Average score per flow

The first question of the survey asked the respondent to rank a number of waste flows according to their circular economy valorization potential. Respondents were offered additional information on the definition (composition) and (current and projected) quantities of the flows via a hyperlink. If the respondent decided to click on the link, a pop-up window would appear with the requested information (the displayed text and tables can also be found in the appendix at the end of this report).

To evaluate which flows on average obtained the highest rating, a point system based on ordinal ranking was used. For each respondent the highest ranked flow receives six points, the second ranked flow receives five points, etc. This implies that in total (over our 56 respondents) 1176 points have been awarded (6+5+4+3+2+1 = 21*56). In theory the maximum amount of points any flow could gain, by being ranked first by every respondent, was 336 points (6*56) which corresponds to 28.6% of the total amount of points that was awarded (i.e. 28.6% of 1176). The theoretic minimum any flow can obtain, was 56 points (56*1) or 4.8% of the total amount of points that was awarded.

A first visualization of this data can be found in Figure 2 and Figure 3. The first graph shows the amount of points awarded to each flow as a percentage of the total number of points awarded (i.e. as a percentage of 1176). The second graph also uses the total amount of points each fraction received, but this time expressed as a percentage of the maximum amount of attainable points (i.e. as a percentage of 336). A quick glance at the figures immediately reveals that food waste is regarded (on average) as the flow with the highest valorization potential by the respondents. This flow obtained 255 points, which boils down to an average of 4.55 points (255/56) from each respondent. This is 21.68% ((255/1176)*100) of the total amount of points or 75.89% of the 336 points that could have been received. The second place is for WEEE. This flow obtained 224 points, corresponding to an average of 4.00, or 19.05% of the total points. The flow was awarded 66.67% of the 336 points that could have been received. For the remaining four flows awarded points range between 189 and 156.
3.2.2 Average score and affiliations

In this section we briefly discuss the link between a respondents’ affiliations and their answer to the first question of the survey. As the number of observations is rather limited, we are not able to calculate statistical inferences and hence report significance of observed differences. The results need therefore to be seen as a first indication and cannot be used to draw general conclusions.
In a first step the respondents are divided into three categories based on their affiliations: public authorities and government agencies, interest groups or sector representatives and private organizations and businesses. The number of completed surveys for each group amount to 23, 17 and 12, respectively.

In Figure 4 we report the average points per flow again, but this time we differentiate between the 3 categories of affiliations. Food waste received an average of 4.52 points from the public sector, 4.33 points from the private sector and 4.88 points from interest groups or sector representatives. Although for this flow no important differences between the three categories can be observed, only the public sector and the interest groups awarded the highest average score to food waste. WEEE still has the second highest average score. Respondents from the public sector award this flow with 4.43 points. The flow received 3.58 points from the private sector and 3.65 points from interest groups. Paper and cardboard is ranked third. Respondents from the public sector award this fraction 3.35 points, interest groups gave on average 2.65 points and private respondents 4.42 points. Note that this is the highest average score for the latter category of respondents. The discrepancy between the amount of points paper and cardboard received from the private sector and from interest groups is substantial. Plastic waste gets an average of 2.91 points from the public sector, 2.83 points from the private sector and 3.88 points from interest groups. There is a noticeable difference between the average amount of points awarded by the interest compared to the other two categories. Finally, for inert and bulky waste there appear to be no substantial difference between respondents from different groups.
3.2.3 Average rank per flow

To put the results from the average scores in the correct perspective, the number of times each flow was ranked at each position was counted and reported in Figure 5. This figure shows that food waste received 6 points from 21 respondents (37.50% of the respondents), 12 respondents (12.50%) awarded this fraction 5 points, 7 respondents (12.50%) assigned this fraction 4 points, 11 respondents (19.64%) awarded this fraction 3 points, 3 respondents (5.36%) awarded this fraction 2 points and finally that 2 respondents (3.57%) awarded this fraction with only 1 point. WEEE received 6 points from 11 respondents (19.64% of the respondents). 10 respondents (17.86%) awarded this fraction 5 points, 13 respondents (23.21%) awarded this fraction 4 points, 13 respondents (23.21%) awarded this fraction 3 points, 8 respondents (14.29%) awarded this fraction 2 points and 1 respondent (1.79%) awarded this fraction with only 1 point.

The two ways of presenting the results reveal a similar picture. When looking at the average scores, food waste is regarded as the waste flow with the highest valorization potential in a circular economy. The information on absolute ranks seems to support this assumption. Over 58% of the respondents ranked food waste either first or second. Even when comparing this to WEEE, which was ranked second...
or first in 38% of cases, the difference is still considerable. Note however that looking at the absolute rank reveals nuances the average score did not. For example, bulky waste seems to be regarded as really important by a lot respondents (18 respondents placed it either first or second), while at the same time an even larger amount of respondents didn’t see the valorization potential of this flow (26 people placed it 5th or last).

Number of times ranked **first**

- 7=13%
- 11=20%
- 21=37%
- 9=16%
- 4=7%

Number of times ranked **second**

- 11=20%
- 12=21%
- 10=18%
- 8=14%
- 5=9%
- 10=18%
Number of times ranked third

Number of times ranked fourth

Number of times ranked fifth

Number of times ranked sixth

- Food waste
- Inert waste
- Plastic waste
- Paper and Cardboard
- WEEE
- Bulky waste

Figure 5: Absolute ranking
3.3 Data from the second question (motivation)

In the second question the respondents were asked to motivate their choices made in the previous question (first question). Note that only a motivation for the three highest ranked flows was asked. This question was open ended in the sense that the respondents were expected to write the answer in a small text box. Given the diversity of the answers, we decided not to report the output of this question via quantitative analysis of the motives, but rather opted to describe the main answers per flow more qualitatively. Note that the description below reflects the opinion of the respondents and might not always correspond to the opinion of the researchers.

3.3.1 Food waste

The ease of valorizing food waste was an argument that a lot of respondents gave. A multitude of valorization options were mentioned, including direct valorization among underprivileged residents, valorization as animal feed, composting and biomethanization or the possibility to utilize food waste as an organic fertilizer. Three respondents stressed that selective collection could further stimulate innovation.

The comment was made that separate collection of food waste still isn’t obligated in the BCR. Nevertheless, suitable collection lines for separate collection are being developed. Currently, a large part of food waste ends up in the residual (mixed) flow and gets incinerated instead of being valorized in any way. In the BCR even when food waste does get collected, it gets transported to Ieper to be processed. The BCR does not valorize food waste itself despite all of the possibilities.

A few of the respondents mentioned the possibilities for decentralized management linked to processing food waste. This flow is suitable for local programs, ranging from prevention over recuperation to redistribution. Some respondents explicitly linked food processing to local revalorization combined with urban agriculture. This combination seems to particularly well-suited for areas like the BCR according to some respondents.

Another category of arguments emphasizes the omnipresence of food waste. Four respondents mentioned the scale of this waste stream. This makes food waste an interesting flow to represent the circular concept and to clarify it to a wider audience. Some other arguments that were mentioned
came from a social and ethical standpoint. Finally, one respondent linked the food sector to the growing market of processed/prepared foods.

3.3.2 Inert waste

The most common motivation to rank this stream in the top 3 is its size. Four respondents mentioned the different possible routes for re-use, recycling, etc. More specifically reusability in a segment of the construction sector (roads and debris), gravel and building materials were named. Two respondents think recycling this flow is rather easy. Sorting, in contrast, is a lot harder. At the moment a lot of different sub-flows are collected together, which creates a number of difficulties. Transporting, local needs and linking the fraction to sustainable construction (like ROTOR) are some of the other mentioned difficulties and challenges this flow is confronted with.

One respondent mentioned there were existing, non-saturated valorization channels close to the BCR. The phenomenal amount of work that is needed to improve the existing sorting mechanisms and equipment of construction sites was another argument that was mentioned.

3.3.3 Plastic waste

The vast amount of plastic waste that is being produced was one of the most common arguments. Three respondents considered plastic waste to be an easy flow to recycle. The recycling process in the BCR is already developed to a decent degree, but for some respondents further improvements are always an option.

Several respondents pointed towards the alternatives for recycling plastic waste. In particular increasing re-use is considered as an important opportunity. For instance, a deposit-refund system for plastic bottles was mentioned more than once. Other examples brought up include small scale reusability or particular valorization methods like 3d-printing, bricks, lamps, etc.

Some respondents refer to the fact that plastic waste is not a homogenous flow. Currently the separate collection of plastic waste in the BCR is limited to only one single type of plastic, the rest normally ends up in the residual (mixed) flow and ultimately is incinerated. A respondent explicitly referred to the potential of separate collection for different types of plastic waste. These separated flow might have considerable economic value.
3.3.4 Paper and Cardboard

The most recurring argument with paper and cardboard was the ease of recycling for this flow due its homogenous nature. This provides the opportunity to process this flow on a larger scale, making it much more efficient. Respondents argue that the recycling and collection process is well developed but there’s still room for improvement (via existing non saturated recycling lines as well as through new ones).

Although paper and cardboard can be recycled a significant number of times and there’s a large stock of this flow, a respondent pointed out that re-use of paper and especially cardboard should not be neglected. Composting a small part of this flow that hasn’t been contaminated by ink or glue is also mentioned as a possibility.

3.3.5 WEEE

Potential re-use of WEEE was mentioned several times. Some specific examples were given, most of them related to a social/solidarity perspective. For example, by making it possible for start-ups or households in a financially bad situation to re-use the old equipment coming from large companies.

Both opportunities as potential threats related to recycling this flow were also mentioned. A large amount of devices contains valuable materials, a lot of which are exhaustible. This makes it very important to keep these commodities in circulation. These, often dangerous, commodities frequently have an enormous social and/or ecological cost. The fact that they are usually imported into Belgium or even Europe poses additional problems. Often extraction conditions are unclear, but apparently the impact on human lives, regions, etc. is vast (extraction, water pollution, transport costs, manufacturing).

Some respondents refer to the current collection figures in the BCR which are far below the future European goals. The heterogeneity of this fraction plays a large role in this. Because of the variety and different kinds of devices an efficient incorporation of this fraction is relatively difficult to achieve. Although this hindrance does come with a lot of opportunities for economic development, valorizing this flow is particularly labor intensive, which means it could generate some local employment. This means the delocalization of treatment outside the BCR needs to be diminished as well. Shrinking this flow is possible by further combatting planned obsolescence and investing in, for example, Eco-Design.
3.3.6 Bulky waste

The potential to repair and re-use bulky waste is the most often returning argument to rank this flow among the top 3. Several motives were mentioned. Re-use deserves a lot more attention, partly because a social and economic web for valorization already exists. Like WEEE this flow can be linked to low schooled jobs and the second-hand market. Specific examples to increase valorization are cooperation between recycling centers and thrift shops, a focus on waste connected to renovation projects, re-evaluating the design process and promoting innovative business models focusing on this flow.

Next to potential motives several threats were listed by the respondents. Planned obsolescence also plays a large role in this flow. Bulky waste isn’t sorted with re-use in mind. The sorting focusses largely on recycling, which isn’t necessarily the easiest option, considering the heterogeneity of this flow. A large part is also still being incinerated.

3.4 Data from the third question (niche flows)

The third question of the survey invited the respondent to identify some specific niche flows with potential high valorization potential in a more circular model. Note that the respondents were only asked to mention those niche flows which are a sub-flow of their top 3 ranked general flows (see section 2). As some niche flows might be selected at a later phase in the project, we decided to list all suggestions in this document.

3.4.1 Food waste

- Kitchen waste coming from households.
- Mass catering
- Packing unsold food in meals to avoid waste
- Supermarkets
- Cantines and restaurants
- Green waste
- Waste from the food industry
- Methanization for green waste
- Fresh vegetables (edible: leaves from cauliflowers, carrots, turnips)
- (raw) vegetal waste
3.4.2 Inert waste

- Demolition waste
- Building materials (bricks, blocks of concrete, window frames, metals and concrete beams, etc.)
- Stones
- Buildings
- Walls
- Renovations from residential buildings and offices
- Wood

3.4.3 Plastic waste

- Cracked shells coming from WEEE devices
- Sorting all plastic flows at the source
- Bottles
- Hard plastics
- Diverse packaging
- Types of plastic of the sorts surrounding 6 bottles
- Plastic coming from businesses
- Plastic bulky waste
- Expansion in diverse sectors (WEEE, vehicles, compiled)
- Isolation from construction and renovation
- Energy-efficiency control
- Depolymerisation
- Reducing the production of petrosourced materials or renewing their exploitation (making the part that isn’t renewable already renewable)
- Plugs

3.4.4 Paper and cardboard

- Beverage cartons
- Diverse packaging
- Paper and cardboard coming from offices
- Paper and cardboard coming from stores
- Paper and cardboard coming from advertising
- Paper and cardboard coming from administration and the service sector
- Paper
- White paper with little ink
- Paper with ink
- Paper that has been recycled
3.4.5 WEEE
- IT (computers, printing)
- Industrial WEEE devices from regional agencies (Stib etc.) and other industrial equipment
- Printed circuits
- Technical fractions that can potentially be re-used
- Cable components
- Battery components
- Large WEEE (fridges, dish washers, ...)
- Printers
- WEEE with rare (precious) metals
- WEEE with metals
- WEEE with plastics
- Smart glass
- Electronic products consumed on a large scale (cell phones, laptops, tablets, ...)
- Battle against programmed aging
- Certain parts like lamps which are processed easily
- “Big whites”
- Small devices

3.4.6 Bulky waste
- Wood
- Mattresses
- Sofas
- Furniture
- The reusable part
- Mixed bulky waste
- Leisure products
- WEEE
- Metals

3.5 Conclusion
The main aim of this survey was to collect information which can serve as input when selecting/prioritizing the flows which will be analyzed in more detail during the next phase in our project. Based on prior internal discussions, six flows were included in this survey: food waste, inert waste, plastic waste, paper and cardboard, waste electrical and electronic equipment (WEEE) and bulky waste. To get the best possible insight, stakeholders with diverse backgrounds and affiliations were asked to complete the online survey. Although representatives from the public sector, interest
groups and the private sector were contacted, the number of completed surveys from respondents affiliated to the private sector remains too low in comparison to the number of completed surveys from other groups.

The answers to the first question of the survey shows that food waste and WEEE are considered as the two flows with the highest valorization potential. Not only did food waste receive most points overall, but this flow was also placed first by 37% of the respondents. A lot of different motives were given to rank food waste highly. The diversity in valorization options was an argument that returned frequently. Another interesting recurring argument was related to the possibilities for decentralized management. It was argued by some respondents that food waste is particularly well-suited for local valorization and urban agriculture. Finally, the scale of food waste was mentioned several times. Most of the niche flows related to food waste can be classified in two broad classes: catering and industrial food waste and vegetal or green waste. WEEE was ranked first by 20% of the respondents and was perceived as the flow with the second highest valorization potential. The most recurring motivation to rank WEEE this high is its potential for re-use, although its recycling potential was also mentioned more than once. Niche flows identified by the respondents include (precious) metals, printed circuits, electronics consumed on a large scale, etc.
4 Bilateral meetings

During the bilateral meeting phase, we have been introduced to several workgroups or project meetings that are in direct line with the scenario development planned in BRUCETRA. In the following part, we present the topics and actors of these projects/studies and the foreseen collaborations as an introduction to the specific bilateral meetings methodology and results. These studies have been considered in our discussion on the selection of the priority streams for the further development of scenarios of waste management in the BCR in a circular economy perspective.

4.1 Overview – Project and studies

In this section, we present the studies/projects that are related to the pre-selected waste streams management in BCR.

4.1.1 Organic waste

Table 13: Overview of projects and studies related to organic waste

<table>
<thead>
<tr>
<th>What</th>
<th>Who</th>
<th>When</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study on the potential of collection of organic waste in BCR (Bortolotti et al. 2017)</td>
<td>(Commissionned by Cabinet Fremault) ULB LoUIS (Stefan Kampelman)</td>
<td>2016-2017</td>
</tr>
<tr>
<td>Study on the benchmarking of organic waste management</td>
<td>(Commissionned by Cabinet Fremault) ACR+ (Jean-Benoît Bel)</td>
<td></td>
</tr>
<tr>
<td>Technical multicriteria study on the biogas system</td>
<td>(Commissionned by Cabinet Fremault)</td>
<td>6 months -end 2018</td>
</tr>
<tr>
<td>Operation Phosphore (Co-Create Innoviris)</td>
<td>Simon De Muynck</td>
<td>2017-2019</td>
</tr>
</tbody>
</table>

Following the study of ULB LoUIS on the potential of collection of organic waste in BCR, the Operation Phosphore analyses different scenarios to collect and treat organic waste in BCR. They gathered information from a variety of stakeholders in the value chain, from political actors to the composters in order to identify new business models, centralized and decentralized and mixed treatment options. The technical study on the biogas system is not yet available.
Collaboration

BRUCETRA and Operation Phosphore have mutually agreed to collaborate on the scenario definition of alternative food waste management solutions in BCR.

Regarding the other studies, an agreement to share information has been taken.

4.1.2 WEEE

Table 14: Overview of projects and studies related to WEEE

<table>
<thead>
<tr>
<th>What</th>
<th>Who</th>
<th>When</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study on a new collection system for small WEEE in the professional sector</td>
<td>COBEREC, Recupel</td>
<td>Beginning in 2017</td>
</tr>
<tr>
<td>Workgroup on the WEEE capture in the professional sector</td>
<td>(Supported by Impulse, Ecores, Groupe one) Mistergenius, CF2D, Febrap</td>
<td>Beginning in 2017</td>
</tr>
<tr>
<td>Study on the WEEE quantity in Belgian households (Recupel 2017)</td>
<td>Recupel</td>
<td>until 1st trimester 2018</td>
</tr>
<tr>
<td>Study on the WEEE mass balance in Belgium</td>
<td>Recupel, Deloitte</td>
<td>until 1st trimester 2018</td>
</tr>
<tr>
<td>Study on the “repairability” of WEEE (Plateforme BENELUX, n.d.)</td>
<td>BENELUX platform</td>
<td></td>
</tr>
<tr>
<td>“Evaluation du potentiel d’amélioration du tri, de la collecte et du traitement des déchets professionnels tout-venant en RBC” (RECYDATA 2017)</td>
<td>Bruxelles Environnement and RDC Environnement</td>
<td>until 1st trimester 2018</td>
</tr>
<tr>
<td>Weesoc – “Optimisation des filières de démantèlement des déchets d’équipements électriques et électroniques par l’économie sociale, en vue de l’augmentation du taux global de recyclage de métaux stratégiques en Région de Bruxelles-Capitale”</td>
<td>ULB</td>
<td>2016-2017</td>
</tr>
</tbody>
</table>
Collaboration

The BRUCETRA team has participated in the workgroup on the WEEE capture and valorization in the professional sector. The workgroup tries to identify interesting WEEE fractions for which a sustainable collection and treatment system could be implemented with the collaboration of social economy.

The collaboration on specific scenarios is not yet effective and is currently under discussion.

Contacts have been made concerning the study on a new collection system for small WEEE in the professional sector.

4.1.3 Plastic and paper waste

Table 15: Overview of projects and studies related to plastic and paper waste

<table>
<thead>
<tr>
<th>What</th>
<th>Who</th>
<th>When</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Evaluation du potentiel d’amélioration du tri, de la collecte et du traitement des déchets professionnels tout-venant en RBC” (RECYDATA 2017)</td>
<td>Bruxelles Environnement and RDC Environment</td>
<td>09/2017</td>
</tr>
</tbody>
</table>

Collaboration

There is no collaboration foreseen for these streams.

4.1.4 Inert and construction waste

Table 16: Overview of projects and studies related to construction and demolition waste including inert waste

<table>
<thead>
<tr>
<th>What</th>
<th>Who</th>
<th>When</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD01 (PREC): Definition of the vision of circular economy in the construction sector (PREC 2016)</td>
<td>Bruxelles Environnement, ULB BATir</td>
<td>2016-2017</td>
</tr>
<tr>
<td>CD02 (PREC): Monitoring and development of the sector (PREC 2016)</td>
<td>Bruxelles Environnement</td>
<td>2016-2017</td>
</tr>
</tbody>
</table>
Collaboration

CSTC has shown its interest to collaborate with BRUCETRA, in particular for Life Cycle Assessment of C&D streams management.

4.1.5 Bulky waste

Table 17: Overview of projects and studies related to bulky waste

<table>
<thead>
<tr>
<th>What</th>
<th>Who</th>
<th>When</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadastre of waste streams collected by arp-gan in BCR</td>
<td>Arp-gan</td>
<td>2017</td>
</tr>
</tbody>
</table>

Collaboration

A collaboration is possible with arp-gan for a compositional analysis and further evaluations of the bulky waste stream.

4.2 Methodology for the interviews

Goal

The goal of the bilateral meetings was to gather direct and more detailed information from stakeholders regarding the waste management in BCR, their vision on the circular economy and their opinion on the potential of valorization for the preselected waste streams.

Focus group

Nineteen stakeholders have been met or called. They have been chosen regarding the following criteria:
• Their direct implication in specific waste stream management in BCR (collect, sorting, treatment): RecyK, CF2D, Recyclis, Arp-Gan, SUEZ, Renewi (Shanks/Van Gansewinkel), Gallo, BRMet, Aba Recycling

• Their global vision of an economic sector (Federation of recyclers, of Construction...): COBEREC, CSTC & Confédération Construction, Fost Plus, Val-I-Pac

• Their political and global vision about the circular economy in BCR: Bruxelles-Environnement, ACR+, BECI, Cabinet Frémault

BRMet: information collected from BRMet are limited.

Isoproc, a Walloon society that recycles paper fibers to produce cellulose wadding insulation, was also contacted regarding new valorization options for paper in BCR.

Other stakeholders were contacted without successful follow up. These are the biomass center of Ieper, Federplast, Plarebel, Fédération Ressources.

**Questionnaire & Interviews**

A questionnaire has been elaborated with general questions for every stakeholder and more specific questions according to the stakeholder’s competences. Semi-directive interviews were executed as it allowed the stakeholders to provide extra information on the waste management reality and the market and political constraints.

For each bilateral meeting (each stakeholder), minutes have been written (cf. separate report, Annex 9). Based on these minutes, for each pre-selected waste stream (organics, WEEE, bulky, C&D, paper and plastic waste), an individual summary has been written (e.g.: WEEE report, with answers from CF2D, COBEREC, ACR+, BECI...).

The results of the interviews are presented in the following section by type of waste stream. The presented information comes directly from the interviews without interpretation or analysis.

**4.3 Results**

In this section, we present the results of the interviews with the stakeholders. The table below describes for each one their location and the keywords that characterize the stakeholders’ activity and interest.
<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Location</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>RecyK</td>
<td>BCR</td>
<td>Professional waste, WEEE, bulky waste, wood, plastics, textile, collection, reuse, dismantling, social economy, new business model</td>
</tr>
<tr>
<td>CF2D</td>
<td>BCR</td>
<td>Professional waste, WEEE, collection, sorting, reuse, dismantling, recycling, social economy, new business model</td>
</tr>
<tr>
<td>Recyclisis</td>
<td>BCR</td>
<td>Domestic, plastic, paper/cardboard, organic, collection, sorting, recycling, incineration</td>
</tr>
<tr>
<td>Arp-Gan</td>
<td>BCR</td>
<td>Domestic waste, professional waste (assimilated), organic, plastic, paper/cardboard, WEEE, bulky, collection, sorting, reuse, recycling, incineration</td>
</tr>
<tr>
<td>Suez</td>
<td>BCR</td>
<td>Professional, organic, C&amp;D, bulky, plastic, paper/cardboard, WEEE, collection, sorting, recycling, incineration</td>
</tr>
<tr>
<td>Renewi (Shanks/Van Gansewinkel)</td>
<td>FI</td>
<td>Domestic, professional, organic, plastic, paper/cardboard, WEEE, bulky, C&amp;D, collection, sorting, reuse, dismantling, recycling, incineration, new business models</td>
</tr>
<tr>
<td>Isoproc</td>
<td>WR</td>
<td>Domestic, professional, paper, recycling</td>
</tr>
<tr>
<td>Galloo</td>
<td>WR</td>
<td>Domestic waste, professional (assimilated), WEEE, sorting, dismantling, recycling</td>
</tr>
<tr>
<td>BRMet</td>
<td>BCR</td>
<td>Domestic, professional (assimilated), WEEE, collection, dismantling, recycling</td>
</tr>
<tr>
<td>AbaRecycling</td>
<td>WR</td>
<td>Domestic, professional (assimilated), WEEE, collection, recycling</td>
</tr>
<tr>
<td>COBEREC</td>
<td>BCR</td>
<td>Domestic, professional, paper/cardboard, plastic, textile, metal (WEEE), reuse, recycling</td>
</tr>
<tr>
<td>Confédération construction &amp; CSTC</td>
<td>BCR</td>
<td>Domestic, professional, C&amp;D, plastic, collection, sorting, reuse, dismantling, recycling, social economy, new business model</td>
</tr>
<tr>
<td>Fost Plus</td>
<td>Belgium</td>
<td>Domestic, plastic, paper/cardboard, collection, sorting, recycling, incineration</td>
</tr>
<tr>
<td>Val-I-Pac</td>
<td>Belgium</td>
<td>Professional, plastic, paper/cardboard, collection, sorting, recycling, incineration</td>
</tr>
</tbody>
</table>
The table below gives the number of stakeholders by key words.

*Table 19: Quantitative link between stakeholder and key words*

<table>
<thead>
<tr>
<th>Topic</th>
<th>#</th>
<th>Topic</th>
<th>#</th>
<th>Topic</th>
<th>#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic</td>
<td>11</td>
<td>Paper/CB</td>
<td>9</td>
<td>Collection</td>
<td>14</td>
</tr>
<tr>
<td>Professional</td>
<td>14</td>
<td>Plastic</td>
<td>10</td>
<td>Sorting</td>
<td>9</td>
</tr>
<tr>
<td>Organic</td>
<td>6</td>
<td>C&amp;D</td>
<td>4</td>
<td>Reuse</td>
<td>10</td>
</tr>
<tr>
<td>WEEE</td>
<td>12</td>
<td>Bulky</td>
<td>6</td>
<td>Dismantling</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the next paragraphs, the results of the interviews are given for the preselected waste streams, i.e. organics, WEEE, paper/cardboard, plastics, C&D waste and bulky waste. We have structured the results in four parts:

- The value chain and market context
- The circular economy vision
- The constraints to new management scenarios
- The potential to implement new management scenarios.
4.3.1 Organic waste

Organic waste is composed of green waste and so-called food waste. Green waste is not considered as a priority flow in BRUCETRA (see section 2.2) and is thus not discussed in this report. We focus on food waste, i.e. what is allowed in the orange bag. So, included are the eatable and uneatable part of food waste and in addition to that napkins, teabags, etc. Bones, mussel shells and seeds are excluded. During the bilateral meetings, six stakeholders have considered the organic waste stream as a priority one.

Value chain and market

- Households have different options to discard food waste: mixed collection (no sorting, all thrown in residual waste- white bag), individual composting, shared composting (neighborhood) or selective door-to-door collection by arp-gan in orange bags. There is no sorting obligation for households. At the beginning of separate collections experiment, the food waste collected by arp-gan was sent in the biogas station of Ieper. Currently, it is incinerated.
- In the professional sector, there is no sorting obligation neither. Suez provides the One Stop Shopping system in HORECA via 120L containers where food waste is collected at the same time as other professional fractions (glass, kitchen waste, oil). Not all professionals participate in this collection system. Separated collection of organic material is more expensive for enterprises than mixed residuals waste. Collection by private actors is more expensive for professionals than collection by the public actor arp-gan.
- Suez collects packed food from supermarkets in Belgium and sends it to biogas units in Belgium (Van Heede, Op de Beeck). Concerning food wastage, Suez has a partnership with the French operation “Zero Gâchis”. Suez has also a partnership with MABRU and the Samu social for the collection of unsellable vegetables and fruits.
- According to Recyclis, a biogas system is more complicated and expensive than composting.
- New technologies are under development, like the yellow biotechnology that uses insects for the organic decomposition (Renewi).
The circular economy vision

- According to Fost plus, the implementation of a big biogas station in BCR is not relevant. Biogas installations already run in WR and FR and a collaboration could be built to treat all Brussels organic waste in these treatment units. In the other Regions, such collaboration is already effective but not with the BCR.

- According to the Cabinet Frémault, a centralized biogas station is a priority, because it satisfies the European objective for renewable energy (objective 2020 has been reviewed to develop the strategy for 2030). Interregional collaboration is very difficult to realize due to recurrent conflicts between parties.

- According to BECI and Val-I-Pac, there is a gap between offer and demand, among the waste recyclers/reusers and the waste producers and a need to work on the synergies between producers and collectors of food waste (see example of the project Roots, supported by Brussels waste network). Collection of food waste is limited due to olfactory nuisance during storage and collection and legislation limitations (health norms, transport, obligation for every collector to register in each Region for transit).

Constraints to new scenarios

From the previous information, constraints to a better food waste management are identified and summarized in the following part.

Collection

- Collection of organic waste (food) is currently limited because of legislation constraints and olfactory nuisances (during storage and collection).

- For enterprises, separate collection of organics is more expensive than mixed residuals waste due to the current collection system and bags prices.

Treatment

- For the politicians, a centralized biogas station is a priority because it satisfies the European objective for renewable energy. It can be a constraint for the proposal of alternative treatment scenarios.
• It is difficult to develop a common political vision on the organic waste management in the BCR, as opinions are sometimes divergent.

• Interregional collaboration is very difficult to implement due to recurrent conflicts between political parties.

Potential for new scenarios

In this part, the potential for new food waste management scenarios are summarized based on the previous paragraphs.

Collection

• There is a potential to increase the quantity of food waste to be collected by a separate efficient collection. That potential is as high on household side as on professional sectors.

• The creation of effective synergies between waste producers (e.g. Horeca operators) and collectors of food waste can play a significant of the improvement of the separate collection of food waste.

• The place for innovation in this sector (new business models like ROOTS, new collection systems) is still wide.

Treatment

• According to Recyclis a closed composting plant for food waste valorization is better than a biogas installation. Adapted processes for food waste composting can be designed and the plant can be modularly constructed within the BCR. A closed plant can reduce considerably olfactory nuisances can be highly reduced and the obtained compost could be of better quality than the one currently obtained at Bruxelles Compost.

• There might also be a potential in valorizing food waste by the means of the yellow biotechnology. In fact, an expert at Renewi is working on the process of valorizing food waste using insects. This could be subjected to a pilot study of that process, considering the biophysical and chemical characteristics of food waste.

4.3.2 WEEE

During the bilateral meetings, twelve stakeholders have discussed this stream and consider that it is a priority one.
**Value chain and market**

- CF2D collects WEEE from the professional sector and pre-concentrates material flows by a manual dismantling process. The sorted parts are sent to recyclers. CF2D studies new treatment processes, like a shape recognition system to automatically dismantle computers in order to better recover specific materials and minimize the losses (see WEESOC project with ULB). They do not have an agreement with Recupel.

- Galloo has an agreement with Recupel and does not perform the collection. Collection is performed by Recupel that gathers and stores the WEEE by category and sends full trucks to Galloo (categories *Others* and *TVM*). Galloo performs the sorting and the treatment (dismantling, shredding). The different material flows are separated and sent to the European manufacturing actors.

- BrMet recycles WEEE in BCR and sends separated material flows from recycling to companies in Belgium (outside Brussels as there is no specialized industry in Brussels) and in Europe (Italy, Holland, Luxembourg, France...).

- Private recyclers had no agreement with Recupel in 2017 and collect WEEE directly from the professional or domestic sector. Recyclers target different WEEE categories. E.g. Aba Recycling recycles all professional and domestic WEEE apart from TVs and coolers. For enterprises like Aba Recycling, the economic context is not favourable because the main collector on the market, Recupel, is too competitive compared to private companies.

- Private recyclers like Aba Recycling or BrMet consider that the social economy actors are not favourable to the economic situation of private recyclers. According to them, social economy initiatives gets subsidies, are less submitted to administrative constraints and get the ‘best’ WEEE first (those with the highest economic value).

- Renewi recycles all WEEE categories through 9 recycling plants (2 in Belgium, 2 in France, 2 in Germany, 3 in Holland). Small WEEE are recycled in Liege.

- According to BECI, most of the enterprises that produces WEEE do not know where to discard it.

- Until now, Recupel focuses on recycling. They are required to extend their business to reuse, even if it is less profitable at first sight.
- Recupel tends to keep the monopoly of WEEE recycling in BCR.

The circular economy vision

- Prevention and reuse are considered as priority by different actors: CF2D/RecyK, ACR+, BECI, Cabinet Frémault.
- Galloo considers that it is not interesting to increase the centralization of the storage, sorting or dismantling stages. Competitiveness must be preserved as it is better to keep several recyclers. Galloo considers that collection has to be improved in the professional sector and that discussion should be done with professional craftsman (like plumbers, heating engineers, ...) to improve collection of WEEE and reuse. On-demand collections could be implemented with the help of social economy collectors. They are also in favour of collaboration with social economy actors for dismantling hazardous pieces for example.
- For Galloo, there is a lack of traceability and a low efficiency of the recycling for the WEEE exported in Eastern Europe. They recommend to implement a regulatory framework to better control exportation.
- Apart from plastics (exported in Holland) for which there is no manufacture, Aba Recycling sends all material flows resulting from the WEEE recycling and treatment to Belgian enterprises (most Walloon).
- RecyK and CF2D encourage local market and collaboration with other actors in the value chain (professionals, individuals, Repair-cafés...). They are in favour of synergy with designers and recyclers. Supply and demand have to be clarified for the new waste market.
- For BECI, there is a gap between offer and demand, between the waste recyclers/reusers and waste producers.
- New business models in BCR are important for CF2D/RecyK, ACR+, BECI.

Constraints for new scenarios

- Dismantling is considered not economically feasible for the category small WEEE in the category Others (Galloo).
• Recupel has the monopoly regarding recycling of WEEE in BCR. This has a huge effect of the WEEE treatment and valorization options. For instance, the recycling rules defined by Recupel do not allow its collaborators to explore new treatment processes for WEEE.

• Sociological and urban aspects have to be taken into account to implement new business model and collection systems.

• There is a lack of data about the quantity of WEEE available in the professional sector (but current study on mass balance by Deloitte).

**Potential for new scenarios**

• New collection systems could be implemented to collect more WEEE, especially in the professional sector. This is supported by the market (Cabinet Frémault).

• More preserving collection could be implemented to increase reuse.

• The Federation COBEREC studies with Recupel a new collection system for the small WEEE in the professional sector.

• Reuse could be increased by collecting the unofficially collected/lost WEEE in the professional sector. CF2D and BECI think that an additional significant amount of devices could be recovered in the professional sector.

• There is a potential in improving dismantling techniques, like the study on a new dismantling system in CF2D.

• There is a potential in synergy improvement between the actors of the value chain, like designers, recyclers, private companies, social economy enterprises.

4.3.3 *Paper waste*

During the bilateral meetings, we have discussed paper and cardboard streams from the households and the professional sectors. Nine stakeholders have been met. The opinion on the potential for these flows differs from one actor to another.

**Value chain and market**

• According to the COBEREC (Go4Circle), once collected, the paper and cardboard waste is sorted, balled and sent to industries out of the BCR. Sorting is made depending on the fiber quality required by the industry. Treatment processes depend on the type of fiber. Two
industries in Belgium: Stora Enso produces newspapers from Brussels, Belgian and imported newspapers and magazine fibers. VPK packaging group produces cardboard based on discarded cardboard. The BCR market of paper/cardboard is conditioned by the global market that sets the prices of fibers according to the different types and qualities (low, medium, high).

- Paper from households is 60% inked paper, 40% cardboard. Cardboard quantity is higher than inked paper. The quantity of newspaper in BCR is decreasing compared to archives paper. The development of this trend directly impacts the type and quality of fibers obtained after the recovery process.
- According to COBEREC, an increasing market is the one of tissues (‘mouchoirs jetables’), overall in the professional sector. There is no local production in Belgium.
- Suez performs the collection of paper in the professional sector in collaboration with building managers like Cofinimmo. The main competitions of Suez are MCA (offices), Renewi and Arpagan.
- Recyclis performs the sorting of household paper/cardboard waste (domestic printed paper, cardboard, professional paper) thanks to an automated optical recognition system and a manual over-sorting process. Recyclis collaborates with Suez for the selling of paper to treatment actors (recycling, incineration) in Belgium, in Europe or outside Europe.
- The sorting line is not adjustable to the market fiber demand. Before the importation limitations decreed by China, the residual mixed paper resulting from the sorting line was sent to China. It is difficult to find European recyclers for low quality fibers. From the household yellow bag, 1.5% is incinerated.
- Val-I-Pac considers that paper/cardboard from household is well sorted, but thinks that there is a high amount of paper in the residual waste in the professional sector. The service offered by the collector directly influences the way the professionals sort their waste.

The circular economy vision

- According to COBEREC, treatment of paper requires heavy industry which is not possible to implement in BCR.
- Isoproc, a Walloon paper recycler, recycles high quality newspaper fibers to produce insulation from cellulose wadding. They would like to completely work with the Belgian market but do
not have access to enough resources in Brussels. They must import from printing houses from Holland and Germany. Isoproc collaborated with Stora to get a small percentage of the archived newspapers.

**Constraints for new scenarios**

- Waste paper recovery or recycling require heavy industries which do not suit with the urban territorial Brussels context.
- In the sorting line of Recyclis, the recognition system does not allow to change the sorting on-demand.
- The tax system on the waste bags does not encourage selective sorting.
- The BCR market of paper/cardboard is conditioned by the global market that sets the prices of fibers according to the different types and qualities (low, medium, high).

**Potential for new scenarios**

- According to Coberec and Fost Plus, the tax system on the selective and residual bags could be adapted to favour a better sorting and collection of the paper/CB waste, both in household and professional sectors.
- According to COBEREC and Val-I-Pac, the potential in paper waste management in BCR resides in the improvement of the waste sorting and collection in the offices (around 25% of paper in the professional residual waste). This can be improved by the action of ‘facilities managers’ (formation/education/of workers), but also by the action of Agence Bruxelles-Propreté (ABP).
- On the contrary, BECI considers that paper in offices is well sorted as there is a sorting obligation for the enterprises and an increasing dematerialization but that there is a potential in the sorting process of Recyclis that should be improved.

4.3.4 **Plastic waste**

The plastic waste covers a large variety of material. Plastics are submitted to selective collection in household (blue bag) and professional sector (assimilated). There are also packaging plastics films that are largely used in the professional sector. Non-sorted hard plastic composes a lot of composite objects like toys, devices, ...
In the bilateral meetings, stakeholders from household and professional packaging waste management have been met but also other actors to have a global opinion on the plastics waste potential in the BCR. Ten stakeholders have discussed this stream. They do not all consider that it is a priority flow that should be analyzed in BRUCETRA.

**Value chain and market**

- Plastic market in the BCR is directly dependent on the global market. Belgium was a plastics waste provider for China. The latter is a big collector of plastics waste in the world. From this year on, China refuses several kinds of plastics for quality reasons. The Chinese measures have a considerable impact on the global market which is uncertain now.

- Val-I-pac and the Clean site system (2005) offer the possibility to sort and collect flexible professional plastics (films, bags...) from construction and demolition works. However, not all enterprises participate at this initiative.

- According to Val-I-Pac, arp-gan does not offer a separate collection of plastics in the professional sector (assimilated waste). Other professional plastics are industrial plastics like multilayered products with PE and PVC or synthetic carpets. These are currently not recycled but incinerated. There are also different sorts of industrial *packaging* plastics (natural, colored films, bags, hard plastics, expanded polystyrene). Natural plastic films are recyclable in Belgium (Ravago, Iplast, trimoplast,...). 300 enterprises sort plastic films and collaborate with private collectors (around ½ of retailers and wholesale trade). For the others, plastics film is thrown in the residual bag. A study of RDC on the analysis of the composition of professional residual waste for 5 economic sectors shows that 10% is industrial plastics packaging. Most of the industrial plastic is sent to East Europe for sorting where costs are low but where there is no traceability of its management.

- Three Belgian operators (Renewi Lokeren, Van Werven Anvers and Lanaken) sort industrial residuals (not assimilated, in containers) to separate hard plastics based on the polymer types. Most of the resulting fractions are recycled in Europe. Until now, 80% of the industrial plastics generated in Belgium (colored plastic) was recycled in China.
According to Val-I-Pac, it is not sure that the global market of industrial plastic waste will be impacted by the Chinese restrictions. However, Belgian waste collectors encounter difficulties to sell all the plastics waste.

According to Renewi, the import limitation from China is dedicated to the not sorted plastics. Renewi is not very impacted by these limitations. Renewi uses two recycling methods, mechanical and chemical. Chemical recycling is a promising technology for plastic waste.

According to BECI, industrial packaging plastics is no more collected by SUEZ due to export limitation to China. The current Belgian market does not allow Suez to recycle this kind of plastics.

According to Fost Plus, the collection and sorting of household packaging waste in BCR is less efficient than in Flanders and Walloon Regions and the quality of the sorted plastic is lower. This low quality plastic waste from BCR was sent to China (before the import limitation of China).

According to Recyclis, the sorting line (optical recognition followed by a manual over-sorting process) is not efficient enough and is not profitable. Domestic plastic waste is collected by ARP-gan, door-to-door or by containers for the vertical buildings. 30% of this plastic waste is incinerated (undesirable or not sorted waste). The sorted plastics are directly sold to recyclers by Recyclis. The recyclers are rather stable. Due to the variable quality of the sorted plastic and depending on the fuel price market, the value of the plastic decreases and bundles can be refused by recyclers.

According to Recyclis, the market of household plastic is disturbed because of Chinese measures against import. The domestic waste is sent to European countries.

The circular economy vision

Domestic and assimilated plastics

According to BECI, there is a lack of local industry to recycle plastics. BECI encourages new business models like the use of plastic (eg PET) to produce high added value plastic wires for 3D printers. The innovative enterprises must find collectors that agree to share the plastic waste collected that is usually sent to Recyclis.
• BECI recommends to take into account the proposal on beverage deposit already applied in the Walloon and Flanders Regions.

• Fost Plus considers that a collaboration between the Belgian Regions could improve the recycling of plastic, make it more local and enable the recycling of additional niche flows. They also consider that the public agency for waste management in BCR (arp-gan) offers a good collection service but the framework pricing should be adapted to improve sorting at source. The monopoly of arp-gan is a limitation to an improvement of collection and sorting of domestic and assimilated waste, included plastic.

• Recyclis also considers that the improvement of the collection system depends on Bruxelles-Propreté collector (arp-gan). Current sorting lines cannot be adapted on-demand. They need financial investment to increase the capacities as well as the efficiency.

Plastic +

• According to Fost Plus, there is no recycler in Europe capable of valorizing plastic + (domestic food packaging, plastic film, hard plastic,…). Fost Plus is currently studying this issue (end 2017). Other niche flows could be studied like the PP plastic (bottles) which is not recycled in Belgium but for which the technology exists.

• Cabinet Frémault considers plastic + as important to implement.

• Recyclis worries about the potential management of Plastic + as it would require new investment for a new sorting line. Eco-design does not follow the reality of the sorting lines (eg black food basket covered with plastic film).

Industrial packaging plastics

• According to Val-I-Pac, the quantity of additional industrial plastic film that could be collected in BCR is too small to perform a profitable recycling. The vision of CE about plastic waste has to be extended to Belgium, not only to BCR, and even more to Europe, as plastic waste strongly depends on the global market and the global recycling strategy.

• Currently, there is not enough demand for recycled products on the market. There is a need to stimulate enterprises to use recycled material (ex: IKEA commits to using recycled materials in its products).
• According to Val-I-Pac, the situation of the market and the waste management will encounter lot of changes that are currently difficult to anticipate. Recommendation to wait before considering/defining alternative scenarios for plastic waste.
• According to CSTC, industrial packaging waste is the most important flow in the non inert and non hazardous mix and has a high potential of valorization.

Constraints for new scenarios

Collection & sorting

• The quantity of additional industrial plastic film that could be collected is too small in the BCR to perform a profitable recycling in BCR.
• The pricing of the bags for the selective collection of domestic and assimilated waste is an issue for the efficiency of sorting.
• Financial support is needed to adapt the Recyclis sorting lines to improve and extend sorting of plastics.
• Manufacturers do not consider enough eco-design. Plastic products/packaging is not adapted to the sorting line requirements.

Recycling

• Plastic waste recycling strongly depends on the global market which is very unstable currently, because of China restrictions. (The global market is changing due to Chinese import limitation.)
• According to Suez, hard plastic from bulky waste is difficult to recycle.
• Currently, there is not enough outlet for recycled products on the market.
• There is a lack of local plastic recyclers and currently no recycler in Europe treats plastic +.
• Need of interregional collaboration to recycle plastic in Belgium.

Potential for new scenarios

Collection & Sorting

• Collection and sorting of household packaging waste could be improved in BCR. New collection solution could help like a new generation of containers for household waste fractions in vertical buildings (Recyclis).
• Sorting line in Recyclis could be more efficient if investment is done.
• There is a potential of capturing additional industrial plastic film in the professional sector (Val-I-Pac) by stimulating sorting at source, in collaboration with enterprises and authorities.
• Potential in a centralized pre-sorting center in the BCR before sending the different fractions to the recyclers, in collaboration with the 2 other Regions. Small industries could be implemented in the BCR for that purpose, as the size of plastic manufactures are smaller than for paper treatment (Coberec, Val-I-Pac).

Recycling

• There is a potential in new business models like producing plastic wires for 3D printers (BECI).
• According to BECI, there is a potential to develop local industries to recycle plastic in response to the recent and future changes in the global market due to the Chinese restrictions.

4.3.5 C&D waste

As it is also the case for the bulky waste, construction and demolition waste is a collection of material and products that can be manage in different ways. In the pre-selection of the waste streams (see section 2.2), the inert stream was considered as a potentially priority regarding the mass of inert produced in the BCR compared to the other waste streams. During the bilateral meetings, the discussion has been extended to the other C&D waste streams. Moreover, construction waste is distinguished from demolition waste.

Value chain and market

Most of the waste comes from the demolition phase (around 10 times more than the construction phase) and is composed of 90% inert (from which 90% is concrete) and 10% metal and other mix waste. Nowadays, the reuse of material/product is almost not exploited.

Collection & sorting

• According to the Confederation construction & CSTC, big C&D enterprises work with certified waste collectors. They usually sort C&D waste well, under the responsibility of the collectors.
• Small enterprises sort less on site due to storing and sorting space limitation. A mixed container is usually used on site and transported in the sorting center afterwards. Sorting at source in selective bags adds cost for both the professional and the client.
• Waste are typically sorted between inert, hazardous and others (non-inert, like wood/nonhazardous waste).
• Packaging waste (plastics, wood, metals and glass) is the most important flow in the non-inert and non-hazardous mix and has a high potential of valorization. Val-I-pac and the Clean site system (2005) offer the possibility to sort and collect flexible plastics (films, bags...).
• Flat glass is generally removed before demolition for security reasons.
• According to Suez, there are two collection centers in BCR: Laeken (main for C&D waste) and Neder-Over-Hembeek (all streams). These centers are direct provisioned by small enterprises (most of the C&D waste supply) and bigger enterprises with agreement (eg: arp-gan for the sludges).
• Mixed C&D waste centralised at Suez waste centers is sent to the full-automated sorting line of Tirlemont.

Recycling
• Crushing of inert on site is possible with environmental permits on big demolition sites where space and cost can be handled. Nowadays, most of the inert collected by De Meuter is crushed in Grimbergen.
• According to Suez, most of the C&D waste they collect is treated in Belgium (inert, residuals, wood, metals, hard plastic, flat glass, amianté, hazardous). Wood and hard plastic are also treated in Holland. No stream is sent to China. 40.000T are treated per year, from which 80% is recycled and 20% is incinerated (eg: rockwool for energy valorisation). Most of the inert fraction from C&D is recycled (down-cycling) for backfill and no alternative treatment is available on the market.
• Renewi collaborates with ‘secondary disposers’ like De Meuter and Suez to which they sent C&D waste and from which they receive bulky waste from building sites. These disposers are particularly interested in heavy waste like inert. Their treatment capacity is not complete.
The circular economy vision

- According to the Confederation construction and CSTC, C&D waste collection and sorting face different issues in the perspective of circular economy: should the building enterprises sort specific streams on site? Sorting at source is maybe not the best strategy as certified sorting center already well manage the waste representing 90% of C&D waste (in tonnage) recycled. Moreover, each municipality decrees its own rent tax (around 2euros/m²/day) which does not encourage the possibility to use several selective containers on site. How to take into account the limited physical space for the containers on site? How to take into account the rent cost for the public road space?

- The strategy in the BCR is to push heavy industries out of Brussels and favour housing and offices. Moreover, lack of available space does not permit the implementation of new manufactures in BCR that could recycle local C&D waste. Currently, streams are sent in sorting centers outside Brussels because the main collector, SITA/Shanks, cannot deal with the total C&D waste volume.

- CSTC expects that in 30 years, the C&D waste will be very different, with more insulation products and other streams with new valorization potential.

- Nowadays, inert crushed on site are considered as waste and not as a product. As such, it cannot be directly used in the building works. A review of the definition of the end-of-life of waste is currently under discussion (see FEREDECO in Walloon Region).

- The construction sector has to face the social dumping due to cheaper foreign workers, but also the political trend that encourages social economy with subsidized less qualified workers. According to CSTC and Confédération Construction, ‘social’ workers are often not in legal conformity regarding the qualification and represents a real concurrency for the local qualified workers.

- In the circular economy perspective, CC&CSTC consider that specific streams like wood (within construction and demolition waste stream) has a wide potential of valorization and several streams have a high potential of reuse (floors, doors, lighting...).

- Inert is considered as already well managed with a recycling rate of around 90% and downcycling as the main recycling technique.
According to Suez, the market determines the valorization channel much more than transport type and distance.

**Constraints for new scenarios**

- Sorting on C&D site is difficult due to space limitation and cost.
- Heavy industries as such required for C&D sorting and valorization are pushed out of Brussels.
- Legislative constraints related to the definition of waste and product, as demolition waste cannot be reused onsite because considered as a waste which should be collected and not reused.

**Potential for new scenarios**

The main potential in terms of C&D management dwells in its capacity to provide a lot of material resources for future construction. Based on that there is a potential:

- In the reuse: this could be done via a selective deconstruction were products which can be directly reused in another site are selected (e.g. floors, doors, lighting, insulation...).
- In the requalification or remanufacturing of products which are degraded but could however be recovered, prepared or may be assembled for various reuses. E.g. old wood recovered to build a new furniture
- In the recycling: especially for fractions of C&D waste that are mixed collected namely packaging wastes (plastic films, bags, ...), which have a high potential of valorization.

On the other there is still place for new business models for companies which can generate more redynamize the sector

### 4.3.6 Bulky waste

In this report and within BRUCETRA, a distinction is made between the whole bulky waste stream and the residual mixed bulky waste stream. The former represents the general and entire stream compounded of several materials and composites products. The latter refers to one in question mentioned in section 2.2. Indeed, once the overall bulky waste is collected, there is a separation within the stream into products made of one material for instance wood furniture, metal, plastics, glass, etc. These materials are thus accounted separately and no more within the overall bulky waste fraction.
The rest is accordingly composed of multi-material products and clandestine waste and represents the bulky waste in question preselected in section 2.2. It consists of multi-materials furniture, carpet pavement, mattresses, gardening tools, old bikes, etc.

In the bilateral meetings, six stakeholders have been met, including bulky waste collectors and that distinction has been kept during the discussion. When the definition relates to the residual mixed part only, this is clarified in the following of the report.

Value chain and market

- The platform RecyK collects, sorts and prepares for reuse or recycling different materials and devices from the professional sector. RecyK is not a storing place. They are open to every waste. Example of material they have collected are plastic films, stamp device from STIB, ... According to RecyK, there is a significant not exploited waste stock in the professional sector and only a very small part of the domestic bulky waste collected in the Recypark is reused on the market. The demand of recycled products is currently very low or nonexistent.
- Most of the bulky waste and residual mixed bulky waste are collected by arp-gan. Suez also collects bulky waste in Neder-Over-Hembeek, partially including the stream collected by arp-gan and performs the material sorting thanks to cranes.
- Renewi collect bulky waste and residual mixed bulky waste from different regions and countries (included BCR) (900.000T/yr in total). This fraction is manually sorted at Renewi plants. They consider 50% of the residual mixed bulky waste as recyclable. Most of fractions extracted from the bulky are hard plastics, films, wood, paper/cardboard.
- Arp-gan considers the residual mixed bulky waste collected in the BCR as a low quality stream for recovery and recycling. This highly hinges on the composition of that stream which is currently not monitored.
- According to BECI, collection and sorting of bulky waste should be improved.

The circular economy vision

- According to RecyK, there is a need to clarify the supply and the demand for a new waste market. They are in favour of the functional value of the waste and not only the economic value. RecyK is a local actor and encourage the synergies with local partners of the value chain.
They encourage new business models and innovative projects, in collaboration with microfactory, microlab.

- ACR+ priority is prevention and reuse of bulky waste. They encourage new collection and recycling alternatives and innovative business models. They think that focusing on specific flows that have a symbolic impact is an efficient strategy in the circular economy perspective.

- BECI considers new business models and niche flows are important to address when studying bulky waste potential. There is a need to improve the connection between the different actors, the recyclers, the collectors, the enterprises, offices...

- The collection cost can be an issue.

- According to Val-I-Pac, bulky waste management should be improved at prevention and reuse stage. Separated flows should be specifically chosen and analyzed.

- According to Cabinet Frémault, bulky waste is a priority flow. There is a high potential of valorization for furniture (eg in administrations), carpet pavement, textile, mattress. They encourage the implementation of new ‘ressourceries’.

**Constraints for new scenarios**

- There is a lack of data on the quantity and composition of residual mixed bulky waste available in the professional sector.

- Collectors/recyclers face the problem of waste “protection” in the professional sector which means that discarded materials or devices are taken out of the official circuit.

- The market demand of recycled products from bulky waste is currently very low or nonexistent.

- There is a gap between offer (recycled or second-hand products recovered from the bulky waste stream) and demand in the professional sector (BECI) as both parties are not aware of each other in the market.

- The traceability of waste streams in a circular economy is getting complicated as the number of intermediaries in the valorization chain is increasing (RecyK)

**Potential for new scenarios**

- Increase prevention and reuse.
- There is a potential in improving existing collection systems to increase the synergy between the professionals and collectors/recyclers. Implement preserving collection.
- Improve the link between offer and demand.
- There is a high collection potential in the professional sector (furniture, WEEE, carpet pavement, textile, mattress, wood, plastic films...).
- There is a potential to implement new business models for specific streams.
5 Conclusions (Synthesis)

In this section conclusions from both types of stakeholder involvement, the online survey and the bilateral meetings are drawn that guided the final decision about the waste flows that are considered in more detail in the analyses from WP5 and WP6.

The outcome of the pre-selection of waste streams was a shortlist of six waste categories that were identified as waste streams with a high circular economy valorization potential for Brussels: Paper and cardboard, plastic, inert, food, bulky waste and WEEE.

The preselected waste streams were further examined by additional stakeholders, implemented with an online survey. To get the best possible insight, stakeholders with diverse backgrounds and affiliations from (i) public authorities and government agencies, (ii) interest groups or sector representatives and (iii) private organizations and businesses were asked to complete the online survey. In the online survey, the respondents were asked to rank the six waste flows according to their valorization potential in a circular economy. The answers showed that food waste and WEEE were considered as the two flows with the highest valorization potential. Different motives were given to rank food waste highly, such as the diversity of valorization options and possibilities for decentralized/local valorization options, but also the scale of food waste. WEEE was ranked as the flow with the second highest valorization potential due to its high potential for re-use and recycling. The third highest evaluation was given for paper and cardboard waste. However, the difference between the ranking of inert, plastic, bulky and paper and cardboard waste was only max. 3%.

For each flow the respondents identified niche flows, which are subflows of a specific waste stream that might be particularly interesting in terms of valorization potential.

In parallel to the online survey, 19 bilateral meetings were carried out in order to collect more detailed information from stakeholders regarding the waste management in BCR, their vision on the circular economy and their opinion on the valorization potential of the preselected waste streams. The collected information is used in the prioritization process and to prepare the scenario development in WP5 (collection of ideas, establishing collaborations).

Regarding the political desirability, the outcome of the bilateral meetings indicated a priority for bulky waste, food waste, WEEE and C&D waste and confirmed the measures that are defined in the PREC.
Concerning the circular economy vision, the development of waste management chains that show highest profitability for the BCR is emphasized. In that sense, almost all stakeholders agreed on bulky waste and WEEE as highly interesting in terms of their potential for the circular economy model. Since these two wastes are heterogeneous streams, composed of multiple products and materials, they can supply an important range of secondary raw materials. Furthermore, stakeholders observed a growing involvement of social economy initiatives in the management of bulky waste and WEEE that stipulates local employment and contributes to the transition towards a circular economy in BCR.

In contrast to bulky waste and WEEE management, stakeholders emphasize constraints for the implementation of paper/cardboard and plastics recycling in Brussels (necessity to invest in large scale/heavy industries) and pointed out threats due to instability of the global market. Nevertheless, a potential for paper/cardboard and plastics was identified related to the extension and improvement of the current collection system.

For C&D waste, a growing interest and increase of activities to implement the circular economy concept in the construction sector was observed by stakeholders. Stakeholders from that sector identified innovative collection systems, the promotion of the reuse of products and materials and recycling of non-inert and non-hazardous fraction as most interesting incentives for CE.

The circular economy potential identified from stakeholders for the food waste management consist mainly in promoting other treatment options than incineration. However, different valorization options are preferred among stakeholders such as closed composting, biomethanization or yellow biotechnology using insects for the decomposition of food waste. For the implementation of such valorization options the increase of the tonnages collected via an efficient separate collection system is mentioned as requirement.

For the comparison of results, it is important to consider that different stakeholders participated at the online survey and the bilateral meetings. In the online survey, private organizations and businesses are less represented, whereas they are represented in a larger share in the bilateral meetings. Related to that, the results from the online survey often show more general motives for the choice of a specific

4 The non-inert and non-hazardous fraction represent less than 10% of the overall tonnage of C&D waste.
waste stream (for example high recyclability potential), while the motives from stakeholders in the bilateral meeting are more often reflections about existing market or territorial constraints.

Nevertheless, regarding the evaluation of the two most promising waste streams in terms of CE valorization potential, both surveys indicate a common trend: WEEE and food waste are identified as waste streams with highest valorization potential for Brussels from most participants.

The evaluation of other streams, however, shows different priorities. For example, the potential of paper and cardboard stream is evaluated as third highest ranking in the online survey, whereas the concrete potential for valorization, beyond the improvement of collection and sorting, for Brussels is evaluated less promising in the bilateral meetings. A similar observation can be made for plastic waste: Although collection and sorting potentials can be improved, the local CE valorization potential seems to be less significant.

Finally, when considering all relevant aspects, such as the political desirability, the potential of each waste flow from a circular economy point of view and practical considerations, food waste, WEEE and bulky waste appeared as the waste streams with the highest valorization potential for a circular economy in Brussels. These three waste streams will be analyzed in detail in the following WPs of the project.
References

Plateforme BENELUX. n.d. “La Réparabilité: Un Défi Actuel Pour Le Futur!”
Annex 1

Survey question 1

Below you can find a selection of 6 general waste flows. The flows refer to the sum of domestic and professional waste generated within the Brussels Capital Region. For some flows a better integration in the circular economy might offer a better economic and/or societal valorization potential than the current waste management practices. Please rank the 6 flows according to this circular economy valorization potential.

The flow ranked first should, according to you, have the highest potential and the flow ranked last should, according to you, have the lowest potential (from an economic and societal point of view). You can rank the flows by dragging them to the box on the right.

If you want to see additional information on the flows (definition, amounts generated in 2014 and expected quantities in 2020), please click here (pop-up window will appear).

Survey question 2

You selected [flow 1], [flow 2] and [flow 3] as the flows with the highest circular economy valorization potential. Please briefly explain why you ranked [flow 1], [flow 2] and [flow 3] in your top 3.

[flow 1]:
[flow 2]:
[flow 3]:

Survey question 3

The 6 flows from the previous questions are rather general flows in the sense that they can be composed of several smaller flows. For each of the general flows from your top 3 ([flow 1], [flow 2] and [flow 3]) please list the smaller flows (if any) which are, according to you, particularly interesting in terms of circular economy valorization potential.

[flow 1]:
[flow 2]:
[flow 3]:

**Pop-up window with extra information**

*Table 20: General methodological information*

<table>
<thead>
<tr>
<th>Current waste flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>The current waste flows represent the amount of waste in 2014. The values are taken from several statistical sources, such as waste statistics from ARP-GAN for household and assimilated waste, the waste register for construction waste and Recydata for other professional waste. The amounts represent an estimation of the <strong>total waste amount</strong> collected in Brussels capital region, generated by <strong>households and economic activities</strong>. The statistical data sources were decomposed into <strong>material fractions</strong> in order to estimate the total potential of each specific material stream like food, plastic or paper waste, etc.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Future waste flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>The waste flows for 2020 represent the results of scenario analyses carried out by the BRUCETRA project. In the scenario analyses, the data from 2014 are used as the basis for the projection of waste flows. The values given for 2020 represent a <strong>business as usual scenario</strong> reflecting (i) regional population and income development to project the amount of household waste, (ii) regional economic projections to forecast the development of professional waste and (ii) waste prevention targets for food, paper and plastics taken from the regional waste plan.</td>
</tr>
</tbody>
</table>

*Table 21: Definitions for specific waste categories*

<table>
<thead>
<tr>
<th>Food waste</th>
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</thead>
</table>
Food waste includes the amount of thrown food and other organic waste such as paper napkins or tea bags. The waste quantities generated by households and economic activities are estimated based on the amount of food waste collected separately (in orange bags or containers) and the food waste part in the mixed residual waste. The amount of green waste from private gardens or from the maintenance of parks is not included.

### Inert waste

Inert waste is composed of concrete, bricks, tiles and ceramic, inert mixtures, asphalt, soil and stones and mixed construction and demolition waste. This waste stream is mainly generated by professional construction and demolition activities, but it also originates from households when repair and renovation works are carried out by a particular.

### Plastic waste

Plastic waste stream is composed of plastic packaging (i.e. PET, PE and PP bottles collected in the blue bag/container, plastic bags and films and other packaging found in residual waste) and hard plastics (from various sources). This waste stream is almost equally generated by professional activities and households.

### Paper and cardboard

This waste stream is composed of paper and cardboard (mostly found in yellow bag and specific container, but also in mixed residual waste). This waste stream is mainly generated by professional activities, but also households generate paper and cardboard waste.

### Waste Electrical and Electronic Equipment (WEEE)

Waste Electrical and Electronic Equipment include big appliances such as washing machines, ovens, cookers, etc. and small appliances such as computers, small household equipment, etc. In terms of material fractions, WEEE represents a mixture of ferrous, non-ferrous, synthetic, others and hazardous fractions. This waste stream is mainly composed of household WEEEs, but also the professional WEEEs are part of the waste stream.

### Bulky waste
Bulky waste represents a mixed waste fraction composed of bulky items (waste typically collected in containers parks or on request). The streams WEEE, plastics and wood are considered separately from the bulky waste and are hence not included in the total amount of bulky waste. Here, bulky wastes are mostly composed of furniture (mattresses, desk, carpet, etc.) and other composite items (bike, swimming pool, toys, etc.). This waste stream is mainly generated by households, but also professional activities contribute to this category.

<table>
<thead>
<tr>
<th></th>
<th>In ton per year</th>
<th>2014</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food waste</td>
<td></td>
<td>223.000</td>
<td>242.000</td>
</tr>
<tr>
<td>Inert waste</td>
<td></td>
<td>1.299.000</td>
<td>1.429.000</td>
</tr>
<tr>
<td>Plastic waste</td>
<td></td>
<td>74.000</td>
<td>77.000</td>
</tr>
<tr>
<td>Paper and cardboard</td>
<td></td>
<td>187.000</td>
<td>188.000</td>
</tr>
<tr>
<td>Waste Electrical and Electronic Equipment (WEEE)</td>
<td></td>
<td>5.000</td>
<td>5.600</td>
</tr>
<tr>
<td>Bulky waste</td>
<td></td>
<td>26.000</td>
<td>34.000</td>
</tr>
</tbody>
</table>