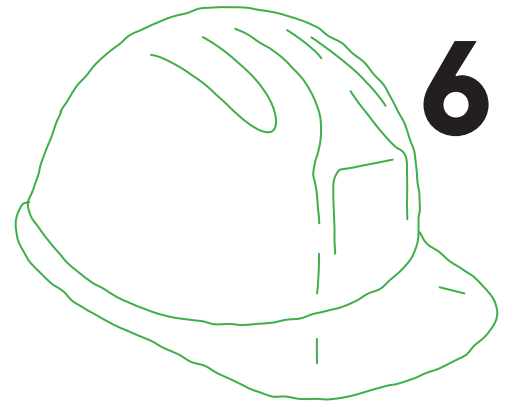


Construction materials bank



Activity description

Context

As recalled by the non-profit organisation Rotor in a March 2020 press release, 'In Belgium, the amount of construction and demolition waste produced annually rose from 11 million tonnes to almost 20 million tonnes between 2004 and 2016 - a growth of nearly 200% in 12 years'. It then goes on to say:

'The fact that a lot of this waste is being 'recycled' doesn't really improve the situation. In practice, this recycling operation covers the grinding and crushing of material to reduce it into fractions: the output is only suitable for basic applications (sub-bases in road foundations, etc.). In the construction industry, recycling most often involves a significant loss of functionality and value.'

In Belgium alone, over 120 companies specialise in the recovery, restoration and resale of reused construction materials and products. When adding to this figure companies based in the Netherlands, France and the United Kingdom, there are almost 1,500 SMEs working in this field. This sector remains largely unknown to construction professionals despite its potential to achieve significant ambitions in terms of promoting resource circularity.'

Indeed, a BBRI report on the circular economy in construction proclaims that 'Belgium appears to be at the top of the class, recycling around 90% (by mass) of its construction and demolition waste, which is notably attributed to the recycling of stony fractions', however this is better described as downcycling. The report also provides a wide range of possibilities for a (more) circular construction industry.

Most importantly, initiatives such as RotorDC and more recently Batiterre are working to make a difference by trying to salvage anything that may be found on a demolition site and by recovering as many items as possible. However this approach suffers from one main flaw: it only allows for the sale of small batches of uniform materials to mainly B2C clients who are more notably attracted to the approach itself. Others, such as Bout2Bois, upcycle by turning the materials into other items. Many other initiatives in other countries exist (see sources of inspiration), whereas the European project BAMB has studied the issue in detail.

Industrial activity

For stakeholders who are looking for a solution on a larger scale, a 'materials bank' could be created, from which industry operators could (or would, if the regulations change) be obliged to tap into before buying new.

This would involve setting tough industrial reuse requirements on recycling specific waste materials. The initial focus would be on three essential items of any construction that we believe are currently undervalued by the existing stakeholders:

- Roofing parts: slates or tiles, which may be taken off and stored, through simple separating, and possibly cleaning, processes;
- Windows: panes can very easily be salvaged (it usually involves undoing a few screws). Depending on the site, it may also be possible to recover the jambs and/or the frame (ideal solution), or, where they are left on the construction site: it will form part of the industrial activities to restore these windows on each occasion by recreating, where necessary, the frame and jambs, and to adapt the glazing to the latest standards. The panes will be set in simple frames to make modular greenhouses or other similar products (possible partnership with Dzero Studio).

- The same approach is taken for doors, both interior and exterior. Recovery of the panel is very simple in that this item is simply removed, whereas the frames and jambs will need to be dealt with on a regular basis.

This would involve the organisation of a major collection operation, followed by a recycling workshop (or even upcycling by improving the insulation of frames and panes) on an industrial scale in order to achieve competitive selling prices and promote maximum reuse.

The associated activities would therefore include the following key stages:

- Working with construction sites in the organisation of their waste material (initially, which could then give rise to structuring of the sector, with subsequent restoration bids from others in the trade who have received adequate training organised by our company);
- Sorting and storage
- Recovery of items collected that cannot be reused (e.g. resale of PVC for granulation, etc.)
- Repair workshop and remanufacturing of necessary items
- Storage and preparation for distribution (transportation packing)
- Loading bays
- Establishment of a sales and distribution network

Technical feasibility

The technical feasibility has been proven for a specific window or door. The technical challenge is becoming increasingly complex:

- due to the wide variety of existing models, as well as materials (wood, aluminium or PVC windows);
- due to the need to achieve economic feasibility.

Feasibility will therefore focus on whether or not it is necessary to restrict activity to certain specific items. Restricting by model seems difficult, as it would drastically limit the capacity to collect basic materials; restricting by material would on the other hand be more plausible.

First Elements to be analysed by the project team

- Analyse the sector and meet with the current major stakeholders in reuse
- Meet with an established manufacturer of windows and doors to fully analyse the activities that will need to be reproduced
- Understand the feasibility of the selected parts (roofing items are probably easier to manage, especially with regard to old tiles and natural slates). Old bricks, stone and wood cladding, metal joists and roof beams may also be considered valuable and interesting items because they bring character to the construction.
- Analyse costs and compare them to the market price for the same items as new
- Analyse the possibility of a partnership with a manufacturer, in particular in terms of machining systems for the frames and jambs
- Approve the global economic model

Sources of inspiration

- RotorDC (deconstruction consulting): <https://rotordc.com/>
- Batiterre: <http://batiterre.be/>
- Bout2bois: <https://www.fermentospilifs.be/wp-content/uploads/2019/01/Bout2Bois.pdf>
- BBRI report: https://www.cstc.be/homepage/download.cfm?lang=fr&dtype=publ&doc=Vers_une_economie_circulaire_dans_la_construction.pdf#:~:text=Toutefois%2C%20la%20Belgique%20se%20pr%C3%A9sente,recyclage%20de%20la%20fraction%20pierreuse.
- Stakeholder Platform for the Reuse of Building Items in Brussels: <http://www.reemploi-construction.brussels/>
- Report (2017) on the 'Économie circulaire dans le secteur de la construction à Bruxelles' (The circular economy and the construction sector in Brussels): https://document.environnement.brussels/opac_css/elecfile/RAP_2017_Economie_Circulaire_Construction.pdf
- BAMB project: <https://www.bamb2020.eu/>
- Summary of initiatives in France to transform buildings into material banks: <https://www.lemoniteur.fr/article/des-initiatives-pour-transformer-les-batiments-en-banques-de-materiaux.1993609>
- In Germany, Restado: <https://restado.de/>
- In Switzerland, MarketplaceHub: <https://circulareconomy.europa.eu/platform/fr/node/21>

Potential of the activity

Market

There is an established demand for materials. However this does not necessarily refer to reused materials, which is due, in principal, to availability issues (the sector is insufficiently supplied), price (including the often higher labour cost to dismantle, clean and use the old materials) and lack of guaranteed quality. The question also arises as to whether the project materials should be made available B2C (for renovation projects) or reserved for construction professionals (which implies regulations in this direction). But what is certain is that the construction market remains dynamic, even in Brussels: where the region granted only 140 residential building permits in 2019, including only 49 for new buildings, the bulk of the market consists of renovations, not all of which require a permit. In addition, many non-residential projects are under way (for which there are no statistics).

There are no or very few statistics that specifically apply to the markets for roofing materials or doors and windows in Belgium. In France, in 2016, the production of doors, windows and closing mechanisms amounted to 5 billion euro. This constitutes approximately 42% aluminium, 36% plastic and 22% wood.

Competition

The market for the sale of doors and windows, as well as roofing materials, is highly structured with a large number of stakeholders. It is therefore a highly competitive market, whereby many of these stakeholders are trying to gain the vital loyalty of professionals (typically installers, i.e. glaziers, roofers, etc.) compared with B2C end customers who generally do not have reason for repeat business.

It will be necessary to analyse this ecosystem and consider the best way to establish ourselves within it, most likely in a partnership alongside other contractors engaged in ecological construction or renovation activities.

Circular nature of the business

At the heart of the project is the idea of making the construction sector more circular than the status quo, through the authentic reuse of engineered materials such as doors, windows, roofing items and possibly cladding.

Key figures

Hypotheses

Below are some key figures from a 2012 study on the potential for recycling frames which was carried out by Factor-X on behalf of one of the largest Walloon operators in the manufacture of frames, doors and windows at that time to help project leaders set out their hypotheses. The figures given here are now outdated (over 8 years old) and will need to be updated.

Cost of site waste in renovation/construction projects: Min €160/t + €40/t transportation 50% of frame waste is glass.

The remainder is mainly wood (aluminium is often sold by workers on the black market & need to recover all parts). It should be noted that in the meantime the proportion of PVC frames being dismantled has increased and that some companies in the PVC sector say they are recovering them for regranulation to be reused in their production chains.

Overall cost of waste on a site (installation of windows) = approximately 1.3% of sales (13,000 euro and 50 tonnes of waste per € 1 million of turnover).

Resale price:

- Aluminium: €600 to €800/t
- PVC: €400 to €700/t
- PET: €600 to €700/t
- Sheet glass evacuation: €70/t (including delivery)
- Wood evacuation: €30/t (including delivery costing approx. 20 euro/t)
- Energy reuse from crushed wood: cogeneration = minimum 1000 t/year to install a wood crusher and make it profitable (cost: €10/t)

At the time, the market for windows and doors represented 1.8 million openings per year, 50% of which were new.

900,000 units were dismantled at 35 kg per window, resulting in more than 30,000 tonnes of waste.

The 15 largest installers in Belgium represent 50% of the market and can collectively recover 15,000 tonnes, or around 1,000 tonnes each. The largest manage between 2 and 5000 tonnes per year.

It should be noted that 2000 tonnes over 50 weeks only amounts to 40 tonnes per week, i.e. 1 to 2 lorry loads for the group, spread across all its sites: logistics must therefore be strongly considered (provision of containers on sites or at head offices?).

The economic model of the activity as a whole would be as follows:

- Customers pay for the evacuation and sorting of waste (this is already the case - €160 to €260/t paid by stakeholders).
- A proportion of this figure goes towards the cleaning and reuse processes.
- The actual transformation is the responsibility of the company, which makes its profit on the resale.
- Items that cannot be upcycled are downcycled, or even used to produce energy (frame wood).

Assuming that:

- We collect 50,000 frames per year or 1,850 tonnes of materials (or 21% of the 50% of the market held by the largest distributors)
- 15% of the frames collected can be resold following upgrading at a selling price of €450/m² (less than €600/m² for a regular new window), of which 40% goes to the resellers & turnover of €270/m²
- 15% of the wood collected is recovered from furniture manufacturers at €1000/t
- The remainder of the wood is paired with glass in the construction of interior glazing for partitions
- 50% of the glass is reused (double glazing manufacturing, etc.)
- 35% of reuse occurs in the manufacture of greenhouses (with aluminium and wood) and 15% in partitions for interior glazing

Therefore the annual turnover could be €385,000 in collections, broken down as follows:

	%T	1850 T	€/T	euros
PVC	5%	87.5	220	19,250
Wood furnishings	45%	787.5	220	173,250
Glass	40%	700	220	154,000
Aluminium	10%	175	220	38,500
TOTAL				385,000

And a total revenue from reuse of €7.1 million, broken down as follows:

	T	€/T		euros
PVC	87,5	400		35,000
Wood furnishings	118,125	1000		118,125
	#	M2	€/M²	euros
Resale of frames	7500	2	270	4,050,000
Greenhouse glass	23.100	2	35	1,617,000
Glass partitions	11.900	1.5	75	1,338,750
Total reuse				7,158,875

It is highly likely that the unit cost per m² of interior partitions is underestimated (to be reviewed).

These figures show us that, assuming transportation costs of €40/t, i.e. €70,000 outsourced, the collection activity generates a net turnover of €315,000 to pay for the collection of materials, as well as the team in charge of dismantling and cleaning the products. Assuming wage costs of 70% , 20% Opex and 10% CapEx, gives us a wage bill of €220k (5 FTE), €44k Opex and €31.5k CapEx to repay the investments.

The number of FTEs is not sufficient for the dismantling to be performed 100% internally (in this case each worker would have to dismantle 46 frames per day). It will therefore be necessary to enter into agreements with other service providers in order to recover frames dismantled according to our criteria, even if it means offering them reduced transport costs when it is done well!

Over €7 million in revenue would be generated from reuse alone, which is more than enough to pay a production and upcycling team of several dozen people (around 60 FTEs).

euros

Margin	10%	715,88
Wages	50%	3 147 663
OPEX	30%	2 147 663
CAPEX	12%	859 065

Potential tonnes recycled

It would be possible to recycle 1,850 tonnes, the majority of which would be upcycled.

A similar exercise should be carried out to assess the financial potential of other parts (roofing items, stone and wood cladding, old bricks, etc.).

Execution of the concept in Brussels

Local procurement

As a market comprising mainly renovation projects, the Brussels construction sector is more than able to supply materials in sufficient quantity. Should this not be the case, the supply in the 2 bordering regions should make it possible to source the necessary materials.

Local partners

Partners

Even though they are not direct purchase influencers, it will also be important to dialogue with architects, and to succeed in demonstrating to them the relevance of the reuse of such materials, perhaps by determining distinguishing aesthetic features (the preservation of a historical or heritage aspects, if applicable).

Suppliers

- Contacts to be made within the main stakeholders in construction and demolition in Brussels (see ecobuild.brussels, for example).
- Partnerships to be established with BatiTerre and ROTORDC and also Retrival in order to share the available materials.
- Partnerships also to be established with circular construction stakeholders to identify the sites for dismantling.

For frames and windows, it will undoubtedly be quick and efficient to enter into take-back agreements with fitters (who must then remove the dismantled windows, which constitutes waste for them).

We could work in the same way for roofing systems (roof repair or insulation from the outside, removal and replacement of tiles or slates, which would then be recovered by the reuse company).

Distributors

To be carefully considered with sellers of 'sustainable' materials, such as Carodec, BC materials and sponsors of targeted initiatives, such as the architects at Dzero Studio and Drees & Somer, and also with the stakeholders on the platform for reuse in construction (see links).

Partnerships to be forged with contractors who are interested in promoting post-consumer materials in their constructions: this may be cities and towns, key players in the world of education or demo sites (see the learning centre for 'old' construction techniques in Wallonia for the training of workers in renovation using original techniques).

Subcontractors

Possibility of subcontracting certain parts and certain machining operations to stakeholders active in the production of new frames.

Competitors

Almost all manufacturers of new materials.

Location

Relatively large amounts of materials will need to be stored, especially if the project decides to address a relatively wide range of window and door types and roofing products. Several thousand m² will be needed quickly.

Key success factors

Operational and commercial barriers

The big difficulties are storage space and the flow of unregulated volumes (we remain in the craft industry). Hence an additional difficulty: fixing prices in a market that apportions margins to all stakeholders.

Non-requirement to reuse in order to save new resources is disadvantageous and moves the focus of the activity to price, whereas should a requirement exists, we would have the conditions to make it a profitable activity, creating jobs and saving thousands of tonnes of materials per year.

We prefer the implementation of regulations to the granting of subventions which would be very expensive for public authorities but which would make the use of recovered materials economically advantageous compared to new.

Intellectual property

None.

Legislative obstacles

None in order to proceed.

Absence of legislation on reuse in construction and renovation sites.

For example:

- For renovation projects, 30% of the mass of materials used on site beyond the ground floor must be post-consumer.
- For new constructions,
 - 100% of the earths must be reused on site
 - Concrete cannot represent more than 20% of the total mass of materials used on site (excluding ground preparation). Its aggregates must be 100% recycled.
 - 30% of materials must be post-consumer from the ground floor up

Other risks

None.

Project team skills

There are no specific technical skills that need to be in place upon foundation of the project team, those necessary can be obtained by the first employees. On the other hand, there will be a real need for market analysis and price determination skills, as well as the ability to be convincing when contacting the numerous stakeholders involved (suppliers, distributors, public authorities). In addition, the team will need classic entrepreneurial skills (management, finance) and the right operational profile to ensure the organisation and quality of the production process.

What the RBC (Brussels-Capital Region) can do make it a success

- Give priority to reuse materials in all public contracts (minimalist selection criteria and award criteria focused on this aspect to suit the quantities specified by the project author, with penalties at the end if not achieved).
- Impose the requirement to reuse on all sites.
- Ruling to promote post-consumer materials.

References and links

- Millet group Reuse of reclaimed wooden frames in the production of artisanal furniture:
<http://www.groupe-millet.com/Developpement-durable--Recyclage-des-fenetres-292>
<http://www.groupe-millet.com/Millet-Developpement-Durable-69>
<http://www.ruedition.com/collection-meubles.asp?meuble=console>