Circular construction and renovation

Actions and recommendations to the Federal government for accelerating the circular economy in construction

Final study report

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Circular Construction and Renovation - Actions and Recommendations for Accelerating the Circular Economy in Construction to the Federal Government

Final Study Report

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Documents attached to this report

- Appendix 1 - Sustainable Development, Circular Economy and Construction
- Appendix 2 - Instruction Sheets
- Appendix 3 - Obstacle Cards
- Appendix 4 - Share Data Sheets
- Annex 5 - Instruments, obstacles, actions and thematic priorities
- Appendix 6 - Prioritization of actions
- Appendix 7 - Summary of the workshops on operationalization of actions

Disclaimer

This report is a deliverable of the study. It reflects the final result of the study as of 06/11/2020.

This study is the result of the work provided by the ICEDD research department on behalf of the CFDD. The study therefore does not necessarily represent the point of view of the members of the CFDD.

Cover photo

Renovation of the Belgacom building as part of the "Tivoli green city" project (winning project of the "Circular worksites" call for projects) (photo Romnée A.).

Study terms and conditions

The general objective of the study **is to propose actions to be taken by the federal level of government (and in a related manner the regional levels) to accelerate renovation and circular construction, with respect to building products (and materials).** More specifically, the aim of this study is to identify the instruments dealing with the theme, the obstacles to be overcome and the actions to be undertaken or already started, and to issue general recommendations to the federal power. The operational implementation of these actions or the modification of the instruments is not taken into account in this study.

Meeting this general objective requires, first of all, **to identify the obstacles** to the development of circular construction and renovation in the instruments carried by the public authorities or stated by the actors in the value chain of construction products. Then, on the basis of **an evaluation of the intervention potential of the federal and regional authorities** to act on the identified obstacles, **proposals for appropriate courses of action** to be implemented mainly by the federal government will be issued according to several priority axes.

In addition to the above-mentioned intermediate objectives, a third phase has been added to the study. This phase aims to identify **avenues for the operationalization** of certain proposed actions. This aspect of the study was conducted during various workshops organized with the stakeholders of the construction sector.

The methodology implemented to meet these objectives combines two complementary approaches. The first will consist in identifying, in the documentation relating to the various instruments, the obstacles and actions on which the public authorities can intervene to accelerate the transition to a circular economy in construction. The second will consist, through a double consultation (review and opinion on an interim report and workshops), to gather the opinion of the actors in the field of the value chain of construction materials on this same theme.

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1. Introduction

1.1. Circular economy and sustainable development in the construction sector

The economic model[1] in which the world is currently evolving is essentially **a linear model**: raw materials are extracted, transformed into products that are consumed and finally discarded. Implicit in this model is the assumption that resources are inexhaustible. This linear model is under increasing strain as the resources it consumes become scarcer, which also translates into higher prices and difficulties in sourcing raw materials, in addition to the environmental impacts associated with the extraction and processing of materials. Given the high energy and material intensity of the Belgian economy and the low availability of certain primary raw materials, this model creates a significant risk for Belgium's economic growth and the standard of living of its population. (CCE, 2019b). It is therefore important to move from this linear economic model to a **circular model** that aims "to retain the value added in products as long as possible and to eliminate [the concept of] waste" (CE, 2014). This model minimizes the need for new inputs of virgin materials and raw materials and energy, while reducing environmental pressures related to resource extraction, emissions and waste management.

The consumption of materials and the production of waste in the construction sector have undeniable consequences: most of the raw materials extracted end up in buildings, the production of construction materials and the incineration of demolition waste emit significant quantities of greenhouse gases (VUB, 2019). In 2017, the construction and operation of buildings accounted for 36% of global final energy consumption and nearly 40% of energy-related carbon dioxide (CO2) emissions. (UN, 2018). In addition, 54% of the materials resulting from demolitions are landfilled. (EMF, 2015). The circular economy, by increasing the lifespan and use of materials, choosing resources according to their environmental impact and their renewable nature, and developing various strategies to reduce the environmental impact of raw materials can be considered an effective strategy to reduce the environmental and climate impact[2], as well as the toxicity to humans, particle emissions, land use, etc., of the construction sector. By keeping material resources in circulation for as long as possible, the circular economy therefore often allows for a double benefit: limiting the pressure on the earth's resources and simultaneously reducing greenhouse gas emissions and other undesirable impacts (various types of pollution, reduction of biodiversity, etc.). This double benefit makes it possible to achieve various sustainable development objectives. The circular economy is therefore a principle (or a model) that makes it possible to meet certain sustainable development objectives.

The circular economy in construction tends to minimize the production of waste through repair, maintenance, reuse of products and recycling of materials, but also through a reflection on the design and the way in which are assembled the built elements whose life is to be extended and optimized. (CSTC, 2017). However, the circular economy in construction remains a complex notion and several definitions coexist in Belgium. According to the definition given by the CSTC (CSTC, 2018), the circular economy in construction is based on 3 main axes. Upstream of the construction, it is necessary to : (1) "Design and build circular", i.e., design construction with the end of the cycle in mind: design and build with adaptability in mind, build in layers, select materials according to their end of life and their impact on the environment (over the entire life cycle), make material assemblies accessible and reversible, and minimize waste production. (2) Practice "Urban Mining" by considering buildings as material resources, maintaining, for as long as possible, a maximum of constructive elements and carefully deconstructing the elements, practicing remanufacturing or reuse and then recycling. (3) Develop new "business models" that enable joint local value creation, for example by developing local channels for maintenance, repair and keeping goods in circulation. They can also sell a performance of use of a good

[1] A more detailed text is provided in Appendix 1.

[2] However, regardless of the material, the origin, life span and end-of-life treatment must be taken into account.

rather than ownership of it. Finally, they can create value from waste and thus allow for a 'post-consumption' of the resources present in the waste.

Numerous initiatives are already underway in Belgium for each of the "facets" of the circular economy (design, production, construction, valorization, etc.) and for different aspects (standardization, secondary raw materials, training and employment, etc.). Any attempt to take an exhaustive look at these initiatives would have been in vain, as there are so many examples in all sectors of activity (production, design, implementation, deconstruction and valorization) and in constant evolution.

1.2. Scope of the study

It is clear that materials and construction products are at the heart of the principles of the circular economy because they affect all of its "facets": eco-design, reversible implementation, prefabrication, deconstruction, repair, reuse, business models, training, etc.

The Construction Products Regulation (CPR) defines a construction product as "any product or kit manufactured and placed on the market for incorporation in a durable manner in construction works or parts of construction works and the performance of which affects the performance of the construction works with respect to the basic requirements applicable to the said works". (UE, 2011). Regardless of this definition, the Construction Products Regulation (CPR) does not cover the marketing of reusable materials. Consequently, certain aspects of the circular economy such as, for example, repair or reuse are not explicitly covered by this European regulation. Indeed, a study shows that reusable building materials are similar to non-harmonized products. (Rotor, 2017b). Without the development and integration of a normative framework to characterize the technical performance of reusable materials, it is not possible for a supplier to draw up a declaration of performance and affix the CE[3] marking. Moreover, the end-of-waste status is also an issue in the perspective of a transition towards a circular economy, even more so in the regionalized Belgian political landscape. Finally, the economic models of the circular economy promote the association of a service with a product by encouraging the use of a good to the detriment of its ownership.

These three examples (placing on the market, status of waste, economic model) among many others, tend to show that, in a model of circular economy, the term "construction product" can no longer be interpreted according to the linear meaning of its definition (extraction, production, distribution, marketing, disposal, etc.). Moreover, these examples highlight the roles of the different levels of power in Belgium, since they are a reflection of the regionalization of competences. It is therefore appropriate to be able to address all of these themes in this study dealing with construction products and materials (from near or far) through several "facets" of construction from reversible design to preventive construction through selective deconstruction, efficient waste management, high-value recycling, reuse and life in work and economic models.

[3] In reality, this framework exists. It is the voluntary route proposed by the CPR. It is possible for a supplier of reusable materials to establish a DoP (Declaration of Performance) and consequently to affix a CE mark to its product - at least for the most common products. However, this requires the establishment of an ETA (European Teachnical Approval), which in turn requires the establishment of a notified body.

2. Instruments, obstacles and actions in « circular construction »

On the basis of a review of the literature, consultations with the actors of the sector and the authors' proposals, the following paragraphs resume the identification of the instruments and obstacles as well as the proposal of actions related to the circular economy in the construction sector. These three elements are presented and classified[4] and finally the actions are prioritized.

2.1. Instruments, obstacles and actions

By definition : an instrument is a reference document (regulatory, legal, legislative, financial, fiscal, economic, normative, technical, sanitary), carried by a public authority (regional, federal or European) which is responsible for its publication, which deals with a matter relating to the circular economy in construction (both in terms of obstacles or actions opposing or in favor of the development of the circular economy in construction) ; an obstacle is defined as any difficulty slowing down, hindering or preventing the development of the circular economy in construction; an action[5] is an exercise of power or a willingness to act on an obstacle with a view to influencing its transformation (lifting it, removing it, qualifying it, making it more flexible, etc.); an obstacle is defined as any difficulty slowing down, hindering or preventing the development of the circular economy in construction. - In this report, we will often use the general term "impacting" or "tackling" it) in favor of accelerating the development of the circular economy in construction.

The instruments, barriers and actions are classified (ID card) according to the parameters listed in Table 1. Appendices 2, 3 and 4 contain presentation sheets for the instruments, obstacles and actions.

Table 1: Instrument Ranking Parameters, Barriers, and Actions

Instruments	Obstacles	Actions
Theme: theme of the circular economy in construction addressed by the instrument. This criterion can take on several values: design; construction; deconstruction; waste; reuse; recycling; work life / economic model.		
Category: instrument family to which they belong. This criterion can take one or more values grouped together: Economic / Financial / Fiscal; Normative / Technical / Sanitary; Regulatory / Legislative / Legal.	**Category:** family to which each barrier belongs. This criterion can take only one of the following grouped values: Insurance; Economic / Financial / Fiscal; Training / Education / Awareness / Cultural; Normative / Technical / Sanitary; Regulatory / Legal.	**Action competence:** competences are the 3 axes/types[6] of actions usually carried out by public authorities. The competences of a political power can take several forms: *Activate:* encourage experimentation and the dissemination of good practices (make the activity more intense or faster). *Support and Encourage:* using incentive mechanisms to stimulate change and providing leadership, vision and adaptation of structural frameworks (not coercive devices). *Regulate and Regulate:* by enacting and implementing legislation or enforcement mechanisms.
Level of authority: the level of authority that has the competence to carry the instrument and the responsibility for its publication. This criterion may take only one	**Level of responsibility**: the level of competence at which the obstacle arises and for which this competent authority is responsible. This criterion	**Nature of the action**: the actions can have impacts on the construction sector of different natures such as : *Skills*: skills development, training, awareness raising (sensitizing, educating and informing).

[4] A classification consists in modeling a practice to understand its complexity and by definition, a model is not 100% sure. There are therefore borderline cases, which could be classified in different ways for which a clear-cut decision had to be made. The purpose of this classification is therefore to help in the analysis and understanding of the different elements.

[5] Where they could be identified, initiatives completed or in progress were identified for the actions to which they relate. These initiatives are explained in the form of "They have done it" (see Appendix 4).

[6] Allwood and Cullen, cited by (Rotor, 2018)

of the following values: European; Federal; Regional or Inter-regional (shared between Regions).	may take only one of the following values: European; Federal; Inter-regional (shared between the Regions); Regional (Flanders, Brussels or Wallonia); Municipal; Private (within the domain of a single actor, public or private).	Implementation of experiments related or not to research. *Exemplarity:* promoting exemplarity through experience feedback, labeling. *Tools:* implementation or development of tools, procedures, monitoring, technical texts. Regulation: imposing obligations on technical, fiscal and legal levels. *Support:* support (mainly economic, but not exclusively) companies and structure the actors (voluntary commitment of the actors on the basis of financial or technical support or structuring).
Scale: The "scale" of the construction for which the instrument constitutes an obstacle and/or action. This criterion can take several values: sector - sector scale - ; building; product; material.		**Level of power:** the level of power to which the action, if implemented, should be carried out. This criterion can take several values: European; Federal; Regional or Inter-regional; Communal.

During this analysis, 64 instruments[7] and 32 obstacles were identified and 41 actions were proposed. Many of the proposed actions will require significant development, while others already have initiatives underway or completed.

From the analysis, the summary observations in Table 2 emerge.

Table 1 : observations from the analysis of instruments, obstacles and actions

Instruments	Obstacles	Actions
The instruments are numerous and seem to be distributed in a relatively homogenous way between the 3 regions, the Federal and Europe; on the other hand, few instruments are also co-ported at the "inter-regional" level.	The majority of the obstacles identified under the responsibility of the federal government relate to the theme of re-employment. The obstacles relating to the themes of "Recycling", "Deconstruction" and "Re-employment" are the most represented under the responsibility of the regional authorities.	Most of the actions relate to regulations (according to the "Nature of action" criterion). This is consistent because, in order to really boost the circular economy in construction, it is necessary to ratify the actions in texts with regulatory value. This goes hand in hand with the fact that the majority of actions are under the competence of "Regulating and Regulating".
The majority of the instruments surveyed belong to the Regulatory/Legislative/Legal category.	A large number of obstacles have been identified, but the majority of these obstacles are the responsibility of regional authorities.	The actions are numerous, diverse and can be carried out by the different levels of authority.
Most of the instruments inventoried only address one scale in construction. The two scales mainly supported in the instruments carried by the	Most of the obstacles identified belong to the "Economic / Financial / Fiscal" or "Regulatory / Legislative / Legal" categories. At the Federal level, with the exception of obstacles related to	Most of the actions are carried out either by the federal government or by the (Inter-)regional government[8]. Indeed, at present, as the diversity of instruments shows, there is a lack of governance at the level of the circular

[7] It should be added that other reference instruments that are not carried by levels of political power for the world of construction exist and constitute part of the technical framework. These other instruments are not taken into account in the inventory carried out in this study. They concern the Belgian Standards (Belgische Normen) of the Bureau de Normalisation; Technical Information Notes (Technische Voorlichting) of the CSTC; Technical Approval (Technische Goedkeuring) of the UBAtc; Technical Prescriptions (Technische Voorschriften).

[8] Note: the fact that the European level of power as a shareholder is poorly represented is due to the nature of this study, which focuses on the construction sector in Belgium. Most of the actions could be carried by the European level, and thus be transposed in the Member States, and thus in Belgium. The actions selected here as carried by Europe are those that are linked to existing European rules/legislation (for example, action 4 in relation to CE marking).

Federal government are the product and sector scales. The two scales mainly supported in the instruments carried by the Regions are those of material and building. This observation reflects the separation of competences between several levels of government in Belgium.	"Training / Education / Awareness / Cultural", all other categories of obstacles are identified. The fact that there are no barriers related to the "Training/Education/Awareness/Cultural" category at the federal level is partly due to the distribution of competences, as it is the communities that are responsible for education. However, the federal government can play a development role in the provision of training, in particular by ensuring that the offerings in the various communities are harmonized.	economy in the construction sector. It makes little sense to put a particular Region as the bearer of an action because for an action to be really effective it must be implemented throughout the whole Belgian territory and not only in a part of it.
Very few of the instruments surveyed deal with working life and economic models.		Most of the actions relate to the themes of deconstruction and reuse. As reemployment is ranked very high on the Lansink scale (CE, 2008), it is relevant to try to develop this practice as much as possible. In an *urban mining* perspective that aims to preserve and enhance the value of existing buildings as much as possible, deconstruction is then important to the circular economy. It is necessary to succeed in changing the sector's vision of existing buildings to see them as real sources of materials, and this must also involve training for those involved in construction.
		The Federal government mainly carries out actions falling under the competence of "Regulating and Regulating" while the Inter-regional government develops actions of the "Activate and Stimulate" type. This reflects the fact that the Federal government must really play the role of the circular economy by modifying the laws impacting the circular economy for which it is competent, particularly in terms of taxation, products and more specifically their labeling. The Inter-regional level of power focuses more on actions aimed at activating and stimulating, such as education and training. These observations can be found in the analysis by nature of action, with the Federal government carrying more regulations while the Inter-regional focuses on competences and exemplarity.

2.2. Prioritization of actions

The prioritization of actions is done with the objective **of highlighting actions that accelerate the sector's transition to a circular economy**. The grid of criteria established below and the evaluation of these criteria are oriented to meet this objective. It is important to note that this ranking remains a proposal based on the consideration of a limited number of criteria; other criteria (which would pursue other objectives) would probably have led to another ranking. Ideally, all of the proposed actions would be worthwhile.

2.2.1. Criteria grid and evaluation method

To meet the objective of the ranking, several criteria are taken into account: competence of the actions, impact of the actions and speed of implementation and impact of the actions. The evaluation of the actions for their ranking is based on a method known as "quick scan", i.e. a comparison of several criteria to which scores ranging from 1 (low) to 4 (high) are assigned. Each action is evaluated independently for the 3 criteria (competence, impact, speed). Each criterion has an equal weight in the evaluation. The actions are prioritized in descending order of the sum of the scores attributed to each criterion.

With regard to the criterion of **competence of actions**, in a phase of acceleration of the sector in the circular economy, it is important to "come out of the pilot phase to increase the market phase". To this end, regulatory and regulatory actions are favored over support and activation actions. Indeed, in order to make the sector evolve, the implementation of a regulatory framework will allow (more) actors to take part in the market within a defined framework. Then actions to support and stimulate the evolution of the actors can be implemented. Finally, activation actions will continue to be encouraged in order to continue the development of other pilot phases.

As far as the criterion of the **impact of actions** is concerned, the aim is to give priority to actions that have the greatest potential impact on the acceleration of the circular economy in construction, i.e. actions that can have a determining or decisive influence on the evolution of the sector.

In fact, the transition to a circular economy requires systemic changes that are supported by the implementation of substantive actions to sustain this change and which, consequently, have a significant impact on the sector.

With regard to the criterion of **speed of implementation and impact**, the aim is to give priority to actions whose implementation and impact are the quickest and easiest. Indeed, aiming to accelerate the circular economy requires the implementation of a number of actions in the short term. If implementation is quick and easy, it is better to do it right away, especially if the impact is late. Moreover, most actions have a rapid impact when they are implemented.

2.2.2. Classification of share

Table 3 and Appendix 6 show the ranking of actions based on the evaluation of the above criteria. The actions highlighted in bold in Table 3 are those that could or should be taken by the federal government.

In this respect, the ranking of the actions carried out by the workshop participants corresponds very similarly to that carried out by the authors of the present study. Indeed, the synthesis report of the workshops (Appendix 7) shows that the main priority actions to be implemented by the federal government (according to the participants) are as follows:

- the status of waste and products to be discussed around cooperation agreements and legal provisions ;
- the extraction and integration of reuse materials as well as the use of environmental assessment tools to be prescribed in public procurement;
- the establishment of a framework for evaluating the performance of reused materials as a first step, and the principles for carrying out resource inventories;

- the reduction of VAT on circular products;
- the internalization of environmental and social costs in the cost of products;
- financial assistance for circular projects;
- taxation of raw materials;
- the imposition of a level of detour of reuse products;
- training and sensitization of public planners;
- the integration of modules on the circular economy into training programs.

Table 2 : classification of shares

		Competencies	Impact	Speed	SCORE
Act_35	Integrate the principles of construction and circular design	4	4	3	11
Act_37	Use tools such as GRO, TOTEM, the EPD database in public procurements	4	3	4	11
Act_14	Require selective deconstruction for reuse for building types and materials (or components) that lend themselves to reuse	4	2	4	10
Act_30	**Standardize a traceability procedure for the recycling of deconstruction waste**	4	2	4	10
Act_27	Develop and set up a waste tax for major demolition sites	4	3	2	9
Act_31	Set up cooperation agreements between the Regions and the Federal government for waste management and product standards	4	3	2	9
Act_1	Carry out a pre-demolition inventory / resource inventory	4	2	3	9
Act_16	Prescribe the extraction and integration of circular materials and products in public procurement (via standard specifications)	4	2	3	9
Act_5	**Set up a framework to characterize the technical performance of reusable materials**	3	3	3	9
Act_22	Develop material passports	2	4	3	9
Act_7	**Integrate the circularity criterion into existing environmental certifications**	2	3	4	9
Act_36	Revise the RPC to include recyclability requirements	4	3	1	8
Act_38	**Revise material recovery objectives and create new material recovery channels**	4	3	1	8
Act_4	**Clarify and ratify the obligation or not of CE marking for reuse products**	4	2	2	8
Act_13	**Taxing raw materials (instead of taxing labor)**	4	2	2	8
Act_15	Impose a minimum level of detour and/or integration of reusable elements into reuse channels	4	2	2	8
Act_24	**Internalize the environmental and social costs and externalities of a new product and/or demolition activities in their price**	4	2	2	8
Act_25	Adapt administrative procedures (PU, PE, site permits, requirements) to the specifics of circular practices	4	2	2	8
Act_40	**Framing the development of new circular economic models**	4	2	2	8
Act_17	Sensitize and train public planners and the institutions and organizations that grant authorizations or give opinions on the themes of circular construction	3	2	3	8
Act_11	**Reducing VAT on "circular" construction products**	4	2	1	7
Act_26	**Review the legal provisions concerning the status of waste, the procedure for the end of waste status, the status of re-use**	4	2	1	7
Act_39	**Extending producer responsibility**	4	2	1	7
Act_41	**Promoting digitalization in circular construction**	3	2	2	7
Act_2	Making an inventory of the players in the circular economy	3	1	3	7
Act_12	**Involving the social and solidarity economy sector in reemployment and deconstruction activities**	3	1	3	7
Act_6	**Set up a labeling and certification of buildings and circular products**	1	2	4	7
Act_23	**Clarify responsibilities for donations of reusable materials**	4	1	1	6
Act_34	Relaxing and modifying the conditions for cross-border transportation of waste for recovery	4	1	1	6
Act_29	**Define the conditions for setting up a commercial guarantee for reused materials and products**	2	2	2	6

Act_8	**Provide financial assistance for circular economy construction projects/companies**	2	1	3	6
Act_3	**Federating the actors of the circular economy**	1	2	3	6
Act_10	Integrate modules on the circular economy into curricula and training programs	1	2	3	6
Act_21	**Develop a circular construction or renovation assistance tool**	1	2	3	6
Act_33	**Develop a tool for monitoring circularity in the construction sector**	1	2	3	6
Act_28	**Create a 'Circular Economy' Fund**	2	2	1	5
Act_18	Develop and make available infrastructures that promote the exchange of material resources	1	2	2	5
Act_9	**Identifying and highlighting successful circular construction projects**	1	1	3	5
Act_20	Set up specific support for individuals: Facilitator "circular economy construction"	1	1	3	5
Act_32	Define the role and profile of the auditor in terms of material resources	1	1	3	5
Act_19	Raise public awareness of the impact of the construction sector on the environment and the opportunities of the circular economy	1	1	1	3

3. Priority thematic axes

From the analysis of instruments, obstacles and actions, six thematic axes have been identified as priorities for accelerating the circular economy in the construction sector and on which the federal government should mainly work. Among these thematic axes, two are cross-cutting axes that can frame and stimulate the development of actions in the other four; these are the governance and policies axis and the public procurement axis.

Annex 5 lists the instruments, obstacles and actions identified in this study in relation to each thematic priority axis.

3.1. Governance et policy

A territorial approach to the circular economy requires different types of governance, enabling the development of effective strategies[9] and facilitating the involvement of different types of actors who can contribute to the transition towards greater circularity. The aim is to create the framework for multi-stakeholder participation of policy makers, industry representatives, businesses, social partners and civil society organizations, to frame reflection and discussion within a broader circular economy framework. This proposal is in line with the opinion communicated by the social partners on this subject (CCE, 2019a)) : "The different levels of government need to do more and better coordinate their policies. In this way, they can strengthen their respective capacities for action, and the coherence and effectiveness of policies can be guaranteed". The CCE and the CFDD also concurred in this sense in their latest opinion on the development of the circular economy in Belgium: "The need for better governance through coordination and consultation. Bringing it into line with the European level is crucial. At the level of Belgium as well, it is essential that the authorities, with their various competences, work together and coordinate their policies and instruments"(CCE-CFDD, 2020).

It will therefore be necessary to inventory and federate the actors of the circular economy. A federating body of actors[10] could coordinate progress on technical, normative, commercial, awareness raising, training, etc. issues. Some of these issues could also be dealt with within already established organizations such as existing federations, technical research centers, etc. This grouping of actors should also consider the participation of the social and solidarity economy sector.

The policies on which these actors could work will focus in particular on the implementation of cooperation agreements between the Regions and the Federal Government for waste management and product standards. The definition of the conditions for setting up a commercial guarantee for reused materials and products, the legal provisions concerning the status of waste, the procedure for the end of waste status, the status of reuse[11], the modification of the conditions for the cross-border transport of waste for recovery, the creation of a framework for the development of new circular economic models, etc. These policies should also promote a way of life and use of buildings, methods of construction, building owners' expectations, etc. that preserve the highest value of materials and products (including buildings).

During the analysis of the actions by the participants of the workshop, it was notably highlighted that the reflections around the question of waste and products are priority actions to be carried out by the Federal government; through cooperation agreements and legal provisions.

[9] In the medium and long term, for example by defining the vision to 2050 of circular construction in Belgium.

[10] This federation of actors could also be organized according to the "themes" or "facets" of the circular economy. It would then also be necessary to provide for moments of cross-fertilization between the different "federations" in order to ensure that they converge in their actions.

[11] As far as reuse is concerned, it should also be possible to study the end of the differentiation between household and industrial waste. Reuse is still too focused on Business to Consumer (BtoC: relations between companies and consumers) and not enough on Business to Business (B2B: relations between companies). Re-employment should not be limited to B2B or B2C but should be done between all types of actors.

However, it must be borne in mind that the actions thus proposed, which would be carried by the different levels of power, should not, in all cases, lead to the promulgation of new regulations. The addition of new, uncoordinated (or even contradictory) taxes or recommendations would probably prove inapplicable in an already "loaded" regulatory context. Given the large number of existing instruments, new regulations must be made in a coordinated and consistent manner.

The different actors involved in this participative and collaborative approach will develop a set of cross-cutting actions with an integrated and holistic vision of the issue aiming, on the one hand, at harmonizing between the different levels of Belgian and European powers, the policies and actions that will be carried out in favor of the acceleration of the circular economy in construction, and on the other hand, at harmonizing the economic, environmental and social objectives of the policy areas dealing with climate transition.

These actions will deal with competences that will aim at the coordination between policies and instruments of the different levels of power; they will advocate a maximum of transparency, an approach based on the strong involvement of actors in the field, and a particular attention to the coherence of the different legislations.

At the European level, the new action plan for a circular economy is particularly supportive of this (CE, 2020b): "To exploit the potential for increasing material efficiency and reducing climate impact, the Commission will launch a new comprehensive strategy for a sustainable built environment. This strategy will ensure coherence between relevant policy areas such as climate, energy and resource efficiency, construction and demolition waste management, accessibility, digitisation and skills. It will promote the principles of circularity throughout the life cycle of buildings. »

3.2. Public procurement

Public procurement has the potential to stimulate the development or scaling up of circular solutions. Public authorities must set an example, show the way forward and create the preconditions for the development of the circular economy, notably by setting the regulatory framework. More specifically, public procurement has a real potential to stimulate demand for circular materials (reusable, recyclable, bio-sourced, decomposable, etc.).

Public authorities have already taken some initiatives or plans to promote the circular economy in construction. The Brussels government has, for example, set up the Be.Circular (RBC, 2020a) and Be.Exemplary (RBC, 2019a) calls for projects that reward and promote circular economy projects and exemplary construction and renovation projects in terms of sustainable urban development, respectively. In the Walloon Region, the Introductory Report, recently reinforced by Circular Wallonia (Stratégie de déploiement de l'économie circulaire (Wallonie, 2020)) on the circular economy in Wallonia (Wallonie, 2019c), calls in particular for the concentration of public resources in the pilot area of the circular construction and renovation of infrastructures managed by public authorities. In Flanders, one can cite the Tracimat organization, which has developed a procedure for tracing demolition waste (especially aggregates) with a view to recycling, or article 4.3.3 of the VLAREMA Regulation, which imposes a demolition inventory for certain conditions. Initiatives such as the *Green Deal Circulair Bouwen* have also been launched. In addition, the *Facilitair Bedrijf* is also required in public procurement to take into account circularity aspects for any new construction or renovation for the Flemish government through the mandatory application of the GRO. In addition, there is an initiative at the European level on which public authorities can rely to highlight their exemplarity in public procurement: the Platform of European Actors in the Circular Economy (UE, 2020a). This platform allows the different actors to submit content (good practices, publication, event, network, ...), to exchange and interact on this topic. A new action plan for the circular economy is also under preparation at the European level (CE, 2020b), its main goal is to increase the recycling and reuse of products in Europe. There are, moreover, other initiatives than those mentioned in this paragraph.

The public authorities are therefore taking some initiatives or plans to promote the circular economy in the construction sector, but this is still fairly marginal. Moreover, in practice, certain clauses in the

specifications prescribed by the public authorities are only partially drafted in favor of selective deconstruction for reuse or high-value recycling, and there are still often demolition clauses in these specifications. It is therefore necessary to open up (i.e. to define selection criteria according to the need for use, not by describing a product) the clauses of the specifications in order to allow for an easier integration of circular practices. Thus, the study initiated by the Walloon Region on the prioritisation of reuse materials to be included in the 2022 building specifications (CCTB, 2022) is a concrete example of an initiative put in place by a public authority in an attempt to make its public contracts circular. Public authorities must therefore go further and take action to ensure that their public procurement contracts promote the circular economy and set an example by allowing (or at least formalizing) the possibility of deconstructing before obtaining a permit. This will necessarily involve defining a "public procurement strategy". As such, Wallonia aims to build public policies with public procurement as a lever through the Sustainable Development Department, which is a cross-disciplinary department.

This will require, in particular, a phase of awareness and training of public planners and institutions/organizations that grant authorizations or give advice (Urban Planning Services, Monuments and Sites Commission, Fire Services[12], etc.) on the themes of circular construction. This could push these actors to take decisions in favor of the circular economy during their daily work. For example, in the Brussels-Capital Region, there is a possibility of exemption from urban planning charges if office space is removed for housing purposes. As the text does not impose the maintenance of the building, developers are therefore interested in demolishing the office building to rebuild housing and benefit from the exemption from the urban planning charge. This reflects a weak culture of preservation of the built environment in the regulations, in the processing of applications for planning permission and in public procurement. Numerous actions could be implemented to overcome this difficulty[13].

Although it is necessary for the project author to acquire the right reflexes upstream, rather than at the time of the specifications, changes in public procurement clauses could (continue to)[14] play a big role, such as for example :

- Prescribing the extraction (removal and recovery) (careful inventory and deconstruction) and integration of reused or recycled materials in public procurement contracts.
- Include circular economy clauses in standard specifications[15]: standard specifications are instruments used mainly by public authorities to prescribe the work to be carried out. These specifications should integrate all the precepts of circular construction (deconstruction, choice of materials, implementation, etc.).

Moreover, it is clear that for the participants of the workshop on public procurement, reflections on the extraction and integration of reusable materials as well as the use of environmental assessment tools in public procurement are a priority. Nevertheless, a spirit of fairness must always be maintained by avoiding, for example, that the imposition of minimum requirements for the detour of reusable elements jeopardizes or puts an end to other initiatives. Similarly, the requirement for a minimum level of reusable materials should not be allowed to hinder the development of new projects, if only because of a shortage of reusable materials that are usable and adequate to meet the other requirements that projects must meet (notably, technical and energy requirements).

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[12] Fire standards also have an impact on circular building design and the choice of materials and connections that allow for future disassembly and reuse. A more detailed analysis would be interesting to conduct on this normative framework and the different points blocking the transition to a circular economy as well as potential solutions to overcome them.

[13] For example, prohibit demolition based on the age of the building, remove the exemption from the urban planning charge in the event of office demolition for housing, tax the production of waste, impose the use of the Totem tool to take into account the environmental impact, impose reversible design so as not to have buildings that cannot be dismantled in the future, include an award criterion in public procurement contracts and a better rating for the bidder if it favors the maintenance of the building, create a circular economy fund for public authorities that favor renovation over demolition to offset the additional cost, etc.).

[14] The means to award "long-term" projects already exist: Sections 81 (criteria for awarding contracts) and 82 (life-cycle costs) of the Public Procurement Act (http://www.ejustice.just.fgov.be/cgi_loi/change_lg.pl?language=fr&la=F&table_name=loi&cn=2016061719).

[15] See in this regard the work carried out by the Sustainable Development Department of the SPW (and the action sheet 19): http://developpementdurable.wallonie.be/actualite/economie-circulaire-dans-la-construction

Care must also be taken to ensure that the market can meet the circularity clauses. Various examples exist where such clauses could not be considered by bidders because the supply of materials to meet them did not yet exist. It is therefore also important to support the technical and economic aspects of the offer to enable the demand to be met in parallel.

The public authorities must also support innovation and research and continue to highlight successful projects in the circular economy in construction in order to promote its development.

3.3. Economic framework

Investments in the circular economy are currently insufficient. While alternative financing is struggling to finance all large-scale projects, banking institutions often consider them too risky and complex. Banks use the same evaluation tools for innovative *business models* as for traditional *business models*. They therefore tend to underestimate the economic potential of projects in the circular economy. For example, banks are sometimes reluctant to grant a leasing contract to a company with very specific equipment. The risk for the bank is that it may not be able to reuse this equipment with another company afterwards. The economics of functionality, as a circular business model, also poses another problem for investors: it very often generates payment delays that require significant working capital requirements (SPF, 2018b). However, initiatives to finance the circular economy are gradually emerging[16].

Europe is relying heavily on the circular economy as a model for a sustainable economy in order to position itself as a world leader in this field. Today, it offers one of the most important public financial supports for circular economy projects. In Belgium, subsidies are mainly granted on a regional scale. The three regions have each established an action plan summarizing the objectives set, followed by a series of initiatives to achieve them, some of which include guidance and financial support to companies in the form of calls for tenders, competitions or subsidies. The federal government's role is more one of promotion among consumers and business leaders. (SPF, 2018b).

In addition to this lack of investment, the current fiscal framework and the lack of consideration of all externalities in the price of building materials do not favour the circular economy (for example, the use of products and materials from reuse or recycling). Nevertheless, it should be borne in mind that the scenario of internalizing the negative externalities of new building materials (which would aim to improve the competitive position of reused materials by increasing the cost of new building products) could lead to an increase in the cost of construction and renovation, which could limit housing affordability and keep poorly performing and decent housing on the market. Even if the inconveniences are more limited, the renovation of the housing stock does not totally avoid noise, dust, transport of materials, etc., either. Moreover, it is also important in this scenario to prevent any distortion of competition between new locally produced materials and imported ones. Therefore, it is necessary to accompany the issue of renovations with a complete analysis in terms of the life cycle of the materials and the cost of the entire life of the building.

Various macro and micro economic measures need to be taken to counter these obstacles and promote the circular economy. These measures call for the revision or creation of new economic mechanisms (taxation, bonuses[17], taxation, etc.) to provide incentive financing for actions in favor of the circular economy in construction, on the one hand, and financial mechanisms that penalize actions that are detrimental to the circular economy in construction, on the other hand.

[16] For example, ING's fund for a circular economy (ING, 2020) makes available for its 2020 call for projects, 250,000€ for initiatives that strengthen the skills and professions of the circular economy. Other funds supporting in particular projects in circular economy also exist such as the Fonds Duurzaam Materialen- en Energiebeheer (FDME, 2020), the fonds de Village Finance (VF, 2020) et the fonds Brucircle (CircleMade, 2020).

[17] For example: reversibility surcharge, low environmental impact insulation surcharge (based on Totem), designer bonus "optimizing the project to reduce its environmental impact by using Totem", incentives for reuse elements, etc.

For example, a measure[18] to reduce the VAT rate to 6% for demolition-reconstruction runs counter to resource management that keeps products (including buildings) at their highest level of use for as long as possible. This measure should be accompanied by a carbon balance sheet[19] or a scan of the project to check whether it is worthwhile, whether there is a potential for reuse, etc.

Any differentiation of the VAT rate to promote certain construction products will also have to prevent any form of unfair competition. In this context, it will be necessary to ensure that this reduced rate is not a source of VAT fraud and/or against the client.

The tax framework needs to be reviewed, for example by moving from a taxation of labor to a taxation of raw materials (or on CO2 emissions or other environmental impacts); by tax deductions for donations in kind of second-hand materials or for deconstruction or inventory work on reusable materials; or by reducing VAT on recycled or reused construction materials.

This change in the tax regime on raw materials will, however, have to be integrated into the rules of the European single market, which prevents any discrimination against materials from abroad, whether through tax measures, border closures or any other measure that limits their free movement. In fact, adapting taxation by increasing the taxation of raw materials would risk only affecting the competitive position of local producers of new materials vis-à-vis their foreign competitors, without promoting reusable materials that will continue to compete with new materials produced abroad.

Other measures relating to the internalization of external costs so that the prices of construction materials better reflect their environmental impact should also be considered.

The reduction of VAT on circular products and the internalization of environmental and social costs are the first actions recognized as priorities by the participants in the discussion workshops. Actions for financial assistance for projects, taxation of raw materials and the imposition of a level of deviation are actions of a second order.

Finally, the increase in investments in the circular economy could be boosted by the creation of a specific fund that would finance circular economy projects. This Fund could be fed, for example, by the money collected through the tax levied on reused materials or by the money that could be collected through a tax on the externalities of the sale of construction products (with a higher tax for new materials).

3.4. Normative and technical framework

The construction sector, like any other sector, is governed by a certain number of standards (resulting from laws, decrees, orders). These different standards may prescribe things to be done during construction, deconstruction or renovation work, but also prohibit certain things. As an example, an article in VLAREMA (Vlaanderen, 2012) imposes a demolition monitoring plan for certain demolition work, while a Royal Decree sets minimum requirements for environmental displays on construction products and for the registration of environmental product declarations in the federal database (SPF, 2014).

There are also a number of technical requirements that apply to the construction sector such as Technical Specifications (STS) (SPF, 2018). Other reference instruments that constitute part of the technical framework, even if they are not (necessarily) instruments carried by levels of political power, also exist for the world of construction. One thinks in particular of the Belgian Standards of the Bureau de Normalisation, the European harmonised standards, issued by the technical committees of the CEN, the Technical Information Notes of the CSTC, the Technical Approval of the UBAtc and the Technical Prescriptions. These various elements are detailed in Annex 2.

The normative and technical framework can sometimes hinder the development of the circular economy in construction. It is also often challenged by its many innovations.

[18] This measure was initially proposed for its favorable social impact, which contributes to meeting the growing demand for decent and adequate housing as well as the renewal of obsolete and energy inefficient housing stock.

[19] Based on the TOTEM tool, it has been shown that demolition-reconstruction has a greater environmental impact than renovation.

One of the obstacles to the circular economy relates to the evaluation of the technical performance of reusable materials. Indeed, various normative texts require that the technical performance of materials be known. The Construction Product Regulation (CPR) (UE, 2011) provides that in order to place on the EU market a construction product covered by a harmonized standard or conforming to a European Technical Assessment, the manufacturer must draw up a declaration of performance and affix the CE marking to the product in question. In doing so, the manufacturer assumes responsibility for the conformity of his product with the declared performance. This raises the question of the method of evaluating this technical performance (and more broadly the need for CE marking for reusable materials). One study shows that reused construction materials are similar to non-harmonized products (Rotor, 2017b). Without the development and integration of a normative framework to characterize the technical performance of reused materials, it is not possible for a manufacturer to make a declaration of performance and affix the CE marking.

Prior to actions to encourage or set up mechanisms to promote circularity and recycling, more knowledge should be collected on the environmental and technical quality (and variability) of secondary materials and its influence on the performance of the facility. Indeed, one of the challenges is to be able to describe the characteristics of a material with sufficient precision to enable designers to ensure that it is suitable for its intended use and all the requirements associated with it. The field of reflection must focus on characterization methods.

The responsibility for marketing or quality assurance of recovered and reused or resold materials is also a subject to be specified. The absence of a manufacturer's guarantee pushes some installers or project managers to refuse to reuse products unless the architect takes responsibility, which creates great pressure on this actor.

Another case in which standards seem to complicate the development of the circular economy appears with the EPC (Energy Performance Certificate) regulation. This regulation does not explicitly prohibit the use of reusable materials, for example, but pushes building owners to choose new products and materials because these are accompanied by the necessary technical data sheets for the EPC, whereas it would also be possible to accept performance declarations based on performance tests. Similarly, the default performance values of materials described in the regulations are sometimes too penalizing and require potentially very expensive tests to meet the requirements, which discourages the use of reusable materials[20] and construction elements. Simplified tests to evaluate the performance of reused materials can in no way be a pretext for reducing the energy performance of buildings to meet climate objectives. It is also important to recall and insist on the fact that performance cannot be judged solely on the performance of materials. Buildings must meet the fundamental requirements of the CPR and, therefore, the interaction between materials and their implementation are equally important.

Although adaptation of standards is necessary, there are still many situations where knowledge of technical performance will remain a prerequisite for the use of reusable materials. In order to keep costs to a minimum, the assessment of technical performance should be limited to knowledge of their technical characteristics relevant to the intended application or a '(re)use. In parallel with the assessment of the technical performance of existing materials to enable their reuse, it is essential to put in place the framework to avoid this problem in the future. Material passports that allow the traceability of materials and the maintenance of information on their performance will make it easier to guarantee the quality and performance of reused materials in the future.

Finally, a European consensus on the calculation of the module D in a building ACV should also be reached.

In order to promote the circular economy, it is therefore necessary, on the one hand, to adapt these normative texts so that they take into account the case of reusable materials (while maintaining priority over the guarantee of the technical properties of reusable materials and the safety linked to their (re)use). It is also a question of aiming for a holistic product policy in order, in particular, to include

[20] A regulatory framework may therefore be useful, but (financial) support for smaller/innovative actors could be initiated.

recyclability requirements. New requirements should also emerge, such as the obligation to carry out an inventory prior to demolition, the integration of a circularity criterion in existing environmental certifications or the imposition of certain clauses in favour of circular economy in the specifications.

The participants in the discussion tables on the normative and technical framework clearly indicate that the reflections on the evaluation of the performance of reuse materials followed by the carrying out of inventories and the prescription in the specifications are priority issues.

The technical-normative framework is just as complex for "innovative products" that come on the market and which could be "more circular" than existing products (for example, biological products, such as cement-free concrete). It is therefore not only a question of "reuse". A solid and accessible technical framework is also needed for the use of recycled products and the use of innovative materials and products.

3.5. Tools and digitization

The circular economy in the construction sector requires new tools to respond to the various challenges it raises: characterizing the technical performance of reusable materials, tracing the precise origin of these materials, labeling circular materials and projects, assessing the environmental impact of buildings throughout their life cycle, orienting architectural choices towards environmentally friendly variants from the design stage, measuring the "circularity" of buildings, being able to quickly and efficiently identify materials with a potential for reuse in buildings, digitizing the construction sector whether for the design of a new building or for inventorying an existing building, etc. These various challenges therefore require the creation and use of new tools (to which must be added the need to develop new trades and skills - see below). Some tools have already emerged such as TOTEM (environmental impact of buildings and construction elements), GRO, Level(s) (sustainability at the level of buildings (more than environmental impact, limited circularity)) and the EPD database for the evaluation of the environmental impact of buildings and/or materials; the CO2 ladder (construction process), GRO and Level(s) for the certification of circular buildings; Tracimat and Walterre which are tools for the traceability of materials. In addition to these existing tools, various projects have tackled or are tackling other tools: the BAMB project, which has aimed to develop material passports that centralize all the information on a material; the *Interreg Digital Deconstruction project*, which aims to develop an innovative digital system that helps define the most sustainable and economical strategy for deconstructing and reusing buildings, etc. In connection with the digitization of flows, a mapping of reusable or recyclable flows based on demolition monitoring plans could be another tool to be created.

These different tools are not all cross-cutting: some of them apply either in certain regions or for certain types of projects, but not globally. Others, such as TOTEM, are developed in a transversal or even integrative manner. The TOTEM tool is an example of a global and transversal tool: it was developed by the 3 regions following a proposal from the Federal Government and therefore applies to the whole Belgian territory. TOTEM is also exemplary from the point of view of governance and cooperation because it was developed thanks to a strong partnership between the Regions and the Federal Government, which continues this fruitful collaboration in the evolution and improvement of this tool. The use of these instruments, in general, is not obligatory, which makes their use rather random depending on the willingness of the actors to use them. Moreover, most of them are still in the process of development or continuous improvement.

It is therefore necessary to create and (or continue to) develop these different tools (for labeling[21], measuring the environmental impact of buildings and materials, collecting information on circular materials, digitalization, inventory, characterization of technical performance, traceability, spatial

[21] Labeling is not necessarily a panacea because only a relative evaluation (compared to other materials, techniques, ...) is possible and there are no absolute criteria.

design[22]) and harmonize them so that their use becomes systematic and global in Belgium. The development of these tools, their teaching and their implementation are a cornerstone of the development of the circular economy in construction, because without them, it is more difficult to assess whether or not we are moving in the right direction. Digitization in particular is essential, as the current lack of digitization in the construction sector is one of the main factors preventing better exploitation of circular opportunities. Digitization technologies are tools (BIM, 3D scanners, sensors, blockchain, etc.) expected to be vectors for accelerating circularity in construction. Nevertheless, it will be necessary to ensure that these developments benefit everyone and not only certain players. Promoting, training actors, experimenting and developing such tools is an action to be carried out in the various aspects of the circular economy, since the acquisition of information, its management, storage and, eventually, its optimization represent a major opportunity to improve the circularity of buildings both through the accuracy and reliability of the information collected and through the improvement of exchange and design processes (deconstruction, construction, design, resource management, etc.) (CSTC, 2020).

Beyond these tools, it is also necessary to develop circular economy indicators in construction (employment, economic framework, technical framework, public procurement, projects, etc.) adapted to the Belgian territory and to set up a monitoring mechanism for these indicators in order to control the effectiveness of the circular economy strategies implemented.

Moreover, it was highlighted by the participants of the discussion table that the reflections on the performance framework for reuse materials and the use of environmental tools are priorities to be put in place.

3.6. Employment and training

The circular economy in the construction sector is an opportunity for the Belgian labor market. Indeed, to close the production loops, new companies, new functions and therefore new skills are needed, and existing ones must evolve and adapt. In the face of unemployment and the mismatch between supply and demand for jobs, circular construction creates new opportunities, the majority of which will be local and not relocatable jobs, thus helping to combat social dumping. All construction functions and trades are targeted. The transition to a circular economy in construction therefore makes it possible to generate different types of jobs for diversified profiles, ranging from low-skilled and manual jobs[23] (for example, a ratio of 1:7 is sometimes used to illustrate the labor required for selective and careful deconstruction compared to mechanized and rapid demolition (Rotor, 2017a)) to medium and high-skilled jobs. Furthermore, access to the profession of "deconstructor" should also be clarified: currently, it is not regulated and depends on the demolition for which it is necessary to be recognized as a general contractor.

As the circular economy gains ground in the construction sector, the need for skilled personnel will increase. The development of an offer of education and continuous training can, from now on, allow to anticipate these needs. Education, training and job creation in the circular economy in the construction sector can therefore contribute to meeting some of the social and environmental challenges facing Belgium. This opportunity can be seized to meet the needs of workers of all qualifications in the construction sector.

Jobs in circular construction require a mix of both traditional and manual skills from the "classic" construction trades, and innovative and conceptual skills from the circular transition. The circular construction transition will therefore build on existing trades, but also on emerging and developing occupations. New professions have already emerged, such as the valorist, the inventorist or the circular economy facilitator.

[22] For example, reversible design tools have been developed as part of the BAMB project. They are currently being tested and adapted by Bruxelles Environnement to enable their implementation (https://www.bamb2020.eu/).

[23] Notably "little hands" to deconstruct, clean, store, resell, put back into use, etc.

A monitoring (a task force) of employment in the circular economy in construction should be developed to make it possible to determine precisely the employment opportunities offered, their distribution in society, the skills that employees must acquire to respond to the evolution and potential risks of the circular economy. This will also require attention to the social challenges associated with the transition to a circular economy. This will have consequences on the labour market (jobs will disappear or be transformed because the content of the function changes, and new jobs will be created). Within this framework, the education and training offer will have to be adapted to ensure that no one is left behind (this requires research on the changing requirements of circular jobs in line with the development of the sector, technological progress and the needs of employers and companies, but also the updating of existing trade repositories to ensure that the skills required in each circular construction trade are well developed through training). One of the first tasks of this "task force" should be to identify the potential risks of implementing concrete actions, as it would be inappropriate for a multitude of new binding rules to be adopted or implemented without taking these risks into account.

Future workers will need to acquire the necessary skills to be able to work in circular construction. At the same time, construction workers will need to be trained to continue working in circular construction or to retrain. Social dialogue, social protection[24] and regional support adapted to each context will have to be integrated. In addition, workers' rights must continue to be protected and decent jobs must be ensured (Dufourmont, 2019). In particular, SMEs and TPMEs have very few resources to cope with these changes. It would therefore be necessary to develop specific actions exclusively aimed at supporting SMEs and TPMEs, particularly with regard to worker training (e.g. coverage of training costs by the competent authorities, etc.).

This training should range from simple popularization to specialized courses and should be aimed at young schoolchildren, academics and the general public (many of whom will be investing in (re)construction or renovation projects) as well as material manufacturers, designers and specifiers of buildings, not to mention contractors and all construction trades. Consider a circular economy awareness program in basic and secondary education (general and not just qualification), as well as specialized courses in higher education, whether university or not, in order to overcome the current lack of knowledge and to make the younger generation aware of this systemic change. As education is a community competence, it will be necessary to convince the politicians and the various organizing authorities - public and private - of the country's French and Dutch-speaking education to integrate this subject into the curricula. Skills upgrading is crucial in the areas of conservation, reuse and deconstruction where there is a lot of handling and repair, and where a skilled workforce is therefore required. There is a need to upgrade technical, craft and manual trades and to promote the social value of circular jobs. For example, the reuse of old materials and elements implies the mastery of skills that tend to be lost or no longer taught. It is therefore necessary to teach and restore these old "trades" (which are often practiced in SMEs) and give them the means to exercise their talents (specifications, tenders, etc.) under good conditions (especially economic).

The training and sensitization of public planners and the integration of modules on circular economy in training programs were considered the two priority actions of stakeholders during the discussion workshops. Moreover, with regard to the awareness raising mentioned above, it would be useful to make visible and promote, in the press (general public and professional), architectural forms that are compatible with circularity in contrast to the fashions that are instilled by certain magazines and by industry. Thus, the current dominant architectural image favours transparency, white and black. Smooth and glossy finishes are little in phase with reusable materials and often prove, over time, fragile. In the same spirit of a "dematerialized" architecture, the fashion of removing joints is not favorable to deconstruction and dismantling (no homogeneous flow, nor reusable at the end of life). The tendency to produce and use hyper-specialized materials[25] also complicates their reuse.

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25 These hyper-specialized materials facilitate installation by poorly trained, non-specialized professionals: specialization has in fact shifted from implementation (know-how) to the product, which itself evolves from the material to the kit.

4. General Conclusions and Recommandations

The circular economy in construction tends to minimize the production of waste through repair, maintenance, product reuse and material recycling, but also through a reflection on the design and the way in which the built elements are assembled, whose life is to be extended and optimized. By extending the service life of materials, products and buildings, it is possible to reduce the extraction and use of primary raw materials, the environmental impact and emissions from the production and processing of materials, and the waste from the construction industry. Three changes[26] are essential to support a transition to a circular economy: a transformation in design culture; a shift in value definition; and a shift in modes of collaboration.

Numerous initiatives are already underway or under way in Belgium for each of the "facets" of the circular economy (design, production, construction, valorization, etc.) and for different aspects (standardization, secondary raw materials, training and employment, etc.). Any attempt to take an exhaustive look at these initiatives would have been in vain, as there are so many examples in all sectors of activity (production, design, implementation, deconstruction and valorization) and in full evolution.

However, this study shows that there are still many obstacles to the development and acceleration of a circular economy in construction. The first are global. Systemic issues are, in fact, present, such as a low sense of environmental "urgency", little inclination to take risks on the part of project owners and companies, investment in long-term solutions, low confidence in the value chain so that new solutions can be satisfactorily implemented, etc. The second is the lack of a clear and comprehensive vision of the construction sector. Others, more specific, were also exposed in the study such as the qualification of reuse materials, the end-of-waste status, the low recycling rate of non-stones, etc. The actions to eliminate (mitigate or qualify) these obstacles are diverse and are located in different fields and at different political levels (international, federal, regional and local). The role of a public authority in the development of the circular economy in construction can be varied, requiring multiple skills and carrying out actions of various kinds.

The development of a circular economy in Belgium requires **a deep socio-economic transition that will mobilize many policy areas.** Apart from the environment and the economy, there are still many other policy areas that have an important impact on the transition to a circular economy. Whether one thinks of taxation, labor market policy, education and innovation policy (subsidies for R&D, collaboration, etc.), etc., there are many other policy areas that will have an important impact on the transition to a circular economy. These areas are furthermore divided between different levels of political power: the European level, the federal level and the regional level. This leads to major challenges in terms of coordination and coherence between the different instruments (CCE, 2016). It is therefore essential that **the policy for the development of the circular economy in Belgium in the construction sector be designed in consultation between the Federal and the Regions, on the one hand, and between the federal government and the European level on the other** (an obstacle at the European level that can block a large number of options at the federal or regional level).

During the workshops on the operationalization of the actions, it was noted that it is often undesirable for the federal government to act alone, but rather in consultation with the regional (mainly) or European levels of government.

Few actions are really carried solely by the Federal power. The latter essentially plays **an integrating role** that will ensure the best consensus between the parties involved. These parties may be different levels of power, the Regions or Europe, or other specialized bodies (for example, with regard to the framework for evaluating the performance of reuse materials).

The role of the Federal government would then be **to lay the first working bases and the general framework** within which actions could be developed. It would mainly consist of ensuring that the various

[26] https://www.bamb2020.eu/

regional policies are harmonized on the one hand and that the opinions of the various stakeholders are taken into account on the other.

In order to accelerate the transition to circular construction in Belgium, it is therefore necessary to insist on **the importance of a good coordination between the levels of power and on the development of a real governance of the circular economy in construction**.

- The implementation of certain actions requires the adoption of similar or shared vocabulary and definitions among the different actors or levels of power.
- Actions that belong to several thematic axes, and in particular to cross-cutting axes (governance and public policies & procurement), can lead to greater development of the circular economy; it is therefore a matter of promoting and prioritizing their implementation.
- The implementation of actions must follow a logic of continuity: some actions would be meaningless if they are not preceded by preparatory actions; for example, regulatory actions are unlikely to achieve their objectives if they appear in a context that is not prepared; however, some regulatory actions can support a rapid adaptation of the various actors. Consequently, regulatory actions are preferred over support and activation actions. Indeed, in order to make the sector evolve, the implementation of a regulatory framework will allow (more) actors to take part in the market within a defined framework.
- It will be a question of privileging the actions that have the greatest potential impact on the acceleration of the circular economy in construction, i.e. the actions that can have a determining or decisive influence on the evolution of the sector. In fact, the transition to a circular economy requires systemic changes that are supported by the implementation of substantive actions to sustain this change and which, consequently, have a significant impact on the sector.
- Actions that affect the entire construction value chain must also be implemented as a priority by the Federal government because they have a greater "acceleration power".
- Priority should be given to those actions whose implementation and benefits are the quickest and easiest to achieve. In fact, aiming to accelerate the circular economy requires a certain number of actions to be carried out in the short term. If implementation is quick and easy, it is better to do it right away, especially if the benefits are late. Moreover, most actions have rapid benefits when they are implemented.
- Most of the actions discussed during the discussion workshops should be operationalized within a fairly short time frame according to the stakeholders; some of them are already being implemented and would benefit from new developments given the rapid and continuous progress in this area (for example, the use of certain tools such as TOTEM or others in public procurement).
- Some actions still require time to prepare the sector, particularly in terms of training or awareness-raising (the imposition of a regulatory framework is not yet sufficiently prepared for all the issues involved in the transition to a circular economy in construction). The implementation of certain actions may be constrained by the market's capacity to meet certain demands. The instruments are many and varied; better governance must also make it possible to harmonize and synthesize them.

The new governance of the circular economy in construction should therefore develop **an integrated and holistic vision of the problem and the actions to be taken** in order to provide a stable regulatory and legislative framework (EC, 2020a).

In particular, this will **require including reversibility, resource recovery, reuse and recycling at the same level of requirement as other issues such as energy efficiency and the fight against climate change** (and other environmental and health impacts, etc.). Current policies are strongly focused on detour from landfill rather than on the life cycle of buildings. The design of buildings determines the amount of

materials they use, the energy used in their manufacture and operation, their durability, and their ease of reuse and recycling. Within this framework and to exploit the potential for increasing material efficiency and reducing climate impacts (and other environmental, health and other impacts), the Commission will launch a new comprehensive strategy for a sustainable built environment. This strategy will ensure coherence between relevant policy areas such as climate, energy and resource efficiency, construction and demolition waste management, accessibility, digitisation and skills (CE, 2020b).

This will also require **the development of a normative and technical framework as well as harmonized and standardized tools** (TOTEM, GRO, material passports, performance evaluation of reuse products, etc.) to measure and assess the environmental performance of buildings and materials over their entire life cycle. Technical construction documents (STS, NBN, NIT, etc.) should also integrate the principles of circular economy in construction. This framework should continue and consolidate the normative and technical elements already initiated or applied (e.g. those concerning the recycling of aggregates or the suitability for use of secondary raw materials, etc.) while supporting the development of others.

Although there are many cases in which the suitability of reusable materials has been demonstrated, there is often still no guarantee of performance when materials are reused. The performance of some materials changes over time and can be affected by moisture as well as by handling during the placement and/or recovery phases. A reliable knowledge of the performance of the materials used is therefore essential in order to comply with the fundamental requirements of construction works as well as legal requirements such as energy performance, even with the use of reused materials. The demand to develop fast, inexpensive and reliable methods for testing the suitability and performance of materials applies to both new and reused materials.

As a corollary to the development of standards, techniques and tools, it is important to promote and **finance research, development and innovation actions.** The commercialization of research results should also be encouraged with a view to developing more sustainable building products and materials, including recycled and recyclable materials, which, for example, reduce the life-cycle impact of buildings, improve the possibility of extending the life-cycles of buildings and materials [or increase their life span in buildings], increase energy efficiency, reduce CO2 emissions (and other impacts) or absorb CO2 (CUE, 2019).

This will also require **the development of a sustainable economic and fiscal incentive framework** that, first, supports the internalization of external costs, second, allows conceptual choices to be made with a long-term vision, and third, encourages the optimization of resources (material and human) and, in particular, the safeguarding of reusable elements (and, consequently, prevents the overexploitation of these resources). It is important to develop a framework for implementing economic, fiscal and financial instruments. Indeed, fiscal policies in favor of the circular economy are still too little exploited at present. Building materials do not currently integrate the cost of negative externalities in their prices and at the same time benefit from economies of scale. Their prices are often lower than those of materials in the circular economy. Tax incentives would therefore encourage reluctant firms to implement their projects. This could, for example, result in a tax liability or the adoption of a reduced VAT rate. The State must act by ensuring that accounting regulations emphasize the internalization of externalities and better management of material stocks by promoting, among other things, the emergence of a secondary market for raw materials. Moreover, it is also important in this scenario to prevent any distortion of competition between new materials produced locally and those imported. Similarly, market surveillance will have to be put in place to limit fraud as much as possible. The State can also legislate to impose longer warranty periods on products and thus force companies to increase the life span of their products (SPF, 2018b). The creation of labels and certifications on a national or even European scale would also make it possible, for example, to highlight circular companies while guiding consumers towards more sustainable purchases. However, care must be taken to avoid the proliferation of labels that are too specific (the multiplication of labels and evaluations of all kinds will only increase confusion among users). While measures are being considered to provide tax advantages

for the recycling and reuse of materials, any form of unfair competition with other materials should be prohibited.

In parallel to this economic and fiscal framework, **mechanisms for financing** projects and the development of circular economy activities in the construction sector must also be developed. As mentioned by the European Environment Agency, the process of transition from one economic model (linear) to another (circular) necessarily requires profound changes and therefore also generates transition costs (EEA, 2016). The creation of an economic transition fund in favor of circular economy actions in construction could help cover these costs (see in this regard the example of subsidies for Vlaanderen Circulair projects). In addition, it is necessary to encourage and support the development of new business models in the economy of functionality or the sharing economy.

Nevertheless, although the vast majority of workshop participants call for a real paradigm shift, some caution in making the transition is necessary in order to consult and work with all stakeholders.

It will also require strengthening **policies that encourage the reuse and high-value recycling of construction products and materia**ls, including encouraging selective deconstruction, developing a framework for continuing vocational training, facilitating the reuse of products, and lowering the VAT rate on the resale of reused or recycled materials, by maintaining the ban on the use of hazardous materials in construction materials, promoting repair activities and training related to these activities, supporting the development of new *business models* in the economy of functionality or the sharing economy, setting quantitative targets in the development of policies promoting the circular economy, etc.

Encouraging an increase in the intensity of product use should change the orientation of policies on the choice and use of products and materials towards a greater consideration of how these products and materials are used during their lifetime. Complementing the policy instruments already mentioned, such as taxation or training, another potential policy path could be the integration of material efficiency into future environmental strategies. Their objective would be to promote design patterns that use fewer materials, encourage their substitution and more intensive use, improve their end-of-life recovery and recycling, encourage the extension of their lifetime and facilitate the remanufacturing and reuse of components. The sustainability performance of construction products could also be addressed in the context of a coherent European product policy, including the possible introduction of recycled content requirements for certain construction products, taking into account their safety and functionality (CE, 2020b).

It will also require attention to **the social challenges** associated with the transition to a circular economy. Indeed, this will have consequences **on the labor market.** In this context**, the supply of education and training will have to be adapted** to ensure that no one is left behind. The Council of the European Union recognizes the potential of a circular economy in terms of job creation but also for the European economy as a whole. According to estimates, the EU construction sector is expected to be the largest beneficiary of the job creation potential with more than 6.5 million jobs likely to be created by 2030 (EUC, 2019).

Although the circular model is a virtuous growth model, the real impacts on the local economy are still poorly documented. Projections of relocation of production and job creation have, therefore, yet to be measured. The federal government seems to be able to play a role in the development of training and education provision; or at least to ensure that provision in the different regions is harmonized. Indeed, it is important to coordinate the various initiatives and to promote transversality and interdisciplinarity between the actors and between institutions. It is also necessary to encourage exchanges between the world of training and education and the business world.

Consequently, the proposed actions and their operationalization could **constitute the beginnings of a roadmap of the circular economy in construction at the Belgian level** with the various ramifications towards the other levels of power in Belgium.

Bibliographical references

The following references are cited in the report or its appendices.

(BE, 2013) Bruxelles Environnement, 2013, *Guide bâtiment durable*, https://www.guidebatimentdurable.brussels/fr/accueil.html?IDC=1506, Consulté le 28/02/2020.

(BE, 2018c) Sobotka, I. et al., 2018, « Le secteur de la construction à Bruxelles – constat et perspectives vers une économie circulaire », Bruxelles, 02/2018, pour le compte de Bruxelles Environnement, http://www.circulareconomy.brussels/wp-content/uploads/2018/02/be_prec_fr.pdf Consulté le 27/02/2020.

(BE, 2019b) Sobotka, I. et al., 2019, « Feuille de route des acteurs de la construction à Bruxelles », Bruxelles, 24/06/2019, Pour le compte de Bruxelles Environnement, https://www.circulareconomy.brussels/decouvrez-la-feuille-de-route-des-acteurs-de-la-construction-vers-une-economie-circulaire/, Consulté le 14/02/2020.

(CCE, 2016) Conseil Central de l'Economie, « Avis relatif à la proposition de mesures fédérales de renforcement de l'économie circulaire », Avis, CCE 2016-2060, Bruxelles, 21/09/2016, https://www.ccecrb.fgov.be/dpics/fichiers/fr/doc16-2060.pdf, Consulté le 14/02/2020.

(CCE, 2019a) Conseil Central de l'Economie, « Accélérer la transition vers une économie circulaire », Actualité, 01/07/2019, https://www.ccecrb.fgov.be/p/fr/665/accelerer-la-transition-vers-une-economie-circulaire/2, Consulté le 18/02/2020.

(CCE, 2019b) Conseil Central de l'Economie, « Progrès réalisés dans le domaine de l'économie circulaire en Belgique », Note documentaire, CCE 2019-1410, Bruxelles, 12/07/2019, https://www.ccecrb.fgov.be/p/fr/668/les-progres-de-l-economie-circulaire-en-belgique, Consulté le 14/02/2020.

(CCE-CFDD, 2020) Conseil Central de l'Economie et Conseil Fédéral du Développement Durable, « Avis conjoint sur l'économie circulaire », Avis, CCE 2020-0415, Bruxelles, 21/02/2020, https://www.ccecrb.fgov.be/p/fr/726/contribution-commune-du-cce-et-du-cfdd-a-un-plan-d-action-federal-en-faveur-de-l-economie-circulaire, Consulté le 03/03/2020.

(CE, 2008) Commission Européenne, 2008, *Directive 2008/98/CE du Parlement européen et du Conseil du 19 novembre 2008 relative aux déchets et abrogeant certaines directives*, https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:312:0003:0030:FR:PDF, Consulté le 02/03/2020.

(CE, 2014) Commission Européenne, "Towards a circular economy: A zero waste programme for Europe", COM/2014/206 final, 02/07/2014, https://ec.europa.eu/environment/circular-economy/pdf/circular-economy-communication.pdf, Consulté le 14/02/2020

(CE, 2020a) Commission Européenne, 2020, *Circular Economy Principles for Buildings Design*, 25/02/2020, https://ec.europa.eu/docsroom/documents/39984, Consulté le 05/03/2020

(CE, 2020b) Commission Européenne, 2020, *EU Circular Economy Action Plan - A new Circular Economy Action Plan for a Cleaner and More Competitive Europe*, 11/03/2020, https://ec.europa.eu/environment/circular-economy/, Consulté le 24/03/2020

(CM, 2020) Circle Made (Hub.Brussels), 2020, *Le fonds BruCircle est arrivé*, https://www.circlemade.brussels/le-fonds-brucircle-est-arrive/, Consulté le 24/04/2020

(CPE et al., s.d.) Construction Products Europe, et al., (s.d.), *Construction in the circular economy: Towards circular materials, products and buildings*, Joint Declaration: EBC, CPE, ECOS, SBS, EDA, FIEC, EEB, CECE, https://www.construction-products.eu/application/files/3815/5894/2825/Declaration_Enabling_circular_Economy_2019.05.27.pdf, Consulté le 06/03/2020

(CSTC, 2017) Romnée, A., Vrijders, J., « L'économie circulaire : bien plus que du recyclage !», CSTC-Contact n°54 (2-2017), Bruxelles, 02/2017, pour le compte du Centre Scientifique et Technique de la Construction,https://www.cstc.be/homepage/index.cfm?cat=publications&sub=bbri-contact&pag=Contact54&art=812, Consulté le 14/02/2020

(CSTC, 2018) Romnée, A., Vrijders, J., « Vers une économie circulaire dans la construction - Introduction aux principes de l'économie circulaire dans le secteur de la construction », Monographie, Bruxelles, 09/2018, pour le compte du Centre Scientifique et Technique de la Construction, https://www.cstc.be/homepage/index.cfm?cat=publications&sub=search&id=REF00010714, Consulté le 03/03/2020

(CSTC, 2020) Centre Scientifique et Technique de la Construction, *Le numérique : un outil pour favoriser l'économie circulaire*, CSTC-Contact 2020-1 https://www.cstc.be/homepage/download.cfm?lang=fr&dtype=publ&doc=cstc_artonline_1_2020_no10_le_numerique_un_outil_pour_favoriser_l_economie_circulaire.pdf , Consulté le 21/04/2020

(CUE, 2019) Conseil de l'Union Européenne, 2019, *L'économie circulaire dans le secteur de la construction – Conclusions du Conseil (adoptées le 28 novembre 2019)*, 13814/19 ENT 246 MI 772 + COR 1, 28/11/2019

(Dufourmont, 2019) Dufourmont, J., et al., 2019, *Emploi Circulaire en Belgique - Analyse de référence de l'emploi dans l'économie circulaire en Belgique*, Consulté le 01/04/2020.

(EEA, 2016) European Environment Agency (EEA), 2016, « Circular Economy in Europe – Developing the knowledge base", EEA Report No 2/2016, https://www.eea.europa.eu/publications/circular-economy-in-europe, Consulté le 18/02/2020.

(EMF, 2015) Ellen Mc Arthur Foundation (EMF) and McKinsey Center for Business and Environment, 2015, *Growth within: A circular economy vision for a competitive Europe*, Ellen Mac Arthur Foundation and McKinsey Center for Business and Environment, Isle of Wight. https://www.ellenmacarthurfoundation.org/assets/downloads/publications/EllenMacArthurFoundation_Growth-Within_July15.pdf , Consulté le 01/07/2020

(FDME, 2020) FDME, 2020, *Fonds Duurzaam Materialen en Energiebeheer,* https://www.fdme.be/home/, Consulté le 22/04/2020.

(ING, 2020) Banque ING, 2020, *Fonds ING pour une Economie plus Circulaire,* https://www.kbs-frb.be/fr/Activities/Calls/2020/20200401EG , Consulté le 22/04/2020.

(ISO, 2020) International Organization for Standardization (ISO), 2020, *ISO 20887:2020 - Sustainability in buildings and civil engineering works — Design for disassembly and adaptability — Principles, requirements and guidance*, 01/2020, https://www.iso.org/standard/69370.html, Consulté le 27/02/2020.

(OVAM, 2018) Van Pelt, A., Wante, J. & Umans, L., 2018, *De bijdrage van de circulaire economie aan het klimaatbeleid*, Ed. Openbare Vlaamse Afvalstoffenmaatschappij (OVAM), 17/05/2018. https://www.ovam.be/sites/default/files/atoms/files/Achtergronddocument-Klimaat-CE.pdf, Consulté le 27/02/2020.

(OVAM, 2020) OVAM, 2020, *Bouwen in de circulaire economie*, https://vlaanderen-circulair.be/nl/kennis/bouwen-in-de-circulaire-economie, Consulté le 27/02/2020

(RBC, 2019a) Urban.Brussels, 2019, *Be.Exemplary, http://beexemplary.brussels/*, Consulté le 28/02/2020.

(RBC, 2020a) Be.brussels, 2020, *Be.Circular,* https://www.circulareconomy.brussels/appels-a-projets-be-circular-entreprises/, Consulté le 28/02/2020.

(Reike, 2018) Reike, D., Vermeulen, W. J., & Witjes, S. (2018). The circular economy: new or refurbished as CE 3.0? — exploring controversies in the conceptualization of the circular economy through a focus on history and resource value retention options. Resources, Conservation and Recycling, 135, 246-264.

(Rotor, 2017a) Ghyoot, M., 2017, *Objectif réemploi - Pistes d'action pour développer le secteur du réemploi des éléments de construction en Région de Bruxelles-Capitale*, pour le compte de Rotor, http://rotordb.org/sites/default/files/2019-10/OBJECTIF_REEMPLOI.pdf, Consulté le 02/03/2020.

(Rotor, 2017b) Seys, S., 2017, *Vers un dépassement des freins réglementaires au réemploi des éléments de construction - Un meilleur cadre pour le réemploi de produits, pas d'obligation de marquage CE et un système d'évaluation ad hoc*, Publ. pour le compte de Rotor dans le cadre du projet « Feder Bruxelles – Le Bâti Bruxellois, Source de nouveaux Matériaux », 12/2017, https://www.bbsm.brussels/wp-content/uploads/2018/01/Rotor-WP7-Rapport-final-1.pdf, Consulté le 27/02/2020

(Rotor, 2018) Ghyoot, M., & Devlieger, L. (2018). *Déconstruction et réemploi. Comment faire circuler les éléments de construction*. PPUR-PressPoly & Uni Romandes.

(SPF, 2014) SPF Santé publique, Sécurité de la chaîne alimentaire et Environnement, 2014, *Arrêté royal fixant les exigences minimales pour les affichages environnementaux sur les produits de construction et pour l'enregistrement des déclarations environnementales de produits dans la base de données fédérale,* https://www.health.belgium.be/sites/default/files/uploads/fields/fpshealth_theme_file/19098141/KB%20milieuboodschappen%20van%2022-05-2014.pdf, Consulté le 28/02/2020.

(SPF, 2018a) SPF Economie, PME, Classes moyennes et Energie, 2018, *Spécifications Techniques STS (Technische Specificaties)*, https://economie.fgov.be/fr/themes/entreprises/secteurs-specifiques/qualite-dans-la-construction/specifications-techniques-sts, Consulté le 28/02/2020.

(SPF, 2018b) SPF Economie, PME, Classes moyennes et Energie, 2018, *Financement de l'économie circulaire*, https://economie.fgov.be/fr/publicaties/financement-de-leconomie, Consulté le 20/03/2020

(SRC, s.d.) Rockström, J. and Sukhdev, P., (s.d.), *How food connects all the SDGs*, Ed. Stockholm Resilience Centre (SRC), https://www.stockholmresilience.org/research/research-news/2016-06-14-how-food-connects-all-the-sdgs.html, Consulté le 27/02/2020.

(UE, 2011) Union Européenne, 2011, *Règlement (UE) n°305/2011 du Parlement Européen et du Conseil du 9 mars 2011 établissant des conditions harmonisées de commercialisation pour les produits de construction et abrogeant la directive 89/106/CEE du Conseil*, 9 mars 2011, https://eur-lex.europa.eu/legal-content/FR/TXT/?uri=CELEX%3A32011R0305, Consulté le 02/03/2020

(UE, 2020a) Union Européenne, 2020, *Plateforme des acteurs européens de l'économie circulaire*, https://circulareconomy.europa.eu/platform/fr/ , Consulté le 21/04/2020

(UN, 2018) International Energy Agency and the United Nations Environment Programme (2018): 2018 Global Status Report: towards a zero-emission, efficient and resilient buildings and construction sector, 2018,

https://wedocs.unep.org/bitstream/handle/20.500.11822/27140/Global_Status_2018.pdf?sequence=1&isAllowed=y, Consulté le 01/07/2020

(UN, 2019a) United Nations Environment Programme, 2019, *UNEP circularity platform*, https://www.unenvironment.org/circularity, Consulté le 02/03/2020

(VF, 2020) Village Finance, 2020, VLAREMA, *Bourse économie circulaire,* http://www.villagefinance.be/bourse/ ,Consulté le 21/04/2020

(Vlaanderen, 2012) Vlaamse Regering, 2012, VLAREMA, *Besluit van de Vlaamse Regering tot vaststelling van het Vlaams reglement betreffende het duurzaam beheer van materiaalkringlopen en afvalstoffen,* https://navigator.emis.vito.be/mijn-navigator?woId=43993 Consulté le 21/04/2020

(VUB, 2019) Galle, W., Vandervaeren, C., Poppe, J., Cambier, C., Elsen, S., Lanckriet, W., ... Verswijver, K. (2019). *Concevoir la transition vers l'économie circulaire. Des critères de conception pour guider et inspirer tous les acteurs de la construction*. Brussels: Vrije Universiteit Brussel, VUB Architectural Engineering. Publication dans le cadre du projet « FEDER Bruxelles – Le Bâti Bruxellois, Source de nouveaux Matériaux ». https://www.vub.be/arch/files/dynamic_environment/VUB%20Architectural%20Engineering%20-%20Environnement%20Dynamique%20(2019.12).pdf, Consulté le 27/02/2020.

(Wallonie, 2019c) Wallonie – Parlement Wallon, 2019, *Rapport introductif sur l'économie circulaire en Wallonie*, Rapport présenté par Henry, Simonet, Evrard, Morreale et Puget le 21/02/2019, http://nautilus.parlement-wallon.be/Archives/2018_2019/RAPPORT/1301_1bis.pdf, Consulté le 27/02/2020.

(Wallonie, 2020) Wallonie, 2020, *Circular Wallonia – Stratégie de déploiement de l'économie circulaire*, 07/2020, http://economie.wallonie.be/content/%C2%AB-circular-wallonia-%C2%BB-la-wallonie-se-dote-d%E2%80%99une-strat%C3%A9gie-ambitieuse-de-d%C3%A9ploiement-de-l, Consulté le 23/07/2020

(WEF, 2016) World Economic Forum, "Can the circular economy transform the world's number one consumer of raw materials?", 04/05/2016, https://www.weforum.org/agenda/2016/05/can-the-circular-economy-transform-the-world-s-number-one-consumer-of-raw-materials, Consulté le 14/02/2020

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