Circular Economy Performance Contracting: the contract that does not exist …yet

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Abstract. In 2017, construction and demolition waste were again the heaviest waste stream in France with 227.5 million tonnes (42.2 million tonnes for the building sector). To achieve a 70% (by weight) recycling target by 2020 for non-hazardous CDW various policies have been launched by the French government. However, public procurement has been neglected. In the field of energy saving, energy performance contracting has been widely used to guaranty energy efficiency improvement after building refurbishments. The paper shows how this approach could be duplicated to building deconstruction projects. Circular Economy Performance Contracting (CEPC) would encourage creativity of the deconstruction contractors and the value-chain and maximise circularity. It would lead to significant environmental benefits (e.g. increase of reused products and materials, reduction of CO₂ emissions).

1. Introduction
In 2017, construction and demolition waste were again the heaviest waste stream in France with 227.5 million tonnes (42.2 million tonnes for the building sector). France adopted the framework provided by Directive 2008/98/EC on waste to promote the circular economy and achieve a 70% (by weight) recycling target by 2020 for non-hazardous CDW [1]. In 2014, 69% of waste were recycled, 16% stored and 15% had an unknown destination.

However, these data could be misleading. Firstly, recycling figures for the building sector are lower than for roads. Waste sorting is more complex for buildings and the sector is less organised. There are also discrepancies between demolition and renovation projects. Reuse and recycling are higher than 70% for demolition but lower than 40% for building renovations. Secondly, valorisation rates are also insidious since the rates are not attached to a building site but to the platform where waste are sent.

To achieve a 70% (by weight) recycling target by 2020 for non-hazardous CDW, various policies have been launched by the French government. The Energy Transition for Green Growth law was enacted in August 2015. Tackling waste and promoting the circular economy are among the main issues tackled by the law. In April 2018, several measures were proposed by the government to promote the circular economy [2]:

- To strengthen the waste audit before the demolition and renovation works of buildings: The aim is to detail the inventory of materials and elements present in a building prior to its partial or total demolition. An assessment of their reusability and their quality has to be carried out;
- To develop technical guidance providing information on sanitary, environmental and technical performances of materials and equipment;
• To modify the regulation in order to promote up-cycling options such as reuse or the use of recycled aggregates in concrete construction. Up to now most recycled CDW are used as aggregates constituents of roads which is considered as a down-cycling option [3];
• To use public procurement as a driver of circular economy. Public procurement and the way procurement processes are shaped provide public authorities with significant opportunities to promote circular principles. By orienting their procurement strategies toward new solutions that improve the reuse / recycling of materials and equipment, local and national authorities can reduce CO₂ emissions and contribute to sustainable development.

A large part of the demand in construction is stimulated by public procurement. In 2018, in France, the value of public procurement concerning works, goods and services was €101 billion [4]. By adding public works concessions, public procurement represents about 10% of GDP. However, public procurement is seldom used to promote innovative solutions addressing the challenge of climate change and promoting circular economy principles.

The aim of this paper is to show how public procurement can contribute to move from a dominating linear to a circular economic model in building deconstruction projects. The next section presents the specificities of public procurement of innovation and indicates why it can promote innovative circular models. The third section focuses on energy performance-based contracts which represents a shift from traditional prescriptive approaches. The fourth section examines why and how a similar performance-based approach could contribute to the valorisation of CDW waste through the creation of Circular Economy Performance Contracting (CEPC). The conclusion indicates how this approach may also benefit to construction projects.

2. Public authorities procuring innovative goods and services

2.1. Public procurement as an innovation policy tool

According to the European Directive, public procurement is a “market-based instruments to be used to achieve smart, sustainable and inclusive growth while ensuring the most efficient use of public funds”. According to Edler and Georghiou [5], the advantages of applying public procurement to innovation are threefold:

1. It represents a major part of local demand;
2. It can counteract market failures hindering innovation by securing market demand and reducing risks surrounding R&D investment;
3. It offers opportunities for improving public infrastructures and public services.

As presented by Aschhoff and Sofka [6], public procurement is just one form of public support for innovation activities. The supports of research institutions and universities and public R&D subsidies have been used by the governments of most OECD countries for many years. They are even considered as the most important supply-side instruments. Conversely, regulation and public procurement are demand side instruments.

2.2. Public Procurement of Innovation

Whyles [7] defines innovation procurement as: “Undertaking the procurement process in a way that stimulates the supply chain to invest in developing better and more innovative goods and services to meet the unmet needs of an organisation OR simply removing barriers to innovative solutions”. Within innovation procurement, the existing literature distinguishes Pre-Commercial Procurement (PCP) from Public Procurement of Innovation (PPI). With PCP, public authorities initiate R&D since goods or services do not exist on the market. With PPI, they act as early adopter. They look for innovative goods or services which are not yet available on a large-scale commercial basis [8]. The innovative solutions do not need new research and development and the public authorities contribute to the diffusion of the innovative solutions.
2.3. Benefits of PPI for the development of circular economy principles in the building sector

The benefits of PPI are threefold [9]:

1. It improves the quality of public services: Buying innovative products, works and services contributes to achieving best value for public money. Thus, PPI is one way to accelerate the mutation toward circular business models. It is one way for public authorities to promote circularity in their call for tenders.

2. It helps innovative companies to grow: PPI reduces the risks faced by innovative firms. The risk associated with the development and sales of a new product is reduced since a certain amount of sales is granted. As a first buyer, the public procurer gives the example and sends a positive signal to the market by encouraging public and private customers to adopt the innovation. This impact is even stronger for start-ups that lack references and look for credibility. Newly created companies that develop an activity based on circular approaches would be among the first beneficiaries of PPI;

3. It stimulates investment in innovation: The creation of a public market is considered as a guarantee for private investors who finance the last stage of the innovation cycle (e.g. final product adaptations) and contribute to the development of the commercial network (e.g. setup wider product distribution channels). This strong initial demand emanating from the public sector can demonstrate the functionalities of the innovation and reassure the private demand. Moreover, public demand contributes to the creation of standards and increases the incentives to develop innovations. In the building sector, the difficulties to adopt circular principals are due to lock-in effects. The organisation of the supply chain, the logistic on the building sites are based on linear models. Public demand could play the role of a catalytic function and invert this process.

3. Performance-based models: the example of energy performance contracting

Performance-based models are becoming more and more important in construction. This change of approach results from the pressures of demanding clients who need better value from their projects and spur the actors of the built environment supply chain to improve their quality standards and to provide better services. Consequently, traditional design and build contracts based on input specifications are increasingly being replaced by service-led contracts where the output to be delivered is specified [10]. Moreover, as construction is moving away from its production-based focus and is developing new service activities (financing projects, operating and maintaining systems…), interfaces are multiplied, and project complexity becomes stronger. Project management does not anymore concentrate on the internal project team and external supply chains. It also integrates downstream service delivery. [11].

The diffusion of energy performance contracting in France is one example of this trend towards service-led contracts. “Energy performance contracting means a contractual arrangement between the beneficiary and the provider of an energy efficiency improvement measure, verified and monitored during the whole term of the contract, where investments (work, supply or service) in that measure are paid for in relation to a contractually agreed level of energy efficiency improvement or other agreed energy performance criterion, such as financial savings” [12].

The complexity of these contracts covers several dimensions:

- Dynamic thermal modelling and simulation is a complex activity as illustrated by the frequent gap between predicted energy performance of buildings and measured energy use once buildings are operational [13].
- Works such as the removal and installation of efficient heaters, measurement and monitoring equipment, insulation of buildings, cover a broad range of activities. They usually involve several subcontractors and are done in occupied buildings.
- Measurement and verification are the cornerstone of EPC since it is used to allocate risks between the “provider” and the “beneficiary”, to assess energy savings and reckon penalties / bonuses, to monitor equipment performance and to improve operations and maintenance [14]. Despite the development of protocols, progress in monitoring and data mining techniques, it is difficult to get reliable building operation data before the signature of the contract and to monitor behavioural changes during the project life time.

Despite this complexity, EPC has been widely used to guaranty energy efficiency improvement after building refurbishments. While the first public EPC was signed in 2007, more than 260 contracts were signed between 2007 and 2018 representing more than 20 million m². This development contributed to structure the sector for energy building refurbishment. Construction companies, energy service companies, architects and thermal design offices developed new competences to answer to the call for tenders. They also learnt to collaborate and to propose innovative solutions that integrate whole-life cycling costs. Moreover, guidelines dedicated to these contracts and to the procurement procedures were published. Thus, clients who were not familiar with these performance-based approaches and with procedures such as the competitive dialogue that is frequently used to select the preferred bidder became progressively accustomed. The publication of case studies and testimonies of public authorities who implemented EPC also contributed to the diffusion of these contracts. Moreover, EPC also concerns more and more new buildings. The aim of the owners of the new buildings is to be certain that the energy performance predicted at the design stage is real.

4. Managing CDW through Circular Economy Performance Contracting

The principles that contributed to the success of Energy Performance Contracting could be applied to CEPC for the benefit of up-cycling options such as reuse and the valorisation of CDW.

Before launching an EPC, the owner of a building needs to collect information about the occupation level, equipment inventory and conditions, energy consumptions of buildings, etc in order to provide potential candidates with reliable information and to reduce information asymmetry. An energy audit is frequently used to find out more about the energy consumptions of each building, the efficiency of heating equipment and the quality of building façades. This data set contributes to the definition of the perimeters of the call for tenders and helps potential bidders to develop proposals. When they launch their call for EPC, public authorities do not know which technical solutions will be implemented and the level of the guaranteed savings that will be retained in the final bid.

CEPC does not exist yet. However, the framework used for EPC exists and could be easily duplicated. Its implementation requires to follow a step by step approach starting with the identification of the issue, a reclamation assessment, continuing with the market engagement, the tender procedure and the selection of the preferred bidder.

4.1. Evaluation of the material and equipment available in the building: the reclamation assessment

The raison d’être of PPI is to improve the quality and efficiency of public services by finding solutions to specific issues faced by the authority or unmet needs. It is a prerequisite to the call for tenders strategic for procurers since it will constitute the base of the performance-based specifications. The aim is to “focus on describing the problem to be solved and defining clear outcomes that are required (functionality/performance/efficiency improvements) rather than prescribing technologically how the solution for the problem should be built” [15].

In the case of deconstruction project, owners of buildings usually do not know the materials and the equipment that can be reused, traded, disposed or buried. In France, the building owner must conduct a waste inventory before the demolition of a building. However, only 5% of the inventory are really done by building owners [16]. Moreover, this inventory is very light since its goal is to “predict the nature and quantity of the materials that are released from the demolition and to define their destination” [17].
If the public authority owning the building really intends to optimise reuse and avoid down-cycling options, it should go further with a reclamation assessment. This assessment is performed by aggregating enough detailed information on building elements. It is carried out sufficiently early before the launch of the call for tenders of the deconstruction project by the building owner in order to identify potential solutions. It is the first step to identify potentially eligible products for reuse, recycling, energy recovery or disposal. It can be used by the building owner to establish scenarios concerning its deconstruction project since it gives information about the resealable / salvageable / recycling / reusable potential of identify products. It plays the same role as the energy audit before a renovation project leading to EPC.

At this stage, public authorities also need to decide how far they are ready to go in the promotion of circular economy principles and for which budget.

4.2. Market engagement

With PPI there is a need to assess “the market and its opportunities, both in terms of what is already offered and in terms of what the market could deliver if asked for by the public buyer” [18]. However, public authorities have seldom a good understanding of the organisation of the potential supply chain linked to the innovative solution [19]. This task is a complex since innovation involves new market players. Consequently, public authorities are allowed to contact the market and to inform potential suppliers about a forthcoming consultation. This approach which could have been considered in the past as a way to distort competition, is even encouraged by the article 40 of the European Directive 2014/24/EU on public procurement [20] if it respects the principles of non-discrimination and transparency: “Before launching a procurement procedure, contracting authorities may conduct market consultations with a view to preparing the procurement and informing economic operators of their procurement plans and requirements”.

This phase takes place before the formal procurement procedure. The aim is not to evaluate potential suppliers but to “assess the appetite, capacity, capability of the market to respond to the customer’s requirements” [19]. Interactive relationships with potential supplier have proved to speed up the innovation process since frequent communications induces an understanding of reciprocal needs. Public authorities must stay open to any solution. They can also encourage suppliers to cooperate together and to develop alliances [20]. It is necessary to show potential suppliers that the public authority is credible and that the market is wide.

In a conventional demolition process (but also during major rehabilitation) enterprises respond in a relatively short period of time. It does not allow them to assess properly the potential for reuse and recycling. They discover eligible products to reuse / recycle at the stage of the demolition procurement process. They lack time to identify the resealable / salvageable / recycling / reusable potential of the deconstructed building. Consequently, CDW is not valued at best.

Market engagement is a good way to circumvent this limit and to promote a circular approach. The aim is firstly to inform economic operators on the public authorities’ procurement plans and requirements. Secondly, the goal is to share some of the information of the reclamation assessment with the stakeholders of the deconstruction process: architects, construction and demolition contractors, reuse experts. There is a large spectrum of tools which are more or less formal to dialogue with the market. A prior information notice is a good way to inform the market about the future call. Site visits and workshops are traditional approaches used to communicate with the market. It is a good way to inform the stakeholders about the potential of the building that will be dismantled but also to get feedbacks from the market and to get an idea of the perceived barriers linked to the dismantling of the building and materials reuse and recycling. If the project consists in deconstructing one building and reintegrating part of its components in a new building, these experts can also provide the building owner with information about other sources of reclaimed building materials and products. Two other sources are usually considered [21]: 1/ the reclamation market that gathers dealers who store, and sale
reclaimed building materials and products; 2/ other demolition sites which can potentially offer reclaimed building materials and products.

The discussions between the building owner and the deconstruction contractors, designers, architects specialised in the integration of reclaimed building materials and products in a construction project, bring credibility to the future procurement and contributes to strengthen the links between the actors of the value chain. For example, deconstruction companies can start contacting reclamation dealers / recycling platforms. Architects and reused experts can imagine innovative solutions to promote same-site reuse that save also transport costs. They can also look for other demolition projects to promote site-to-site reuse.

Market engagement stops the traditional urgency of most call for tenders and allows stakeholders to identify the potential offered by the reclamation / recycling value-chain and other demolition projects. The chances to raise the interest of the stakeholders of the deconstruction process, to get more answers to the future call for tenders, to promote up-cycling solutions such as reuse, and to reduce landfill are higher with market engagement.

Some public authorities still fear to distort the rules of the game with market engagement. But this approach is well recognised and even encouraged. It breaks down barriers between customers and suppliers to the benefit of all concerned. It inspires confidence by showing that the tendering process will allow innovative solutions to compete equally and that transparency and non-discrimination will be respected. This process usually takes 3 to 6 months. However, it should be considered as an investment since it will result in a more suitable contract for all parties.

4.3. The choice of the relevant procedure

The choice of the procedure for PPI strongly depends on the information gathered during the market engagement. When the technical and organisational specifications can be described at the beginning of the tender process, the open market procedure becomes the best option. Such a situation can result from an extensive dialogue with suppliers on available solutions during the market engagement. Conversely, when the procurer cannot specify the end product / service, procedures with negotiation offer better results. The competitive dialogue is adapted to complex projects “because matters such as technical specifications and price levels can be defined during the dialogue rather than being predetermined” [10].

While in traditional public procurement, suppliers and public authorities start to know each other after the awarding of the contract, in these negotiated procedures, parties start to exchange during the procurement stage. These discussions lead to a better understanding of a project.

In traditional public procurement linked to demolition projects, public authorities are not very ambitious. For example, they will ask candidates to achieve a 70% (by weight) recycling target in order to respect the European Directive. However, the market engagement helps the building owner and the other stakeholders to have a better knowledge of the reuse and recycling potential of the building. Several configurations appear possible depending on the size of the works programme.

Promoting reuse is very innovative. For big deconstruction projects involving works with a value above 2 million euros, a competitive dialogue with the bidders would be recommended since all technical specification cannot be predetermined. Combined with a performance-based approach, it could contribute to maximise the reuse target and reduce landfill to its minimum. Thanks to the market engagement, the demolition contractors should be able to propose different valuable scenarios (e.g. percentage of products and materials directed to the reclamation market, ongoing construction sites or reused on site). Innovative proposals can even come up during the dialogue. Thanks to the market engagement, the building owners is also more able to appreciate the capacity of the market to value the materials and products coming from the demolition and start a dialogue with the contractors that should lead to the emergence of the best scenario. However, a competitive dialogue is time consuming and involves frequently high transaction costs. Thus, competitive dialogue may not be adapted to
small demolition projects. But the information gathered during the market engagement should be still used to establish higher reuse targets.

One solution to increase the size of the market and to make the competitive dialogue more suitable could be to propose Deconstruction-Design-Build (DDB) procurement. While Design-Build-Operate (DBO) is an agreement between usually a private and a public entity, which integrates three functions into one contract (design, construction, and operation), DDB will also integrate three functions and lead to a circular approach in the construction sector. The market engagement should be used by the public owner to test whether this procurement route is realistic and the market is ready to answer. DDB have usually a minimum length of 8 years which hinders the participation of small companies. DDB should be much shorter and remains opened to small and innovative actors.

4.4. The selection of the preferred bidder
The selection of the candidates aims at checking whether the potential candidates possess the minimum technical and professional competences to be qualified. Since promoting reuse and recycling in demolition project is new, the candidate should demonstrate that they are sensitive to environmental issues and have complementary skills (architecture, engineering, life cycle analysis, etc.) [22]. The selection of the tender cannot be based on the “lowest price”. A mix of quantitative (e.g. deconstruction costs, toward zero waste to landfill, quantity of reused products) and qualitative criteria (e.g. quality of the circularity plan, the organisation that guarantees the circularity of the offer) is necessary. The most important is to leave open the environmental targets (e.g. percentage of materials reused, CO₂ emissions saved) in order to maximise circularity and to benefit from the creativity of the deconstruction contractors. It should promote circularity like EPC favour energy performance.

5. Conclusion
The aim of this paper was to show that public procurement can contribute to move toward a circular economy. This change requires that public authorities promote performance-based approach and public procurement of innovation in their call for tenders linked to deconstruction projects. The energy performance contracting framework contributed to launch ambitious building renovations projects and to reduce dramatically energy consumption. It also enabled more efficient coordination and information integration. Similar results can be expected in the waste management field.

So far most deconstruction projects are launched without a detailed reclamation assessment. Moreover, the timeframe allowed to the deconstruction project is short. A different approach allowing to communicate and discuss early in an accurate and convincing way with the stakeholders of the deconstruction and reclamation sectors can transform the limits into assets. This is the advantages offered by circular economy performance contracting applied to deconstruction. Under this framework, deconstruction contractors should be able to identify and offer new solutions that optimise CDW management. CEPC gives also public authorities an opportunity to go beyond the 70% target by 2020 for non-hazardous CDW.

The paper focuses on deconstruction projects. Indeed, improving the resources coming from deconstruction projects is the first stage to promote circularity. However, a similar framework could be applied to construction projects. The market engagement could help architects, designers and contractors to identify channels to integrate more reused and recycled materials and products in their construction projects. Then, the competitive dialogue and a performance-based approach may be used to develop and retain the most innovative scenario that maximises circularity.

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