Public policies as obstacle to sustainable CDWM practices

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Abstract. The sustainable management of construction and demolition waste (CDW) should play a significant role to achieve the SDG11 for *sustainable cities and communities* as well as the SDG12 on *responsible consumption and production*. However, the construction sector is still a major contributor to the waste generated within the European union and contributes with around 25-30 percent of the total amount. The EU followed by the Swedish agencies and the professional associations have defined successive policies to increase the recycling ratio of CDW and mitigate its negative effect. The role of these public policies is to define and to encourage the implementation of sustainable solutions. In the case of management of CDW and in particular the renovation and demolition waste, those policies are not delivering the expected result. Building on multiple regulatory levels with the intent to govern professional's behavior, they so far fail to support change in practice. The aim of this study is therefore to study and analyze how the policy framework and professional guidelines are defining the conditions for adopting more sustainable waste management practices in the industry. The study is based on a document analysis of grey literature in terms of governmental reports, official guidelines, regulatory publications and other publicly published documents concerning CDW management. The analysis highlight ambiguity and contradictions within the material as to how the challenges concerning CDW should be addressed. There is a misalignment between the different actors view on definitions, responsibility and the design of roadmaps toward a more sustainable agenda. This ambiguity and complexity could explain the maintaining of the current practices, hampering practitioners to act. We therefore emphasize the need for a more coherent framework to create the necessary conditions for the industry to move towards a more sustainable agenda.

1. Introduction

All member states of the UN adopted the 17 sustainable development goals (SDG) in 2015 together with a 15-year plan to achieve them until 2030. Even though progress is made, the current rate is not enough to ensure that the goals will be realized to that date and the UN secretary general is therefore urging all sectors in society to make necessary actions and set the pace in the upcoming decade to ensure realization. These changes involve among other that the transition is reassured through policy adaptation and design of regulatory frameworks by government, cities and local authorities [1].

Sustainable management of CDW is not clearly specified within the SDGs but does play a significant role in achieving the SDG11 for *sustainable cities and communities* as well as the SDG12 on *responsible consumption and production*. The management of CDW is an increasingly urgent social, environmental, and economic issue worldwide due to its negative effects in society and on the natural environment [2]. It is considered a priority waste stream within the EU due to the voluminous amount that the sector is contributing with, representing almost 30 percent of the total amount of waste generated. The European union has therefore defined a goal that is directly addressing this issue by

stating that 70 percent of the total amount of non-hazardous waste by weight should either be recycled or prepared for reuse by the year 2020. This definition has also been adopted within a Swedish context and pervades the national efforts in the transition towards a more sustainable management of CDW. The total amount of CDW generated in Sweden amount to 10,4 million tons where 50 percent is currently being recycled. Although there are uncertainties regarding the data, it still seems that Sweden isn't achieving the targeted figures [3]. There seems to be a relatively large proportions of mixed CDW that is currently being used as landfill or energy recovery where improved management could reduce the negative environmental impacts, either through reuse or recycling [4].

While much of the work on construction and demolition waste management has been concerned with materials analyses, LCA assessment and optimization of process models as a solution to the problem, there is still a large amount of waste outside the recycling loop. Public policies should address the problem by giving clear and precise regulation to prevent practices that lead to environmental degradation [5]. However, previous analysis suggest that the recycling directives and proposed implementations schemes do not align with the renovation practices of the contractor and demolition companies in Sweden [6]. The purpose of the paper is therefore to analyze the content of these policies and regulations and identify what could account for the lack of improvement of CDW practices within the industry.

2. Framework of understanding

Public policies are governmental tools to address a particular problem and to initiate a transition towards a desired state. Public policies can be generally defined as a system of laws, regulatory measures, courses of action, and funding priorities concerning a given topic promulgated by a governmental entity or its representatives. They commonly share attributes such as a willingness to improve on the sake of the public and they strive towards a desired end state, a solution to a common problem. But it is important to remember that policies are subject to interpretation and that the implementation therefore will dependent on the interpretation of actors [7]. Although McConnell [8] is indicating the strongpoint of incorporating ambiguity in public policies as it can be used to unite groups with seemingly conflicting interests. They even state that there probably isn't any value in public policies without ambiguity since ambiguity allows us to make multiple interpretation depending on our own motive. This multiplicity is what enable actors with different interests to coalesce, make collective action possible. It can also open up and balance polarized views on the solution. At the same time, ambiguous language is also seen as a curse as it is a source for conflicts among actors and also results in legislations that are both vague and at times contradictory.

The lack of a clear political or legal framework can generate a possibility to exploit it in a manner that is not aligned with its original intention. This is done by building on the ambiguity of the material and an opportunistic interpretation of it in order to promote what is aligned with the actors' own view [8, 9]. Besides, ineffective framework consisting of vague statements make it difficult to provide actors with the necessary mandate to take action and control the results [10]. The way that the concepts are both used and framed will shape their understanding, and does both limit and extent the view on the matter. Discussion on waste management needs to be considered as an important aspect that will shape the behavior within the sector.

In this study, we view public policies as an inclusive term which encompasses a range of scripts laws and other regulatory measures, and also other types of documents such as guidelines and defined targets which is endorsed by a governmental entity or its representatives and public statements [11], we focus only on CDWM documents.

The government is a central actor in the transition towards more sustainable behavior due to their large influence and their ability to "*...regulate the use of dangerous substances ... create processes for common goals, introduce economic measures like taxes and subsidies, or create judicial systems to protect the environment*" [5, p.104].

The legislative pressure is an important tool to induce change in the CDWM. But it's important to consider other mechanisms and create conditions for economic viability for change to take place and by that create legislative drivers that support the adoption of more sustainable practices [12, 13].

3. Method

The aim of this study is to analyze how the policy framework on construction and demolition waste management is setting the conditions for adopting more sustainable practices in the industry. The study adopts a constructivist view, where it is necessary to realize that the meaning of the data depends on the analyst's interpretation of that content [14]. We have systematically gathered the documents published the last 20 years on CDWM by the European union, the Swedish government and its enforcing agencies, the municipality of Gothenburg and the Swedish construction federation. The empirical material included in the study are the regulatory framework, industry standards, industry guidelines as well as protocols and other government reports. This is complemented with news media to broaden our understanding of the context of the study.

The research process is comprised of finding, selecting, appraising and also synthesizing the data by thematically arranging the material, according to different publishers and key areas that emerged during the process. The analysis of the material is based on the systematic procedure of document analysis and aim to identify ambiguity, inconsistency or even omission across public policy levels and areas [15]. We focus on some of the basic assumptions that these documents are sharing about the origin to the problem, on their common definition of the potential solutions as well as their further implementation. The analysis is based on a comprehensive review of policy documents where there is a vast volume of publicly available documents concerning the management of CDW.

4. Issues at stake in the policy framework

The section starts with a discussion of the national statistics followed by a presentation and discussion regarding some of the issues identified within the regulatory framework and policies of CDW.

4.1. Insufficient waste data

The member states of the EU have agreed to provide statistics on the treatment of waste according to the regulation (EC) No 2150/2002 on waste statistics [16]. This is used for verification on compliance with the targets set for CDWM in the waste framework directive 2008/98/EC.

In Sweden, the data is collected on behalf of the Swedish environmental protection agency and presented in a report every second year. The data available is described to be inadequate and that it is thereby difficult to estimate and evaluate Sweden's efforts in achieving the intended recycling ratios. Sweden is not achieving the defined goals according to the latest report [3] and among the reasons is that there are significant waste streams that isn't included in the data [4]. Where the inclusion of those streams would result in significantly improved figures. This is showing that the recommendations to increase the figures is to evaluate whether some materials should be included, where the basis of inclusion is its contribution to fulfill the requirements from EU rather than to implement changes in practice that would result in positive environmental effects. The SEPA (2019) has also made public statements that the EU goal is probably already achieved in reality, but that the problem is that they don't have accurate data. They are relabeling the problem from a need of change in practice to a change in measuring it. This type of statement generate ambiguity if the common discourse is that we've already reached the goal and thus, undermines the efforts to incur changes in practice.

Reuse of waste materials is viewed as an important element to reduce the environmental impact. It is incorporated in EUs recycling goal and also emphasized in the waste hierarchy. But it is stated in the report by SEPA that the reuse of CDW is not even part of the data. The reason for this is that there isn't a secure method for estimating those volumes [3]. Thus, diminishing all the prior accomplishment as it isn't possible to assess the effect of those efforts and also rejecting future attempts. It has also been discussions regarding the definitions of waste, and to define the point where material cease to be considered as waste. This is highlighted in the EU discourse on waste [16, 17], that it is crucial to ensure a common language on the subject. Even so, there is still ambiguity as to what is considered as recycling, where one example is the incorporation of asphalt in the statistics, which constitute a part of the reporting in some EU countries, but not in Sweden [4]. There is also a large proportion of the waste in the data that is not considered as CDW, examples of this is the hazardous waste, but also other types

such as CDW generated in other industries or soil- and aggregates. The total waste that is included in the assessment is only 3,4 million tons out of the total amount of 10,4 million tons [3].

There is an apparent need for transparent and accurate data to understand where efforts should be put to generate change that will result in environmental profits and have an impact that will contribute to achieve the goal defined by the EU. The inaccurate material is generating ambiguity for decisionmakers as it does not show the areas with potential for improvement. Also, the basis for data collection and evaluation needs to be transparent to enable decisionmakers to estimate the results of their actions. The risk is otherwise that the ambiguity in the material together with the communication on already achieving the goal is discouraging actors to act.

4.2. The regulatory framework and policies

The legal framework on CDWM on a national level is mainly defined by two legal acts, the environmental act (1998:808) and the planning and building act (PBL 2010:900). The environmental act is not solely addressing CDW but is defining a general responsibility for businesses to obtain the necessary knowledge to be able to ensure that the environment is protected from harm. It also states that all businesses must ensure that all the necessary measurements are taken so that the risks caused by the operations is eliminated, where the premise is built on the waste hierarchy. When doing so, the legal act also demand that the companies need to incorporate the best technology available and this should be done as soon as there is reason to believe that the operations could have negative impact on the environment.

The 15th chapter of the environmental act has a general statement regarding waste which puts the responsibility on the actor that possess it to ensure that it is managed in an acceptable manner. The formal responsibility for managing construction and demolition waste is the client according to the Swedish environmental protection agency [18]

The planning- building act is putting the formal demand on the client to ensure that all construction- and demolition activities are carried out in compliance with the legal requirements [19]. It also states that it is the client's responsibility to monitor the work carried out according to a defined control plan, when the construction activities require building permit or notification under the act. The control plan needs to be approved by the building committee which is the responsibility of the municipalities. The control plan should specify the quantities of hazardous waste that the activities may give rise to and also how both the hazardous and non-hazardous waste generated on site should be managed. The control plan should also describe how the work will be monitored and which elements that will be followed up by the client or by external parties with certified knowledge on the topic. The waste regulations (2011:927) describe how waste should be sorted and puts a strong emphasis on hazardous waste. It also and state that combustible waste should be separated from other types of waste and that hazardous waste should never be mixed with any other type of waste. If it has been, then it needs to be separated if it's considered necessary from an environmental point of view, but only if it is viewed as technologically possible and financially viable [20]. In addition to these regulations, there is also a tax regulation (1999:673) and also a prohibition (2001:512) for different types of waste that goes to landfill [21, 22]

The Swedish Construction Federation [23] is issuing industry guidelines as a complement to the regulatory framework which is agreed upon by the member organizations from the construction industry. These guidelines are in its newest version incorporating elements on circular economy and emphasize on the need to reduce the generation of waste from construction activities. It has a strong emphasis on sorting the material and also aim to standardize waste fractions to facilitate a common terminology, better data and comparability. They do this by providing a template for waste fraction denominations and descriptions. They encourage a practice where all contractors are responsible for managing their own waste.

4.3. Ambiguity in the regulatory framework

The legal requirements provide a regulatory framework that describe how to ensure proper management of CDW. It states that it is the producer's responsibility to ensure that the environment isn't harmed and where the main focus is put on the hazardous waste. The planning and building act only specify that

there should be a control plan which should specify the hazardous CDW that the activities may give rise to and how the CDW should be managed. But it doesn't provide clear guidelines on the actual practices that needs to be adopted when managing CDW. It thus becomes a manner for the client together with the control official and the local building committee to assess what a legitimized way of carrying out CDWM is within that given context. While there are positive effects as it enables decisionmakers to contextually adapt the practices, there is also a risk that there won't be a strong and stringent enforcement of sustainable practices. That different municipalities can make different assessment which generate a variance in the practices. There is also an absence in terms of clear goals for recycling ratios and sorting levels that provide a framework of what is acceptable.

The legal framework provides strict guidelines on certain areas where they incorporate words like 'shall' and 'must' to specify what the mandatory requirements are, but at the same time incorporate a contextual component which result in an element of subjective interpretations. That waste 'shall' be managed at the highest possible level in the waste hierarchy and that actors must adopt procedures that will minimize the environmental impact. But at the same time provides room for interpretations when expressions like 'technologically possible' and 'financially viable' are used within the same sections. As the applications are left to the practitioners' assessments as they depend on the actor's own knowledge, competence and motive, the results vary a lot depending on the individual, the situation and the context. Besides, the compliance to the legal frame is the responsibility of the municipalities, who do not have the resources to carry out controls.

The formal responsibility to manage waste according to the environmental act is assign to the actors producing it. Whereas the legal responsibility to manage CDW is put on the clients who own it [24]. The latter are responsible to monitor the execution of work and should do this according to the approved control plan. But although they are ultimately responsible for it, there are also other actors that through the discourse on CDWM that becomes responsible for CDWM. The municipality is responsible through the building committee to ensure compliance with, and content of, the control plan (PBL 2010:900). There are also several other actors that is assigned responsibility through the industry guidelines provided by the Swedish Construction Federation [23], where they urge all subcontractors to take care of their own waste. These guidelines are accepted by all member organization and has also been recommended as guidance by the Swedish environmental protection agency. This policy framework generates ambivalence as different policies are allocating responsibility to different actors. It then becomes unclear which actor that should ensure that the CDW is managed in a proper way. If we also consider the whole value chain from the design phase of the project, to transportation and final treatment of the waste, then it becomes even more complex as it lacks a clear policy framework specifying the responsibility.

The lack of clear demands on the management of non-hazardous CDW in the legal framework generate an ambiguous framework on how the material needs to be managed and also provide room for variations in the practices. The inconsistencies in allocating responsibility to actors could also lead to partial implementation of practices due to misunderstandings and also that actors can push the responsibility to others depending on the interpretations of the framework.

4.4. Challenging the basic assumptions

The policy framework on CDW is clearly proposing sorting of waste at source as a pre-condition to achieve sustainable waste management as it will increase the quality of the material and lead to efficient recycling. It is described as a crucial part in the EU waste protocol [25] to achieving the EU goal on CDW recycling and is also found in numerous policy documents on national, municipality and industry level as well as the legal framework. Sorting of material has also been clearly highlighted in an early vision statement by the Swedish environmental protection agency where the future state of 2020 would include sorting of CDW at source [26] and has thereafter continued to be a core element.

But the aim of the Waste directive (2008/98/EC) is not only to ensure that the waste is sorted, as it is only viewed as a part of the process in transforming the union into a recycling society by reducing the generation of waste and to increase the resource efficiency. It is highlighted in the directive, that the primary objective should be to minimize the negative effects on the environment, associated to the

generation and management of waste and also that it should aim at reducing the use of resources and '...favour the practical application of the waste hierarchy.' [17]. Even though the Swedish government is urging for the adoption of practices adhering to higher levels of the waste hierarchy, the legislation is not supporting it. There is neither any specific demand for companies in terms of higher-level recycling efforts or specification on behavior that would increase recycling ratios or reuse of recycled materials during construction activities. The industry guideline's is promoting a shift towards a more circular management of CDW but is still mostly focusing on the need to increase separation of materials into clean fractions [23]

The Swedish environmental protection agency [3] report on waste show that Sweden is far from the stipulated target and it is therefore a need to create conditions for businesses to shift towards more resource efficient practices. The waste framework directive (2008/98/EC) is proposing actions that will strengthen the economic value of waste by reducing its environmental impact. But the current regulatory framework is stating that when recycled CDW are being used instead of virgin materials, then it isn't the waste legislation that applies but the product legislation. The product legislation has far higher demands in terms of quality and liability of material than the recycled waste usually obtains. Another barrier described is the lack of an adequate certification procedure which could validate that recycled materials meets the quality requirements of virgin materials. This is necessary for customers to assess the suitability of the materials, and there are also the difficulties to provide product guarantees to the client [27]. The link between those two legislations needs to be strengthened as it is currently difficult to transform waste into a product [26]. There are examples of other member countries in the EU that has incorporated this type of certification of material on demolished concrete that ensures the quality of the material and an implementation of this type of supportive system could potentially have positive effects in Sweden as well [4]. Gothenburg municipality (2019) is also urging for a transition towards a more circular economy and state that public procurement could be crucial, partly due to the volume of work that is undertaken in public governance. To strategically shape the tendering process and incorporate elements with the intent to generate a market for circular material- and product flows. This could create the critical mass for the construction sector to adapt at large and where new markets with new actors could emerge. But the municipalities don't have any formal responsibility in the legal framework to incorporate these types of practices. Instead, tendering often rely on dated industry standards, systems and demands that rule out the possibility to use recycled materials.

The policy pressure is continuing to emphasize the need to sort material in clean fractions but does not support the transition to higher levels of recycling. It does so as long as the legal framework continue to limit the focus to sorting and limit the legislation to proper management of hazardous waste. It is a need for change that create the necessary conditions for the industry and also push actors to transform their businesses and adopt a more circular approach.

5. Conclusion

The construction industry has the potential to influence the realisation of the sustainable development goals defined by the UN through the formulating of a policy and regulatory frameworks that drive the adoption of sustainable practices and thereby deliver a more sustainable built environment. However, some of the ambiguity, inconsistency and omission we have identified in those documents can explain the lack of improvement of CDWM in the industry. The current framework is therefore not contributing to the realization of the sustainable development goals and hampering the adoption of a more circular approach to CDWM in Sweden. The regulation is clearly built on the perception that hazardous waste needs to be managed rigorously through laws and a paradigm of meticulous sorting of waste into neat fractions as close to the source as possible as a means to ensure sustainable management. The industry is tainted by old regulations, guidelines and practices that govern and limits the incorporation of higher levels of recycling. The statistics on CDWM that should act as a base to evaluate the nations efforts to transform into a recycling society is called into question as it is based on inaccurate data and also exclude central elements according to the definition and also the goal stipulated in the waste framework directive on recycling. Much of the reason for such data is to guide decision makers where efforts should be put, but due to the current state of the data, it is impossible to do so.

Based on our study, our recommendation in order to improve the current situation and contribute to the SDG 11 and SDG 12 is to:

- Produce a reliable account of the CDW situation in Sweden and provide citizens and companies with transparent and accurate information and statistics that also include the amount of reused material.
- Clarify the assigning of responsibility and liability for managing CDW.
- Strengthen and clarify the legislation so that a larger part of CDW is reused or recycled in the construction sector through collaboration between regulatory bodies, legislators, researchers and the industry to development a legal framework that is both specific and feasible. Also, to broaden the planning and building acts demand on control plan to include management of all types of CDW.
- Stimulate the emergence of new markets and practices in the sector by incorporating reuse and recycling demands during public procurement.
- Draw from examples in other member countries in the EU and adapt the product legislation to recycled material and include end-of-waste criterions that are clearly defined and ensures that recycled products fulfil the requirements with regards to environmental risk, suitability and performance.
- Allocate resources to regulatory bodies so that proper action can be taken to ensure that the legislation is strongly enforced. Where it is necessary to reject locally conceived rules and enforce a nationwide legislation.

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