Green and circular procurement in public organizations – from single use to reuse and prolonged lifetime in the City of Malmö

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Abstract. The procurement in public organisations has traditionally been performed in a linear way. Using circular solutions could help public organisations to save resources and tackle climate change. The Swedish City of Malmö strives to include circular solutions and become a circular municipality. The goal of the study was to explore activities for increased reuse and visualise how circular material flows can reduce environmental impacts. The goal was also to develop a method for mapping material flows that can be used in the City of Malmö and other public organisations. The studied activities included in this study are the reuse of furniture and replacement of single use plastic with reuse alternatives, as well as prolonged lifetime of IT products and textiles. Life cycle analysis (LCA) based methods were used to estimate the reduction in environmental impact from the studied activities. The perception of circular activities within the City of Malmö was analysed with a survey. The results showed that the purchasing agreements with increased lifetime for clothing and IT products, lead to reduced environmental impacts. The results also showed that most employees are interested in using a digital sharing platform. Additionally, the results pointed out the need for a circular manager.

1 Introduction

Green and circular public procurement is considered an important instrument toward sustainable consumption and production. So far, the circular economy has mainly been studied as a theoretical concept, or in practice with industrial actors, for example within the Ellen Mc Arthur Foundation Network [1]. This needs to be changed according to the latest action plan of the European Union, where measures are introduced to empower consumer and public buyers and make circularity work for people, regions, and cities [2]. Within the Nordic countries, there are best practice examples within construction, waste, transport, food, furniture and textiles from Denmark, Finland, Sweden, and Norway. The best practice examples point at the need to look at furniture and textile flows, since they do have the

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greatest potential for increased circularity and reduced environmental impacts, develop circular services for furniture and the potential in textiles due to the quality and the large number of materials [3]. Success factors for increased circularity that have been pointed out are organisational aspects, individual behaviour and operational tools including not only a price, but also other aspects, such as timeliness and costs for public institution, as well as eco-labels and life cycle assessments [4].

The procurement and waste management in public organisations have traditionally been done in a linear way and in separate parts of the organisation, where material flows are seldom connected and recirculated. In practice that means that products seldom are used to their full potential and lifetime, which is a waste of resources. Using green and circular procurement could help public organisations, to save waste and resources and tackle global issues like climate change. The Swedish City of Malmö strives to include green and circular procurement as an instrument for sustainable consumption and become a circular municipality. The goal of this study was to explore activities for increased circularity and visualise how circular material flows can reduce environmental impacts. The goal was also to develop a lifecycle-based method for mapping and assessing circular material flows that can be used in the City of Malmö and other public organisations.

This paper summarizes the main results of the project so far. The **design of the study** is described in section 2, the lifecycle-based **methods** used for mapping and assessing circular material flows in section 3, the **results** from the environmental study and the behavioural study are presented in section 4 and the **conclusions** and **outlook** are presented in section 5.

2 Design of the study - Procurement within the City of Malmö

The design of the study started in spring 2020 with a co-creation workshop at the procurement department in the City of Malmö. Together with representatives from the environmental department and researchers in the field of circular economy several product categories (around 8-10) were discussed and narrowed down to 4 product categories:
1. IT products (including the use of computers and smartphones),
2. Furniture products (including office products like desk and chair, as well as a sofa),
3. Plastic products (including single-use products based on plastic)
4. Textile products (including workwear).

The final choice of product categories was based on various aspects, including environmental and financial. The chosen product categories were identified as having large potential to reduce environmental impact and total costs for the City of Malmö, if they would adopt a circular procurement strategy. Some of these product categories are pinpointed in EU's circular plans [2] while furniture and textile products are pinpointed in the Nordic Countries [3]. Regarding plastic products, the EU has only recently banned single use plastic [5]. Through the project, annual procurement and waste statistics have been collected for individual departments and for the City of Malmö as a whole. The data have been analyzed to identify possibilities for increased reuse or prolonged lifetime for the mentioned product categories. The activities chosen in this study are the reuse of furniture and replacement of single use plastic with reusable alternatives, as well as prolonged lifetime of IT products and textiles. The analysis is based on LCA-based methods applied for circularity (chapter 3), an environmental analysis as well as interviews and surveys in the City of Malmö (chapter 4).

3 Life cycle-based methods used for circular economy

3.1 Climate impacts based on Environmental Spend Analysis

The National Agency for Public Procurement in Sweden has developed a method to help public organizations in the process of collecting, classifying, and analyzing purchasing data. The **"Environmental Spend Analysis (ESA)"** is a method used for purchasing analysis where different environmental factors have been integrated [5], such as the climate factor per Swedish krona (kg CO_2eq/SEK). The method is widely used in public organizations in Sweden, currently in use by several cities, such as Helsingborg and Gothenburg. One of the weaknesses of the method is that entire product groups have the same climate factor, which makes the results quite uncertain.

During the project, the City of Malmö wants to test the Environmental Spend Analysis since it is an **easy and fast way** of calculating the climate impacts from purchasing, despite it not being the most reliable one. Today, a reused furniture might cost almost the same as a new one, depending on the country, the age of the product and the purchasing platform. This means the same price refers to different climate impacts (new and reused). The method cannot directly be used for circular products and must be adapted to fit calculations of circular products.

3.2 Resource use based on Lifestyle material footprint

The Wuppertal institute has developed a method to better understand the material footprint of products [6]. The **"Lifestyle material footprint (LMF)"** is based on the work on material footprint to better understand where the impacts of our lifestyles come from. The material footprint measures the resource use over the complete life cycle of products, services and activities that shape lifestyles. It can be applied in different scales, from individual lifestyle material footprints to the average material footprint per capita in a country. The material footprint is described as "material input per unit of service" (MIPS) and is measured as "total material requirement" (kg TMR). The Wuppertal institute has published a database for different product groups [6]. The database has been used in Sweden by the research institute of Sweden in a previous project "8 ton-society Sweden" [7].

During the project, the researchers from RISE want to test the **lifestyle material footprint** since it is an **easy and fast way** of calculating the resources used per product. Instead of purchased amount of money, here the number of products purchased needs to be collected. Simply by using the number of products used in the City of Malmö, the database can be used as a resource factor (kg TMR/product). However, when testing the method with the City of Malmö, it turned out that there is little information about the number of products purchased, while the money spent is easy to gasp within the electronic system for procurement. The method and database can directly be used for internal management and circular products since the resources used are directly related to the product and the amount of material used.

3.3 Environment impacts based on lifecycle methods

The international EPD system is a global programme for environmental declarations [8]. Environmental product declaration (EPD) presents transparent, verified, and comparable information about the life-cycle environmental impacts of products and services. There is also a specific climate declaration based on the same calculation rules, verification, and presentation format as for an EPD. The international EPD system has published an open-source database (EPD library) for different product groups (according to product categories).

The Ecoinvent database including life cycle inventory data has been used here [9]. The datasets in Ecoinvent cover a wide array of products, services, and processes, from building materials to food and from resource extraction to waste management. Ecoinvent is widely considered as the largest, most consistent, and most transparent database on the market.

During the project, the researcher from RISE used the life cycle-based methods and database of **EPD and Eco-invent** since it is the **most reliable way** of calculating a broad range of environmental impacts, such as climate impact and resources and waste used per product. Instead of purchased amount of money, here the number of products purchased needs to be collected. Most reliable is using the number of products used in the City of Malmö, the database can be used as a climate factor (kg CO2eq/product), resource factor (kg TMR/product) and waste factor (kg waste/product). The database of EPD can directly be used for internal management and circular products, while Ecoinvent database needs an in log and a fee. However, the data are not per money spent. Therefore, not as easy to use in procurement, even though its most reliable.

3.4 Other methods based on purchasing and circularity

There are other methods and tools for circularity as well, directly applicable for purchasing and product development in companies. The C-value is based on economic values and is calculated as follows: C= economic value (reused)/ economic value (new) [11]. A value of 100% means all economic value is from reused materials, like furniture. It is used by an increasing number of producing companies in Sweden. However, these are based on purchasing and allocating economic values to the reused material and not on the actual weight of the materials used. Therefore, the use of such a C-value will only show the goal of reaching economic circularity, not environmental circularity, and circular material flows.

4 Results for environmental study and behaviour study

The environmental study includes data collection on procurement and an environmental analysis on the reduction potential from the studied circular activities. The perception of circular activities within the City of Malmö was analysed with an interview study and an employee survey.

4.1 Data collection on procurement

Data collection on procurement in the City of Malmö in Sweden has been quite a difficult task, since not all the information was available and had to be collected via suppliers, such as the IT supplier, which had quite good knowledge on both purchased number of products and reused number of products and recycled products. For most of the procurement data, there was little information on product level, such as the quantity of product and waste. For some data, the information had to be recalculated. For other products, the information was only available per supplier, and if there were a lot of suppliers, a lot of handcrafts to collect and recalculate were needed. However, all products had information on the purchase level in general and per supplier. The number of clothing products was also quite easily available (for some suppliers). The City of Malmö has various suppliers for furniture and some department specific contracts for larger suppliers, while the number of furniture was more difficult to grasp. That means that data collection can be a difficult task and need to be planned.

4.2 Environmental study on prolonged lifetime and increased reuse

The environmental study includes an analysis on prolonged lifetime for IT products (computers 3-4 years and 4-5 years, mobile phones 2,5-5 years with/without new batteries), as well as an analysis on prolonged lifetime for textile products (from 3 to 4 years). The results for IT products and textile products show that prolonging the lifetime led to 25-50% reduced climate impacts, depending on the lifetime (Figure 1).
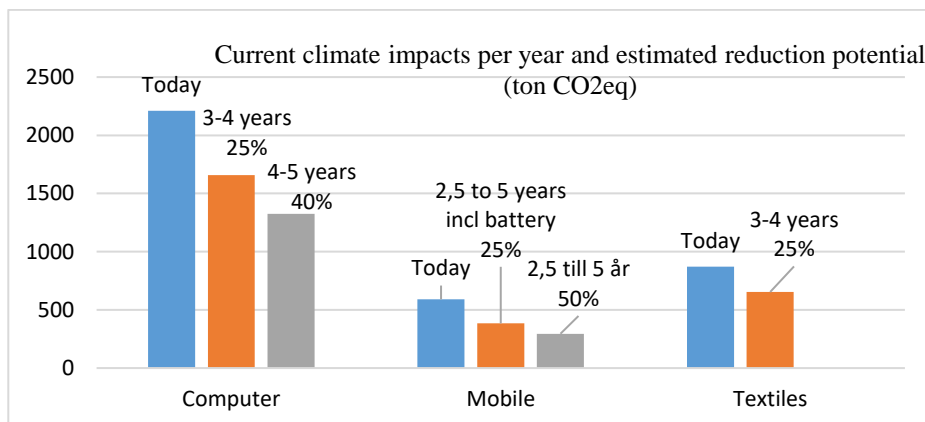

Fig. 1. Climate impacts and reduction potential for prolonged lifetime (IT and textiles)

Today, the City of Malmö spends a large amount of their procurement on computers and most of the office computers are collected after use (80%). However only 1/3 are reused and 2/3 are recycled. For mobile phones, the number of phones that are collected is quite low (10% of which almost all are recycled). Regarding the procurement of furniture, only 15% of their procurement is on reused furniture. In the future, the City of Malmö strives to spend only 15% on new furniture and 85% on reused furniture, which will lead to a climate reduction potential of more than 80% for the procurement of furniture. Regarding the use of single use plastic, the City of Malmö has started to use glass alternatives, which also lead to a climate reduction potential of more than 80%. This will reduce the use of scarce resources for computers and mobile phones and the amount of waste generated for plastic products in the City of Malmö.

4.3 Interview study on prolonged lifetime and sharing

The interview study with operation manager of IT products revealed some limitation on prolonging the lifetime. The City of Malmö purchases a large number and variety of IT products, which need to be collected, sorted, stored, repaired, and recycled. Prolonging the lifetime means that the City of Malmö needs a larger organization for repairing and operational service. On, the other hand, the employee survey with 253 employees showed that 68% are interested in using a digital platform for sharing, 60% do not need the latest version of furniture and IT products, most of the respondents value the functionality above a new product, 81% want to keep the old products until they are broken, while only a few take measures for prolonged lifetime, such as using protection bags for computer and mobile phones. The survey also shows that 36% would like to spend the saved money from prolonging lifetime and sharing for creating a new job position to advance sustainability. This could be a circular manager that can be asked when sorting, and repairing of products are needed, as suggested in the life cycle management and business strategy literature [12].

5 Conclusion and outlook

The City of Malmö wants to apply circular procurement and behavior change. In this paper we have explored circular activities and visualized the reduced environmental impacts. The activities included are the reuse of furniture and replacing of single use plastic with reuse alternatives, as well as prolonging the lifetime of IT products and textiles. The results show that the purchasing agreements with increasing lifetime from 4 to 5 years for clothing and IT products, leads to at least 25% reduced environmental impacts. The analysis of lifecycle-based method for circularity shows that data collection can be a difficult task and need to be planned. The interview study shows that most employees want to use a digital sharing platform. The survey has also pointed out the need for a circular manager as suggested in life cycle management and business strategy literature. To become a circular municipality, the City of Malmö should adopt circular solutions and employ a circular manager who systematically works on enhancing circularity and sustainability.

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