URBAN ReC

ECODISIGN
GUIDELINE
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1.1. What does ecodesign stand for?

Ecodesign is a process integrated within the product design and development that aims to reduce the environmental impact of the products throughout their entire life cycle, from the extraction of raw materials used for their manufacturing to their end of life. Ecodesign does not modify the basic process followed in the design and development of new products, but it complements this process with environmental criteria to be considered at the same level of priority as other traditional aspects, such as functionality, quality, safety, aesthetics and so forth (Figure 1).

Figure 1. Ecodesign approach is not just about environment
ECODESIGN stands at the beginning of the life cycle of products and it is essential for ensuring their circularity (Figure 2). Products designed in a circular way minimise the use of resources and foster reuse, recovery and recyclability of materials. The European Commission aims to promote the circular design of products and it is considering expanding the ecodesign policy\(^1\), which has been successful for energy-related products (through Ecodesign Directive\(^2\) and Energy Labelling Regulation\(^3\)), to non-energy-related product groups like those targeted in the URBANREC project.


1.2. What opportunities can ecodesign bring to companies?

Product designers and developers have a great influence on the life cycle of products and on their associated environmental impacts. The German Federal Agency for the Environment estimates that about 80% of the environmental impacts of the products are defined during the design stage. Once the products materialize and enter the market, there is little room to modify them and reduce their environmental impacts. This fact highlights the need for implementing ecodesign in companies to produce more environmentally friendly products.

Besides the reduction of the environmental impacts of products, ecodesign can offer other competitive advantages to manufacturing companies based on competitiveness (Figure 3).
ECODESIGN ADVANTAGES

1. **Increase in product quality**: Ecodesign provides a more detailed and in-depth knowledge of the product, which can help companies to identify and improve critical aspects other than environmental ones like functionality, durability, reparability and so forth.

2. **Cost reduction**: Many ecodesign strategies aim to minimize the consumption of resources, such as raw materials and energy, thus resulting in economic savings for companies.

3. **Improvement of the corporate image**: Companies that effectively and publicly assume commitments to improve the environmental performance of their products can strengthen their leadership and corporate image and the prestige of their brands.

4. **Access to new markets**: Ecodesign can provide companies with new business opportunities like green procurement (either public or private) and it can serve as a green marketing tool to attract environmentally aware customers (e.g., through ecolabelling of products).

5. **Promotion of eco-innovation**: Ecodesign can stimulate the research and development of more efficient processes, as well as the innovation in the search for products with better environmental performance.

6. **Anticipation to future regulations**: The application of ecodesign strategies by companies provides an experience that will be very valuable when more stringent environmental regulations enter into force (e.g., the current ecodesign EU directive only applies to energy-related products, but it could be extended to other product groups in the near future).
1.3. Ecodesign and life cycle approach

The life cycle of products (Figure 4) typically begins with the extraction of resources from the environment to obtain both raw materials and energy. Then, materials and energy take part in manufacturing, transportation, use and eventually reuse, recycling or disposal of products. The life cycle approach is a way of thinking that considers all these stages in the life cycle of products (from the cradle to the grave) as a whole system. This approach helps to make decisions by understanding how every choice influences what happens at each life cycle stage, thus ensuring that these decisions will positively impact on the environment, the economy and the society.

Figure 4. The life cycle of a product (source: AIMPLAS)
The actions taken by companies to improve the environmental performance of their products have traditionally been focused on manufacturing processes and operations at their own production sites. This is where companies feel most comfortable as they have more knowledge of the processes as well as direct control over the actions. However, the production stage often has a limited contribution to the total life cycle impact of products (Figure 5).

Figure 5. Traditional approach for the environmental improvement of products (source: AIMPLAS)
**ECODESIGN** goes beyond the traditional focus on manufacturing processes, since it follows a life cycle approach to increase the environmental performance of products throughout their whole life cycle. Companies need to comprehensively consider the environmental impacts of all life cycle stages when making decisions on product design. To do this, there is a large set of life cycle approaches from qualitative to comprehensive quantitative methods. The, latter are based on the life cycle assessment (LCA).

LCA results are not easy to understand and to compare. But there are some online tools ready to be used by both experts and non-experts in Life Cycle Assessment

- **ECOLIZER**: It quickly and easily calculates the environmental impact of a product. The overall environmental impacts but also the impact of each phase in the life cycle of the product are assessed. These impacts can be also compared to other products within the tool (Figure 6).

- **GUF TOOL**: It scores the multi-criteria environmental impacts of a urban furniture product against an ideal product in a single value. It is focused on determining the most environmentally friendly urban furniture product in Green Public Procurement processes (Figure 7).
The life cycle approach followed in ecodesign is crucial to avoid shifting problems from one life cycle stage to another and/or from one environmental medium to another (e.g., from air quality to water) when redesigning the products (Figure 7). LCA allows detecting and preventing situations in which one choice seems more environmentally friendly than another simply because it transfers the environmental burdens to other life cycle stages or processes, without achieving a real improvement in global terms.

Figure 8. Problem shifting often occurs when redesigning products without applying a life cycle approach (source: AIMPLAS)
1.4. How can ecodesign contribute to URBANREC?

URBANREC project has implemented an eco-innovative and integral bulky waste management system to enhance prevention and reuse, to improve logistics and to obtain high added-value recycled materials and products through novel waste treatments. Ecodesign can help to make products that become bulky waste at their end of life, such as furniture, mattresses and carpets, more sustainable. More specifically, ecodesign can mainly contribute to the URBANREC project by:

- Boosting the uptake of secondary raw materials produced from bulky waste in new products.
- Designing bulky products for their end of life in a way that enhances both the cost-effectiveness of their reparation, reuse and recycling, as well as the quality of the secondary raw materials obtained.
THIS GUIDE AIMS TO SUPPORT DESIGNERS AND MANUFACTURERS OF BULKY PRODUCTS AS FOLLOWS:

1. Providing a **step-by-step ecodesign procedure** to systematically apply ecodesign.

2. Offering dedicated **ecodesign strategies and actions** for furniture, mattresses and carpets, including examples of their application and highlighting those that can directly contribute to URBANREC.

3. Showing various tools that can be used to **communicate ecodesign achievements** to customers.
Ecodesign Procedure Step by Step

The ecodesign procedure consists of nine tasks, which are grouped into four steps (Table 1). This chapter provides the step-by-step guidelines to systematically implement the ecodesign procedure in manufacturing companies.
## ECODESIGN PROCEDURE (STEP BY STEP)

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<tr>
<th>STEP 1</th>
<th>Ecodesign project preparation</th>
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<td>Creation of the working team</td>
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<th>Identification of product specifications</th>
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<td>Product Analysis</td>
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<th>STEP 3</th>
<th>Definition of ecodesign strategies</th>
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<td>Analysis of ecodesign strategies</td>
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<thead>
<tr>
<th>STEP 4</th>
<th>Action Plan</th>
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<tr>
<td></td>
<td>New concepts development</td>
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</table>

Table 1. Overview of the ecodesign procedure.
2.1. Step 1 – Ecodesign project preparation

The first step of the ecodesign procedure is the preparation of the ecodesign project. It involves the execution of certain preparatory tasks, including the creation of the working team responsible for the development of the project, the identification of the factors motivating the company to carry out such a project and the selection of the target product to be ecodesigned.

2.1.1. Creation of the working team

The creation of the working team includes the selection of the staff that will be involved in the development of the ecodesign project and the assignation of their functions and responsibilities (Table 2). The size of the working team and its configuration should be defined considering the size of the company itself and adjusted depending on the complexity of the product to be designed. The working team should have the following characteristics:

- **Multidisciplinary.** Several departments of the company should be involved in the working team to deal with the diverse aspects of the ecodesign project (Table 1).

- **Decision-making capacity.** Senior management should be part of the working team to take critical decisions and address some strategic and organizational issues that will arise during the development of the ecodesign project.

- **Small and well organized.** The working team should be composed of not more than one member from each department in order to be operational. A team leader should be selected among the members of the working team to coordinate and control the development of the ecodesign project. Design or Environment & Quality departments are the preferred ones to lead the team because their experience and skills are the most relevant to the project, and they have to work closely with each other.
<table>
<thead>
<tr>
<th>DEPARTMENT</th>
<th>FUNCTIONS AND RESPONSIBILITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESIGN</td>
<td>Generation of ideas, evaluation of proposals, and translation of such proposals into concrete ecodesign actions.</td>
</tr>
<tr>
<td>PRODUCTION</td>
<td>Generation of ideas and analysis of the feasibility of the technological changes proposed by the working team.</td>
</tr>
<tr>
<td>SENIOR MANAGEMENT</td>
<td>Definition of the strategic goals for successful development of the ecodesign project and allocation of resources needed.</td>
</tr>
<tr>
<td>LABORATORY AND R&amp;D</td>
<td>Control of product and process parameters and R&amp;D of more sustainable materials and formulations for the product.</td>
</tr>
<tr>
<td>PURCHASING</td>
<td>Integration of environmental criteria in procurement operations and when dealing with suppliers.</td>
</tr>
<tr>
<td>ENVIRONMENT AND QUALITY</td>
<td>Participation in defining the goals and scope of the ecodesign project, development of proposals for environmental improvement of the product, and control and verification of the ecodesign process.</td>
</tr>
<tr>
<td>MARKETING</td>
<td>Participation in defining the goals and scope of the ecodesign project and preparation for market introduction of the new product.</td>
</tr>
</tbody>
</table>

Table 2. Role of each company department in the development of the ecodesign project.
2.1.2. Definition of goals and motivations

Before conducting the ecodesign project, it is necessary to identify those factors that push the company to improve the environmental performance of their product. It is useful at this point to carry out a SWOT analysis to identify and categorize significant internal factors in the company and external factors in the market. The output of this analysis is a matrix that compiles the most important Strengths, Weaknesses, Opportunities and Threats for the ecodesign project (Table 3). This global vision will allow the working team to detect the driving factors for project implementation and will help in setting the goals and motivations.

**Table 3. SWOT analysis matrix.**

<table>
<thead>
<tr>
<th>INTERNAL FACTORS</th>
<th>POSITIVE</th>
<th>NEGATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STRENGTHS:</strong> intrinsic strong points of the ecodesign implementation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>WEAKNESSES:</strong> intrinsic points where further research is required to overcome limitations.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EXTERNAL FACTORS</th>
<th>OPPORTUNITIES: external drivers for the ecodesign implementation.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>THREATS:</strong> external barriers to the ecodesign implementation due to external conditions.</td>
<td></td>
</tr>
</tbody>
</table>
Some of the most common driving factors for implementing ecodesign in manufacturing companies are the following:

- **Cost reduction.** Ecodesign can allow the company to identify critical points in each lifecycle stage of the product, representing an opportunity for setting potential improvements to reduce costs (e.g., weight reduction, process optimization, waste minimization, etc.).

- **Improvement in the product quality.** An ecodesign project must consider product requirements to maintain or improve the characteristics of the product (e.g., functionality, durability, etc.).

- **Applicable legislation.** An ecodesign project must consider the legal requirements applicable to the product when developing new proposals for environmental improvement.

- **Innovation.** An ecodesign project can result in new knowledge and innovative products, allowing the companies to strengthen their brand and enter in new markets.

- **Environmental perception of customers.** Consumers and other stakeholders are showing a growing concern about the environmental performance of products and, hence, companies that apply environmental criteria in product design can be favoured over those that do not use them.

- **Competitor activities.** Ecodesign can be used as a marketing tool by the companies to differentiate from their competitors, improve their brand popularity and increase their sales.

- **Corporate social responsibility.** Ecodesign shows that the companies act in a socially and environmentally responsible manner, and it can also contribute to staff motivation.
2.1.3. Selection of the target product

Once the working team is created and the driving factors are identified, the next task is to select the target product to be designed or redesigned, since ecodesign is often applied over an existing product to improve it. This is a crucial task because an appropriate selection of this reference product is necessary for the success of the ecodesign project. Some of the main criteria used for the selection of the target product are the following:

- The company should have some **design capacity** over the target product.

- The target product should have enough **freedom degrees** to allow its modification in terms of materials, shapes, manufacturing processes and so forth.

- The target product should be properly **aligned with the driving factors** that motivate the development of the project.

A short questionnaire including these criteria can be used to select a target product with a high potential for improvement and strategically adequate according to the goals and motivations of the ecodesign project (Table 4). Other criteria can also be added to the questionnaire if the working team considers that these are relevant for product selection. The working team should list the potential target products and apply the questionnaire as follows:

1. Each product is scored from 1 to 3 in each question depending on the answer that is best suited to the product.

2. The scores obtained in the different questions are then summed to obtain an overall score for each product.

3. The product with the highest overall score is selected as the target product.
### SELECTION OF THE TARGET PRODUCT

#### QUESTIONS

<table>
<thead>
<tr>
<th>What is the role of the company in the design process of the product?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Low, the company does not influence the design</td>
</tr>
<tr>
<td>2. Medium, the design is mostly defined by clients</td>
</tr>
<tr>
<td>3. High, the design is performed in the company</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Is it possible to modify the product (freedom degrees)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The product does not allow changes</td>
</tr>
<tr>
<td>2. The product allows changes, but with limitations</td>
</tr>
<tr>
<td>3. There is a great potential for product changes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What is the clients’ interest in ecodesign?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The clients’ interest on ecodesign is low</td>
</tr>
<tr>
<td>2. The clients’ interest on ecodesign is medium</td>
</tr>
<tr>
<td>3. The clients’ interest on ecodesign is high</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Is the reduction of the environmental impact of the product required by the company’s policy and/or due to actions by clients or competitors?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No</td>
</tr>
<tr>
<td>2. Yes, in the medium/long term</td>
</tr>
<tr>
<td>3. Yes, in the short term</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What are the internal driving forces for ecodesign implementation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. There is no need to change the product</td>
</tr>
<tr>
<td>2. Some improvements are needed in the product (functionality, durability, recyclability, etc.)</td>
</tr>
<tr>
<td>3. There is an opportunity for product innovation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OVERALL SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRODUCT A</td>
</tr>
<tr>
<td>PRODUCT B</td>
</tr>
<tr>
<td>PRODUCT C</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>10</td>
</tr>
</tbody>
</table>

Table 4. Example of a questionnaire for target product selection.
2.2. Step 2 – Identification of product specifications

The relevant baseline information concerning the reference product must be gathered and analysed in a second step so that the ecodesign strategies and actions for the new product are further defined on the basis of a solid rationale. This step involves the determination of the different specifications of the reference product (technical, environmental, economic, market and legal), including the identification of the critical aspects throughout the product’s life cycle.
2.2.1. Product analysis

An analysis of the reference product is necessary to define the product specifications that must be considered during the development of the ecodesign project. All working team members should be involved in this task since different product requirements have to be considered in the analysis, including the following:

**Technical.** It is necessary to know in depth the technical functions to be met by the product and its materials, as well as any technical requirements from customers.

**Environmental.** The environmental profile of the reference product should be evaluated to set reasonable environmental objectives for the new product. Environmental assessment tools, such as the MET matrix or LCA, can be used in the next task to assess the environmental profile of the reference product (see Section 2.2.2).

**Economic.** An economic evaluation of the reference product should also be conducted to support the proposal of ecodesign strategies and actions that are not only more environmentally friendly but also cost effective.

**Market.** It is necessary to consider market requirements related with consumer habits and distribution needs, as these requirements can also have an important influence when designing the new product. It is also recommendable to compare the reference product with best-in-class products produced internally or by competitors.

**Legal.** The working team must be aware of all product-related legal requirements and standards to avoid the development of non-compliant products. Legislation that could affect the products includes REACH regulation, waste regulations, etc.
2.2.2. Environmental assessment tools

An environmental assessment of the reference product should be conducted to identify the major environmental problems of the product and the life cycle stages and/or processes in which these problems occur. This environmental assessment provides the basis for the definition of the ecodesign strategies and actions that will be proposed in the next step.

There are several tools that allow the identification of the environmental hotspots of the product as well as the environmental comparison of two products or two design proposals. Most of these tools are based on the life cycle approach, which offers a global vision of the environmental aspects of the product throughout its entire life cycle. The most useful tools for companies aiming at introducing environmental improvements in products are the following:

- **MET matrix.** It is a qualitative or semi-quantitative tool that shows the inputs (Materials and Energy) and outputs (Toxic emissions and waste) for each life cycle stage of the product (Table 5). It can be applied as part of the ecodesign procedure when potential points of improvement need to be identified quickly and easily requiring neither a high level of expertise nor too much time and effort. However, because of its limits, several environmental impact categories or potential improvement options will remain uncovered. To get a comprehensive understanding of the overall environmental performance of the product and its improvement options, the LCA methodology is recommended.

The procedure for the implementation of the MET matrix is as follows:

1. **Definition of the product.** A basic description of the product throughout its entire life cycle must be done.

2. **Data collection.** Information to be collected includes data about the quantity and type of materials and energy consumed in each life cycle stage as well as data about the quantity and toxicity of emissions and wastes. These data should be relatively easy to collect without the need of a detailed study of the product.

3. **Preparation of the MET matrix.** All the qualitative and quantitative data must be placed in a matrix which shows Materials, Energy and Toxic emissions (in different columns) related to each of the life cycle stages of the product (in different rows) (Table 5).

4. **Analysis of results.** Once the MET matrix is completed, some conclusions can be drawn about the life cycle stages in which environmental improvements should be prioritized. The use of toxic or dangerous materials and energy consumption are key aspects to consider when extracting conclusions from the matrix.
<table>
<thead>
<tr>
<th>LIFE CYCLE STAGE</th>
<th>MATERIAL USE (M)</th>
<th>ENERGY USE (E)</th>
<th>TOXIC EMISSIONS (T)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials (including extraction and processing of raw materials)</td>
<td>Identification and quantification of the materials of the system.</td>
<td>Evaluation of the energy generated by the production of these materials, their transformation of their transport to the site of production or assembly.</td>
<td>Identification of potentially toxic materials but also the waste generated during the phases of mining and processing.</td>
</tr>
<tr>
<td>Factory production</td>
<td>Identification of auxiliary materials required for the production</td>
<td>Evaluation of energy consumption related to production.</td>
<td>Identification of waste produced during the production phase.</td>
</tr>
<tr>
<td>Use and maintenance</td>
<td>Identification of materials related to the use such as consumables or maintenance.</td>
<td>Evaluation of consumption in the use phase.</td>
<td>Identification and quantification of waste associated with the use or maintenance.</td>
</tr>
<tr>
<td>End-of-life system (waste management)</td>
<td>Identification of materials needed to manage end of life product.</td>
<td>Energy needed for the management of the end of life of the product.</td>
<td>Identification and quantification of waste generated during the end of life (including reused or recycled materials).</td>
</tr>
</tbody>
</table>

Table 5. Description on how to fill in a MET matrix for a product.
- **Life cycle assessment (LCA).** It is the most precise and evolved tool for the environmental assessment of products, since it quantifies the different environmental impacts associated with each life cycle stage and/or process. However, it usually requires the use of specific software and a high level of expertise, and it also consumes considerable time and effort in collecting and processing data. Further information on the implementation of LCA can be found in ISO 14040 and ISO 14044 standards.

LCA is a methodology applied to evaluate the environmental burdens associated with a product. This is achieved by identifying and quantifying energy and materials used (inputs) and wastes released to the environment (outputs), and by assessing the impacts of those energy and material uses and releases to the environment (like global warming, ozone layer depletion, etc.). The assessment also allows to identify and evaluate opportunities for environmental improvements. An LCA includes the entire life cycle of a product from the extraction and processing of raw materials to the end of life of the product itself (Figure 6), then providing its environmental impacts as the result.

![Figure 9. Overview of the LCA methodology](image-url)
2.3. Step 3 – Definition of ecodesign strategies

The third step of the ecodesign procedure is the proposal of strategies and actions to improve the environmental performance of the product. This step involves the identification and analysis of potential ecodesign strategies and actions, and subsequent selection of those actions that will be finally applied to the product.

2.3.1. Analysis of the ecodesign strategies

A list of possible strategies and actions to implement ecodesign in the product should be identified by the working team through a brainstorming session or other creativity techniques for the generation of ideas (Figure 10). It is very important to analyse the different implications of the proposed ecodesign strategies and actions, including technical, environmental and economic implications. This information is critical for further prioritization and selection of the ecodesign actions that will be implemented in the new product design.

Several ecodesign strategies and actions can be applied to reduce the environmental impacts of products throughout the different stages of their life cycle (Table 5). A detailed description of the ecodesign strategies and actions applicable to URBANREC products (furniture, mattresses and carpets) can be found in \textit{CHAPTER 3}.

\textbf{Figure 10. Ecodesign strategies may be applied in all the life cycle of the product (source: AIMPLAS)
Table 6. Overview of EcoDesign strategies and actions for bulky products.
### ECODESIGN STRATEGIES

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<thead>
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<th>Optimization of production techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>- How do you make sure that all parties know and apply the necessary product and process information?</td>
</tr>
<tr>
<td>- Strive for efficiency in the entire product-specific value chain</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Optimization of the distribution system</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Which design adaptations on the product and its packaging can minimize the ecological impact of storage and transport (before and/or after product use)?</td>
</tr>
<tr>
<td>- Which design adaptations can optimize delivery and collection?</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>ECODESIGN ACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Use of cleaner energy (renewable/alternative sources)</td>
</tr>
<tr>
<td>- Improvement of energy efficiency</td>
</tr>
<tr>
<td>- Use of alternative production techniques that optimize the use of raw materials (minimising waste)</td>
</tr>
<tr>
<td>- Reduce the number of process steps</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>ECODESIGN ACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Selection of more sustainable transport modes and alternative fuels</td>
</tr>
<tr>
<td>- Optimization of logistics</td>
</tr>
<tr>
<td>- Improvement of packaging processes to minimize the resource consumption</td>
</tr>
<tr>
<td>- Use of more sustainable packaging (e.g., reusable, recyclable, etc.)</td>
</tr>
</tbody>
</table>

**Table 6. Overview of EcoDesign strategies and actions for bulky products.**
### Use and maintenance

**Reduction of impact during use**
- *How can you extend the lifetime of the bulky product?*
- *Take the actual use and maintenance conditions into account*

<table>
<thead>
<tr>
<th>ECODESIGN STRATEGIES</th>
<th>ECODESIGN ACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Minimize the need for auxiliary consumables</td>
<td>- Use of cleaner consumables</td>
</tr>
</tbody>
</table>

**Optimization of initial lifetime**
- *How can we optimize the lifetime of the product?*
- *What are the main reasons to dispose of the product?*
- *How can we maintain the created value for as long as possible?*

<table>
<thead>
<tr>
<th>ECODESIGN STRATEGIES</th>
<th>ECODESIGN ACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Increase product durability and/or reusability</td>
<td>- Make maintenance and repair easier</td>
</tr>
<tr>
<td>- Use of modular design</td>
<td>- Use of classic design (strong product-user relation)</td>
</tr>
</tbody>
</table>

### End of life

**Optimization of end-of-life system**
- *Which design adaptations can facilitate the collection, material identification, dismantling, recycling, etc.?*
- *Can certain steps (e.g., dry collection, dismantling, decontamination, etc.) be made simpler or even unnecessary by design?*

<table>
<thead>
<tr>
<th>ECODESIGN STRATEGIES</th>
<th>ECODESIGN ACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Design for end of life of the product (reuse, remanufacturing, refurbishing and recycling)</td>
<td>- Use of appropriate labelling</td>
</tr>
</tbody>
</table>

*Table 6. Overview of EcoDesign strategies and actions for bulky products.*
2.3.2. Selection of actions for environmental improvement

Some of the ecodesign actions proposed in the previous task may not fulfil the requirements of the ecodesign project. Even if all proposed actions fulfil the project requirements, it may not be feasible to implement all of them. Hence, the proposed ecodesign actions should be analysed and prioritised to select the most feasible options. To this end, aspects related to the technical, environmental and economic viability of the different options should be considered. It is also important to consider the degree of compliance with the driving factors that motivate the company to develop the ecodesign project.

A criteria matrix is a decision-making tool that can be used to prioritize the ecodesign actions, as it allows to easily evaluate different options based on several explicit criteria (Table 7). The procedure for the implementation of this criteria matrix is as follows:
1. Preparation of a list with the different ecodesign options proposed in the previous task. A limit for the number of options should be considered to avoid complex matrixes; a maximum of four proposals is recommended. Every member of the working team should understand what each ecodesign option means.

2. Selection of the different criteria used for decision making. The working team can choose these criteria through a brainstorming session, proposing several criteria and voting those that consider as the most important. There is no minimum or maximum number of criteria, although three or four criteria are considered the optimum number for the matrix. The most commonly used criteria are the following:
   - **Technical viability.** It refers to the possibility of implementing the ecodesign proposal with the actual technical means available in the company.
   - **Environmental viability.** It evaluates the environmental benefits derived from the implementation of the ecodesign proposal.
   - **Economic viability.** It evaluates to what extent the economic costs associated with the ecodesign proposal can be assumed by the company.
   - **Compliance degree with motivating factors.** It evaluates to what extent the ecodesign proposal is aligned with the motivating factors that pushed the company to launch the ecodesign project.

3. Preparation of the criteria matrix, including the ecodesign proposals and the decision-making criteria.

4. Set a scale to qualify each ecodesign proposal attending to each criterion. The qualification scales should range from the best compliance degree (highest score) to the worst (with the lowest score). Different maximum scores can be assigned to each criterion.

5. Calculation of the score for each ecodesign proposal. The scores are calculated individually for each criterion and then summed to obtain an overall score for each ecodesign proposal.

6. Evaluation of the results, answering the following questions or other similar ones:
   - Is there any proposal complying with all criteria?
   - Can any proposal be discarded?
   - If a proposal complies with one or more criterions but not with all of them, is it still worth to continue considering it?

7. Prioritisation of the ecodesign proposals. Once all the proposals are scored, these can be prioritised, deciding if each of them is interesting and if it can be implemented in the short, medium or long term.
At the end of this task, those ecodesign proposals that will be finally applied to the product are fully identified. This task implies crucial decisions and hence, senior management should be involved to supervise and approve them.

Table 7. Example of a criteria matrix for prioritization and selection of ecodesign proposals.

<table>
<thead>
<tr>
<th>CRITERION</th>
<th>PROPOSAL A1</th>
<th>PROPOSAL A2</th>
<th>PROPOSAL A3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical viability</td>
<td>20</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>Economic viability</td>
<td>30</td>
<td>30</td>
<td>15</td>
</tr>
<tr>
<td>Environmental viability</td>
<td>30</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Compliance degree with motivating factors</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>OVERALL SCORE</td>
<td>100</td>
<td>60</td>
<td>35</td>
</tr>
<tr>
<td>TIME FOR IMPLEMENTATION</td>
<td>Long term</td>
<td>60</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Med. term</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Short term</td>
<td>75</td>
<td>35</td>
</tr>
</tbody>
</table>

URBANREC Bulky waste management
2.4. Step 4 – Action plan

The last step of the ecodesign procedure is the development of an action plan for the implementation of the ecodesign actions selected for application in the new product. This step involves the identification of the different specifications of the new product and the definition of the main activities to be done, persons responsible and deadlines.

2.4.1. New concept development

Once analysed and selected the final ecodesign proposal, a specifications document should be prepared including the requirements to be fulfilled by the new product. The specifications document should include the following product requirements (Table 8): functional and technical, environmental, economic, market and legal. It is important to remark that environmental requirements must be considered at the same level of importance as the other requirements.

The information compiled in the specifications document can be used to make preliminary product designs defined in a provisory way (shape, materials, graphic design, etc.). Among the different alternatives resulting from the preliminary design process, the one that best fulfils the product requirements will be selected. The result of this task is a complete definition of the ecodesigned product.

<table>
<thead>
<tr>
<th>SPECIFICATIONS</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional and technical</td>
<td>Same span life shall be guaranteed.</td>
</tr>
<tr>
<td>Environmental</td>
<td>An overall impact reduction must exist with no impact transferring.</td>
</tr>
<tr>
<td>Economic</td>
<td>Costs should not be higher than 10% over the reference product.</td>
</tr>
<tr>
<td>Market</td>
<td>External appearance shall be kept.</td>
</tr>
<tr>
<td>Legal</td>
<td>Bulky products must comply with in force regulatory requirements.</td>
</tr>
</tbody>
</table>

Table 8. Examples of product specifications for a new product design.
2.4.2. Definition of the ecodesign action plan

Finally, once the final ecodesign proposal is selected and the new product design developed, it is necessary to set a comprehensive action plan for the appropriate implementation of the ecodesign proposal. The action plan will be fed from results obtained in the previous tasks and it should include the selected ecodesign proposal and its related actions, persons in charge, costs and deadlines (Table 9).

<table>
<thead>
<tr>
<th>USE OF RECYCLED MATERIALS</th>
<th>ACTION</th>
<th>RESPONSIBLE</th>
<th>COST</th>
<th>DEADLINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier identification</td>
<td>Purchasing</td>
<td>N/A</td>
<td></td>
<td>15/06/2019</td>
</tr>
<tr>
<td>Formulation development</td>
<td>Laboratory and R&amp;D Production</td>
<td>4,000 €</td>
<td></td>
<td>25/06/2019</td>
</tr>
<tr>
<td>Production tests</td>
<td>Production</td>
<td>1,500 €</td>
<td></td>
<td>30/06/2019</td>
</tr>
<tr>
<td>Product characterisation (technical, economic, market, etc.)</td>
<td>Laboratory and R&amp;D Marketing</td>
<td>800</td>
<td></td>
<td>10/07/2019</td>
</tr>
<tr>
<td>Ecolabeling study</td>
<td>Environment and Quality</td>
<td>n/a</td>
<td></td>
<td>15/07/2019</td>
</tr>
</tbody>
</table>

Table 9. Example of an action plan to incorporate recycled materials in the new product.
2.4.3. Internal evaluation of ecodesign process (optional)

Once the project is fully developed, it is advisable to evaluate and obtain conclusions about the project itself to identify strengths and weaknesses of the process and to develop a global action plan in an organization scale. A graphical analysis can be done using the ecodesign strategy wheel, which visualizes the strategies that can be followed for ecodesign and compares the existing product and the new one according to their corresponding degrees of fulfilment of each strategy (Figure 11). There, the greater the values the better implementation of the strategies.

Figure 11. Example of a graphical evaluation of ecodesign strategies for a product (source: AIMPLAS)
Ecodesign strategies for bulky products targeted in URBANREC

This chapter provides a series of ecodesign actions under each of the proposed strategies for the main bulky products targeted in the URBANREC project. Specifically, furniture, mattresses and (textile-based) carpets are addressed. Examples of the application of some ecodesign actions in current market products are provided. Ecodesign actions that can contribute more directly to URBANREC project or those coming from the results obtained are highlighted.

It shall be noted that all actions may not be applicable at the same time and that not all strategies may be covered by this guide for the selected products. Nonetheless, some general guidelines for each strategy are also presented.

The first section is dedicated to general actions applicable to the three targeted products. Then, specific actions are detailed for furniture, mattresses and textile-based carpets, following the same categorized strategies. These strategies are based on the findings during the URBANREC project, as well as other sources including other ecodesign guidelines and ecolabelling schemes for the target products.
3.1. Common strategies for all bulky products

3.1.1. New concept development

“What is the main function of the bulky product and does it fulfil this function effectively and optimally?”

Always start from the user’s need and the desired end result for the user. How can we create maximum value for the customer but at the same time reduce the ecological impact? Perhaps alternative business models can be considered? For example, the strategy to offer services in combination with products (product-service combinations), thus fully or partially “dematerializing” the offered solution, is a completely new way for companies to implement their policies. With product-service combinations the value for the customer is the focus: the consumer pays for the service provided by the product and not for its possession.

General guidelines:

- (Re-)evaluate the potential of alternative business models on a regular basis and anticipate changes in consumer perception and behaviour in due time.

- Divide the product according to the different lifetime of the components and subassemblies and consider replacing only those components that are worn out.

- Keep in touch with recycling companies to keep track of the evolving market demand for secondary materials.
3.1.2. Selection of low impact materials

"Which materials are, in addition to functional and economically interesting, also ecologically and socially the most suitable for the selected bulky product?"

The selection of suitable materials is a critical factor in the development of eco-friendly bulky products.

Choose either a techno-cycle or a bio-cycle (see Figure 11). This choice will determine which material cycle will be closed and how the materials will be processed at the end of their initial lifetime.

**In a technical cycle (techno-cycle),** the product is composed of materials and components that are selected and designed to be maximally reused at the end of their initial lifetime, while retaining as much of their initial value as possible.

- When reused, the reuse of integral products (e.g., through maintenance, repair...) prevails over the reuse of parts (remanufacturing), which prevails over the reuse of materials (recycling).
- Typical examples of materials: polyurethane (PU), (synthetic) latex, polyester, nylon, spring steel, etc.

**In a biological cycle (bio-cycle),** the product is composed of materials and components whose residues safely return to nature after use. They are completely biodegradable.

- This implies that any finishing and coatings that prevent or impede the biodegradation process should be avoided.
- Typical examples of materials: wood, wool, cotton, silk, jute, etc.

Figure 12. Illustration of the bio-and techno-cycle (translated from Innomat project).
In specific cases a combination of both cycles can be an option in which certain subassemblies are composed either according to the techno-cycle or the bio-cycle. In these cases, it is important that the technical and biological material assemblies can be very easily separated.

**Guidelines for both cycles:**

- Restrict the number of material streams. Uniform streams allow more efficient recycling with higher profitability. It is also preferable to select materials that have a broad range of (re-)use possibilities without jeopardizing the potential for material separation at a later stage.

- Anticipate the identification of the applied materials for subsequent recycling already during the design stage. Material identification allows correct sorting for further recycling. To facilitate the processing, it is recommended to make agreements regarding material identification at sector level.

- Evaluate the applicability of new cleantech solutions. For example, are there any new finishing and coating techniques that don’t contaminate the product and are an alternative to harmful substances or additives?

- Do not use products that contain heavy metals (cadmium, chromium VI, lead, mercury or tin) or substances considered hazardous as defined in regulation (EC) N° 1272/2008 of the European Parliament and of the Council (or further amendments) or as defined by the REACH regulation

- Considering the emissions and migration scope, formaldehyde, VOCs and other residual chemicals, like plasticisers or even heavy metals or halogenated compounds, shall not (or only within reasonable limits) be detected on the final product.

- Select local suppliers of raw materials and components, or at least as close as possible to the manufacturing facilities.
Specific guidelines for the techno-cycle:

Choose materials that:
- Qualify for closing material cycles
- Are recycled (secondary raw materials)
- Are 100% recyclable
- Score equally in terms of comfort and durability
- Are available locally (and are not scarce)
- Have a long lifetime, in accordance with the desired lifetime of the other materials and components of the mattress
- Are at least REACH-compliant (ease-of-compliance)
- Preferably allow the reuse of products or parts (reuse prevails over recycling)
- Are preferably 100% pure or at least easy to decontaminate after use
- Preferably have a high market value because of good re-usability and also a high expected market demand in the future.

Try to:
- Avoid dyes when it compromises the recyclability (e.g. dark colours strongly influence the color of the recyclate, limiting the application possibilities)
- Avoid post-treatments that downgrade the material upon recycling
- Anticipate a dry and hygienic collection (or choose materials that make this unnecessary)
- Anticipate easy decontamination (or choose materials that make this unnecessary)
- Combine parts that can be easily separated when using multiple types of material.
Specific guidelines for the bio-cycle:

Choose materials that:

- Qualify for closing material cycles
- Are 100% renewable
- Have at least equivalent comfort properties
- Are completely biodegradable

Try to:

- Avoid post-treatments that negatively influence the biodegradation process
- Avoid dyes, antimicrobial agents and other additives that compromise or prevent biodegradation.

Material-specific guidelines:

- Wood and wood-based materials shall guarantee the origin of the timber by providing valid information, such as FSC, PEF, FLEGT, CITES or related documentation.

- Plastic parts should contain the highest percentage possible of recycled plastics and be marked in accordance with EN ISO 11469 and EN ISO 1043 (parts 1-4), at least for those being the largest component of the bulky product.

- Metallic parts or metal-like coatings should be free of cadmium, lead, chromium, mercury, arsenic or selenium, including electroplating and other treatments where cadmium and nickel are prohibited.

- Glass should not contain any lead, mercury and cadmium. Moreover, crystal glass or fibre reinforced glass should be avoided, while laminated glass can be used on the condition that it can be recycled.
3.1.3. Reduction of materials usage

“How can the bulky product be constructed in a smarter way, using less material and few material types?”

- Avoid oversizing: aim for maximum user comfort/experience with a minimum of material
- Try to omit or redistribute material according to where it is really needed
- Aim for a minimum number of material types: try to use the same material type as much as possible in complex products
- Choose lightweight materials and/or use foamed materials or hollow structures with high volume-to-weight ratio, when possible.
- Avoid/reduce surface treatments

3.1.4. Optimization of production techniques

“How do you make sure that all parties know and apply the necessary product and process information?”

By optimizing production techniques, production waste, emissions and energy consumption can be reduced. However, process optimization also includes the optimization of the size of production batches or production runs, the use of realistic control limits, the establishment of unambiguous quality requirements in terms of colour conformity, permissible errors, etc. This is all related to product and process information, which must be known and applied by all parties. Consulting the entire value chain can lead to quick wins for all involved.

- Strive for efficiency in the entire product-specific value chain (series of different processes, often executed by different companies)
- Reduce production waste, emissions and energy consumption
- Reduce the amount of production steps if possible, e.g., natural or bulk coloured parts are preferred to painted or coated surfaces
- Consider new technologies and analysis techniques
- When available and at any possible stage of manufacturing, Best Available Techniques (BATs) shall be followed. Indeed, BREF documents\(^5\) collecting BATs for specific sectors should be applied for metals, glass, polymers, textiles and others if available.
- Consider cleaner and renewable sources of energy.

\(^5\)https://eippcb.jrc.ec.europa.eu/reference/
3.1.5. Optimization of the distribution system

“What to consider when you want to reduce the environmental impact of the distribution of bulky products?”

Keep in mind that all ecodesign strategies conducted for the targeted products are also applicable for packaging materials and products.

- Restrict transport distances by vertical integration of the production processes and by purchasing, producing, maintaining and/or recycling locally
- Consider the organization of a take-back system when delivering new products and design a system for grouped collection.
- Choose the most efficient means of transport with the lowest environmental impact
- Optimize the distribution routes
- Optimize the use of transport and storage volume
- Check whether the maximum load of trucks can be increased via optimized route planning or cooperation
- Also have a look at internal transport movements in the warehouses: rearrange the warehouse goods to reduce the number of internal transport movements
- Anticipate a dry and hygienic collection and storage
- Optimize the packing, try to reduce it to the minimum amount or even avoid it if feasible.
- Primary and secondary packaging must either consist of readily recycled materials and/or materials from renewable resources or be a multi-use system.
3.1.6. Reduction of impact during use

“What to consider when designing bulky products in order to make the use itself more sustainable?

This strategy mostly applies to active products (i.e. those that consume resources during use, such as energy, water or other consumables). However, perhaps there are (ecological) finishings (dirt-resistant, self-cleaning, anti-odor, etc.) available that can reduce the need for maintenance and cleaning of the product.

3.1.7. Optimization of initial lifetime

“What possibilities do you have to extend the lifetime of the bulky product, taking into account the actual use and maintenance conditions of the end user?”

- Apply materials with a long(er) lifetime.

- Try to balance the technical and aesthetic lifetime; aim for a timeless design that transcends fashion trends and will require replacement less quickly.

- Use a modular base with replaceable parts when it is expected that the technical base will outlast the design (or color).

- Go for adaptability and modularity, e.g. adaptability to style, the possibility of (functional) upgrades, growing with the age of the user, etc.

- Make sure that all parts have a similar service life or make sure that subassemblies with a different lifespan are easily separated from each other.

- Find alternatives for the weakest links or make sure they are easily removable and replaceable.

- Minimize the chance of failure by keeping components as simple as possible and by reducing the number of components to a minimum.

- Only choose finishing and coatings that have a positive effect on lifetime and recycling.

- Guarantee extended product warranty and availability of spare parts for a reasonable period of time, depending on the product.

- Provide the consumer with: i) assembly and disassembly instructions, ii) guidance on cleaning, maintaining and repairing the products, iii) a detailed description of the best ways to manage a product when it is no longer wished for.

- Provide simple and illustrated instructions regarding the disassembly and replacement of damaged components/parts/materials. Disassembly and replacement operations should be executable using basic manual tools and unskilled labour.
3.1.8. Optimization of end-of-life systems

“Which adjustments to the bulky product design can contribute to an easier collection, material identification, dismantling, recycling and/or biodegradation?”

Design for disassembly and recycling (techno-cycle)

- Minimize the number of different material streams in order to facilitate dismantling and material separation and provide larger volumes for processing

- When possible choose monomaterials that will make the time and labour-intensive dismantling and material separation superfluous.

- Facilitate disassembly and separation of different materials and parts by choosing easy fixtures and by reducing the number and the different types of joints.

- Provide easily accessible connection points and identify the connection points for faster dismantling

- When textiles are used, the seams should be easily disassembled (e.g. by using sewing threads that disintegrate in microwave ovens) and any metal or plastic pieces attached to the textiles should be easily removable.

- The dismantling and separation should be executable using common and basic manual tools and unskilled labour.

- Divide large volumes into smaller modules (modular concept) to make it easier to replace parts and dismantle and transport the product.

- Provide a list of materials that the product consists of, stating their weight and placement in the product.

- Caution with stickers, labels, price tags and other “contaminants” that can impede the reprocessing.

- Ensure that the materials can be easily reduced in size.

- Avoid permanent connections (such as welding, adhesives, topstitching) between different material clusters. Non-permanent connections (such as click, clamp and screw types or even reversible adhesives) are always preferable.
3.2. Furniture

3.2.1. Selection of low impact materials

URBANREC’s highlighting

- Use recycled fibre-reinforced composites coming from textiles recovered from bulky waste.
- Use recycled wood plastic composites combining both wood and plastics recovered from bulky waste.
- Use polyurethane from polyols recovered from bulky waste.
- Use agglomerated wood materials with resins derived from methylal recovered from bulky waste.

3.2.2. Reduction of materials usage

- Consider the use of hollow legs, boards and shelves while maintaining functionality by applying advanced materials and design
- Fibre-reinforced composites can provide improved mechanical properties and functionality with reduced materials usage.

Figure 14. WPC legs for a chair obtained in the URBANREC project (source: IYTE)
3.2.3. Optimization of the distribution system

- Make sure that furniture if supplied as a mounted final product, is stackable in order to increase the volume to weight ratio for transport.

- Avoid irregular packaging for unmounted furniture, choose flat or cube-like packaging that is stackable.
3.2.4. Reduction of impact during use

- Any lighting or other energy consuming item that form part of the furniture should meet the recommendations described in ISO 14006 or other related documentation.

- Fittings equipped with light sources, should be classified as energy class A or B. In the case of directional light opt for LED or other effective reflector lamps.

3.2.5. Optimization of initial lifetime

- Make sure the design and selected materials allow easy refurbishment (change of colour, decorative details, upholstery) when the customer gets bored of the items.

- A modular design can prevent the need for new furniture upon relocation or reorganisation.

- Choose fabrics with good colour fastness to light and rubbing, and high resistance to pilling and abrasion for upholstered furniture.
3.2.6. Optimization of end-of-life systems

URBANREC's highlighting

For the treatment of woody waste, the presence of screws and/or other metallic parts is not desirable. Moreover, when these wood fractions are used as raw materials for the wood plastic composites process, the presence of adhesives limits their processability. These two facts are opposed in design as fixing wood parts is mainly done by metallic screws/pins or glues.

In case of upholstered furniture, connections without staples should be used as they make textile and wood very difficult to separate. Through innovative detailing of form, measurement and composition, it is possible to develop dust covers which keep the foam in place without glue, and which are also easy to assemble and dismantle.

Figure 17. Material journey of a Niaga® Ecor® Panel

Figure 18. Example of a dovetail joint in a wood furniture avoiding then the use of glues and screws.
3.3. Mattresses

Reducing the number of different materials may reduce the impact of the mattress referred to single units of product. However, this may also reduce the technical lifespan which in reality leads to an overall increased impact compared to more robust mattresses.

3.3.1. Selection of low impact materials

- Mattress springs are preferably made of recycled metals.
- The chlorine content from TDI-based PUR components should not be detectable or over reasonable limits.
- Avoid the use of organic solvents for glues.
- Select materials that contribute positively to the well-being of the user and his night’s rest thanks to their specific comfort-enhancing material properties (e.g., skin-improving, anti-bacterial, anti-allergic, soothing). However, these properties should not have an adverse effect on the subsequent recycling (techno-cycle) or biodegradation (bio-cycle).
URBANREC’s highlighting

Use polyurethane from polyols recovered from bulky wastes.

Use methylal recovered from bulky waste as a blowing agent in the manufacture of foams.

The core layer(s) of the mattresses may contain a high percentage of recycled foams. Rebounding is the desired production method for this part.

The use of flame retardants, especially those containing halogenated and other harmful compounds, is restricted.

Use recycled textiles as part of the mattress composition.

Use material with similar mechanical and chemical performance with predetermined breaking bond for the chemical recycling.

Figure 19. Cross section of a mattress with a core layer made of recycled foams obtained in the URBANREC project (source: DELAX)
3.3.2. Reduction of materials usage

Use air chambers, springs or other hollow structures for inner layers when possible.

Reduce the thickness of the whole mattress while keeping properties and durability.

3.3.3. Optimization of the distribution system

For efficient storage and transport, mattresses are preferably rollable or vacuum packed.

Figure 20. Rolled packed mattress ready to be shipped (source: DELAX)
3.3.4. Optimization of initial lifetime

- Modular design should enable the top or even inner layers to be changed as required. It applies for sprung mattresses but also for layered structures.

- The mattress cover should have good colour fastness to rubbing and a high resistance to pilling and abrasion. It should also be easily removable and washable considering it comes into contact with sweat, saliva, dander, etc.

- Aim for a strong user-mattress relationship: mattresses adapted to the specific and evolving sleeping habits and physique of the user, make the mattress unique and more personal which makes it more effective and sustainable.
3.3.5. Optimization of end-of-life system

URBANREC's highlighting

Use single PUR-based mattresses and avoid any non-PUR layers (i.e. latex) to be bonded permanently to the PUR layers.

Mattresses should permit disassembly of different parts, avoiding permanent adhesives or non-removable joints. Moreover, seams of fabrics should be easily disassembled (but without reducing durability under normal use and care).

Figure 23. Wear2 is an award-winning technology that involves disassembling garments at end of life.
Components and materials shall be clearly identified for enhanced recycling and upcycling. This is highly recommended for those mattresses containing latex parts. These should be easily identified and removed before the mattress is entering the rebounding or polyol recovery process. In that sense, proper labelling or bulk colouring is recommendable.

Assigning a bonus if old mattresses are given back to the producer is also recommended (deposit return systems can be considered).
3.4. Carpets

These actions are only based on textile-like covering floors: hard and wood-based floor coverings are out of the scope.

3.4.1. Selection of low impact materials

Migration of heavy metals shall be assessed to be limited for the outer layers of the carpet.

3.4.2. Reduction of materials usage

- In order to reduce weight, the use of melt fibres is preferable to latex.

- Multi-fibre carpets should only be allowed when extended producer responsibility initiatives are in place to ensure appropriate take-back procedures for end-of-life removal in which manufacturers sort fibres for proper recycling.

3.4.3. Optimization of the distribution system

Allow carpets to be rollable or vacuum packed.

3.4.4. Optimization of initial lifetime

- Modular approach and time-less design for the carpet is desired to ensure the best surface coverage and long-term fitting in the living space.

- The carpet should have a high light and UV resistance, resilience, wear resistance, stain/dirt resistance and should be easy to clean.

Figure 25. Rolled carpets allow increasing the efficiency in transportation and delivery.

| URBNREC Bulky waste management |
3.4.5. Optimization of end-of-life system

In addition to the general materials, also the fillers and reinforcements applied in these materials should be specified.

**URBANREC’s highlight**

The presence of different materials on the same waste product, like carpets, synthetic turfs or even upholstery can make their processing difficult as these need for being separated and sorted by material affinity.

*Figure 26. Niaga® Duo carpet technology*
Ecolabelling is a voluntary environmental management tool that allows to manifest the interaction of a product with the environment through the communication of verifiable, accurate and reliable information on its environmental aspects. The objective of ecolabelling is to boost the demand for products with reduced environmental impact, thus stimulating a continuous environmental improvement driven by the market. Companies that apply ecodesign when developing their products can therefore use ecolabelling as a marketing tool to attract environmentally aware customers.
The international standard ISO 14020 establishes the general guidelines for the development and use of ecolabels, which are classified into three different types with different characteristics and utility (Figure 12):

1 **Environmental labels** (Type I, ISO 14024): these are labels created by independent bodies (third parties that do not intervene in the market) that grant the license to use the label on the products through a logo (Figure 13). This type of ecolabelling is used to compare products within the same category and it communicates that labelled products are better for the environment based on a set of ecological criteria that encompass the whole products’ life cycle.

2 **Self-declared environmental claims** (Type II, ISO 14021): these are statements made by the manufacturer (or distributor) in the form of text messages, symbols or graphics (Figure 14). This type of ecolabelling does not require certification by an independent third party and does not follow a life cycle approach, but it only refers to an environmental aspect of the products (e.g., recyclable, recycled content, reduced resource use, designed for disassembly, etc.).

3 **Environmental declarations** (Type III, ISO 14025): these are declarations that present quantified environmental information on the life cycle of the products, allowing the comparison between products that fulfil the same function. The quantified environmental data is obtained by means of an LCA of the products, which must be done using predefined parameters (based on ISO 14040 and ISO 14044) and requires independent verification. This type of ecolabelling is part of voluntary programs (managed by companies, sectoral associations, public bodies or other entities) that establish a set of rules for the development and use of environmental declarations.
### Comparison between the Different Types of Ecolabelling

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Utility</th>
<th>Environmental Labels (Type I)</th>
<th>Self-Declared Environmental Claims (Type II)</th>
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<tr>
<td>Provided Information</td>
<td>Better environmental performance with same quality</td>
<td>Improvement of one environmental aspect</td>
<td>LCA data for comparison with other declarations</td>
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<tr>
<td>Scope of the Information</td>
<td>Complete life cycle</td>
<td>One life cycle stage</td>
<td>Complete life cycle</td>
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<tr>
<td>Certification by Third Parties</td>
<td>Required</td>
<td>Not required (but increases credibility)</td>
<td>Not required (but increases credibility)</td>
<td></td>
</tr>
<tr>
<td>Communication with Final Consumer (B2C)</td>
<td>🌻</td>
<td>🌻</td>
<td>🙁</td>
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</tr>
<tr>
<td>Communication between Companies (B2B)</td>
<td>🙁</td>
<td>🙁</td>
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<tr>
<td>Green Procurement</td>
<td>🌻</td>
<td>🙁</td>
<td>🌻</td>
<td></td>
</tr>
</tbody>
</table>

*Figure 27. Comparison between the different types of ecolabelling.*
The Möbius loop is the symbol to be used when making a statement that a product is recyclable.

The Möbius loop accompanied by a percentage value is the symbol to be used when making a statement about the recycled content of a product.

Figure 28. Examples of environmental labels (Type I).

Figure 29. Examples of self-declared environmental claims (Type II): recyclable and recycled content (according to ISO 14021).
4.1. Ecolabels for bulky products targeted in URBANREC

When ecolabels type I or type III are used, the product to be labelled shall fit on a defined product category rule (PCR), which provides a set of environmental criteria that the products must fulfil to be awarded with the ecolabels.

The EU Ecolabel is an environmental label (Type I) with European scope and it includes product categories and criteria for furniture\(^6\) and mattresses\(^7\). However, the EU ecolabel is no longer in force for carpets\(^8\), but it provides criteria for textile products comprising textile floor coverings\(^9\). Besides the EU Ecolabel, there are many other ecolabels available for furniture, mattresses and carpets, including Blue Angel\(^10,11,12\), Nordic Swan\(^13,14\), and GUT\(^15\) or OEKOTEX\(^16\).

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\(^7\)EU Ecolabel for mattresses: [http://ec.europa.eu/ecat/category/en/2/bed-mattresses](http://ec.europa.eu/ecat/category/en/2/bed-mattresses)


\(^12\)Blue Angel for mattresses: [https://www.blauer-engel.de/en/products/home-living/matraten-147](https://www.blauer-engel.de/en/products/home-living/matraten-147)


\(^15\)GUT (German label, pursued by most carpet producers, only for broadloom carpet): [https://www.pro-dis.info/about_gut.html?&L=2](https://www.pro-dis.info/about_gut.html?&L=2)

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