

A routine for reuse inventory – a guide for Lund

Summary

This guide outlines *a routine for reuse inventory* during maintenance, renovation, and demolition of buildings. The purpose was to create the routine with process descriptions to support Lundafastigheter and facilitate their reuse inventory. The routine aims to establish a framework for project managers and property managers to systematically increase reuse efforts. It is intended to support environmental goals, legal requirements related to reuse inventory and lay the foundation for systematic work. It also aims to set clearer reuse goals, prepare for reuse in future projects, and connect more directly to budget and costs.

The work has been carried out by IVL Swedish Environmental Research Institute in cooperation with representatives of the municipality of Lund. The assignment, which was carried out during the period of February to November 2023, is part of Lund Municipality's work in the Dramatically Reducing Embodied Carbon in Europe project, which is run by The Carbon Neutral Cities Alliance (CNCA), and which promotes broad adoption of ambitious local, national and regional policies that will reduce greenhouse gas emissions in the built environment in Europe. The work has been carried out and published in Swedish in its original version. This document is a translation.

Reuse of building and construction material reduces the need for new material and is also a key factor in being able to reduce the environmental & climate impact from construction. It is also a necessity in order to be able to reach goals in Lund Municipality's program for ecologically sustainable development (LundaEko) as well as more specific goals in the recently adopted plan for Climate Neutral Building and Construction. Reuse and reuse inventories in themselves are not new for Lundafastigheter, but have previously taken place as test/pilot projects and or to a limited extent without clear frameworks and support processes. The need to develop clear routines and support for Lundafastigheter to facilitate reuse inventory has previously been identified as an important step in developing the work with more systematic reuse.

The routine includes the following main process steps:

- Preparatory knowledge gathering
- Simple reuse inventory
- Detailed reuse inventory
- Action planning and monitoring

The process is adaptable, and the level of detail in the inventory can vary based on the project's characteristics and potential for reuse.

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The scope and level of detail of these process steps are described according to ambition levels. Ambition level 1 corresponds to the basic level (knowledge gathering, simple reuse inventory and plan of actions) and ambition level 2 and ambition level 3 correspond to different levels of detailed reuse inventory.

Ambition level 1 means that products that can be reused are identified (which and how they can be reused). Levels 2 and 3 mean that the inventory is updated with additional scope of product groups and a higher level of detail of information for the products.

To plan and prioritize the actions following the inventory process the routine includes a concept of reuse hierarchy, prioritizing preservation, reuse within the project, internal reuse within the organization, external reuse between organizations, and, if not possible, recycling.

The reuse inventory is carried out using CCBUILD, a digital tool with a product bank, inventory app, and marketplace, providing support for both internal and external reuse. The reuse guideline also suggests involving various stakeholders, such as project managers, administrators, reuse coordinators, and specialists, in the inventory process.

To succeed in realizing reuse goals, the routine emphasizes the importance of early reuse inventory, thorough planning, and setting specific reuse goals. Furthermore, it is important that the inventory is documented digitally and disseminated to the right actors at the right time.

As final tips and guidelines the routine provides examples of products suitable for reuse, guidance on identifying products with a significant climate impact, and other references that can help to navigate the reuse work.

Procedure for reuse inventory - during renovation and demolition

Background

Reuse of construction and civil engineering materials and fixtures reduces the need for virgin material and is a matter of sound management of limited resources. Moreover, it is a key factor in reducing environmental and climate impact from constructions and is essential for achieving goals outlined in Lund Municipality's program for ecologically sustainable development (LundaEko) and more specific objectives in the recently adopted plan for Climate-Neutral Construction and Civil Engineering. Reuse and reuse inventories, in themselves, are not new to Lundafastigheter but have previously occurred as tests/pilot projects or in limited scope without clear frameworks and support processes. The need to establish clear procedures and support for Lundafastigheter to facilitate reuse inventories in connection with maintenance, renovation, and demolition has been identified as an important step in developing more systematic reuse. Through funding within the project Dramatically Reducing Embodied Carbon in Europe, run by The Carbon Neutral Cities Alliance (CNCA), the development of the procedure was made possible, where Lundafastigheter, together with the Municipal Office and with the support of IVL, takes an important step toward

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increased reuse and a more circular construction. Buildings and their materials need to be seen as a key resource, even if demolition is necessary, and structures need to be designed and regarded as material banks with inherent values, both economic and environmental.

Objective

To create a routine and guide for reuse inventories with process description and system support for Lundafastigheter. The routine becomes a way to support and facilitate the fulfillment of environmental goals, the legal requirement for reuse inventory linked to demolition (from 2020), and to develop and lay the foundation for systematic work. This is achieved by creating a clear framework for project managers and administrators, improving work follow-up, and creating conditions for gradually increasing the proportion of more advanced inventories over time. The purpose is also to set clearer goals for reuse, prepare for reuse in upcoming projects, and more clearly connect to budget and costs. The purpose is also to start working on some of the measures relevant to the Service Administration in the plan for climate-neutral construction and infrastructure.

Description

What is reuse?

A circular economy is the opposite of a traditional linear economy. The linear economy starts with raw material extraction and ends as waste. In a circular economy, resource extraction and waste are reduced by utilizing resources that have already been extracted. All manufactured products and goods are used for as long as possible. When a product or item is no longer functional and no longer serves its purpose, it is reused or recycled.

The waste hierarchy, as seen in Figure 1, which is part of the Environmental Code (SFS 1998:808) Chapter 15, Section 10, and Chapter 2, Section 5, and upon which the EU Waste Policy (Directive 2008/98/EC) is based, provides the framework for achieving resource efficiency. Waste minimization and conservation should be prioritized first, following the principles of circular construction. After that comes reuse, and then material recycling. According to the Environmental Code, reuse (reutilization) is defined as "a product or component that is not waste being used again to fulfill the same function it was originally intended for," as stated in Law (2020:601) Chapter 15, Section 2. In this routine, reuse is equated with reutilization



Figur 1. EU Waste Hierarchy

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What is Reuse Inventory?

In this procedure developed for Lundafastigheter, a reuse inventory involves digitally documenting existing building materials and interiors in CCBUILD with information and details at various levels. The levels and when they apply are outlined in the section 'Lundafastigheter's guidelines for reuse' later in this document. A reuse procedure includes more steps than reuse inventory, such as design, procurement, disassembly, construction, etc. However, the procedure described here specifically encompasses only reuse inventory. The inventory is a crucial initial step in a reuse procedure.

For projects requiring building permits, demolition permits, or construction notifications, there should normally be a control plan. The control plan, as per the requirements of the Planning and Building Act (PBL) (2010:900) Chapter 10, Section 6, should, among other things, include information on which building products can be reused, how they should be handled, and the waste generated and how it should be managed. This means that both an environmental inventory and a reuse inventory need to be carried out and included in the control plan. This procedure solely describes how reuse inventories should be conducted.

Prioritization according to the 'Reuse Staircase'

1. Conservation

The product/material/building is preserved in place

2. Reuse within the building/space/project

The product/material is disassembled and reassembled within the building/project.

3. Internal reuse within the organization

The product/material is retained within the property owner's organization but may move between different departments/buildings/locations. For example, it can be stored for planned or future projects or used directly in another project within the municipality of Lund or affiliated companies.

4. External reuse between organizations

The product/material is disposed of externally outside Lund Municipality, either through sale or donation

5. Reusability not possible

The product/material is submitted for material recycling to the greatest extent possible. Purchasing of new items is minimized

Lundafastigheter's guidelines for reuse inventory

Reuse inventory should be used as a basis and conducted for every demolition and renovation. It is important to document it digitally and distribute it to the right stakeholders at the right time. To enable the greatest impact with the best possible reuse results, the reuse inventory

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should be conducted as early as possible. For example, the initial inventory can take place during the preliminary study/simple investigation or, if not possible, in connection with an in-depth study. If possible, it is done in conjunction with environmental inventory.

The reuse inventory is conducted according to the process steps described in this document. For all reuse inventories, knowledge gathering, simple reuse inventory, and an action plan are performed. If there is deemed to be reuse potential, a detailed reuse inventory is also conducted. The scope and level of detail of these process steps are described according to levels of ambition, where ambition level 1 corresponds to the basic level (knowledge gathering, simple reuse inventory, and action plan), and ambition levels 2 and 3 correspond to different levels of detailed reuse inventory.

Ambition level 1 means that products that can be reused are identified (which ones and how they can be reused). If applicable, the result is submitted to the control supervisor to fulfill the Planning and Building Act (PBL) (Plan- och bygglagen (2010:900)). Levels 2 and 3 mean that the inventory is updated with additional scope of product groups and higher levels of detail for the products. Guidance is provided during the description of the process steps.

Selection of Ambition Level

The level that the reuse inventory should follow is determined for each individual project and based on conditions such as the estimated reuse potential of the project. It can be assessed through, for example, estimated:

- Internal or external demand for the project's materials
- The potential climate savings of the materials
- The potential waste minimization of the materials
- The economic value of the materials

Support for Reuse Inventory

As support for the reuse inventory, CCBuild is utilized, available at www.ccbuild.se. CCBuild's digital inventory tool consists of a product bank, inventory app, and marketplace. It provides support for both internal reuse (within projects or the entire organization) and external reuse. For instance, products can be published on both an external and an internal marketplace. The internal marketplace allows reusable products from all projects within Lund Municipality to be visualized and communicated internally. Through CCBuild, reuse can be tracked along with values such as potential carbon savings, waste minimization, and economic value. This is achieved, among other things, by retrieving result reports.

All inventories should be gathered in CCBuild's system. This creates a shared material bank that can enhance reuse opportunities in projects. Reuse inventory is conducted in the app or directly in the product bank or in the import list that is read into CCBuild's product bank. Result reports from CCBuild are used as a basis for continued work.

You can easily apply for a personal account on CCBuild's website. Provide your name, email, and select Lund Municipality as the organization. Instructional videos for the digital supports are

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available on CCBUILD's help pages. Also, refer to Tips and further guidance at the end of this document.

¹<https://ccbuild.se/>

Which Actors Should Be Involved?

The reuse inventory can be conducted internally or with the assistance of an external reuse consultant. To maximize the benefits of the reuse inventory, project managers and administrators should be involved, in addition to any external reuse consultants and internal reuse coordinators. Other stakeholders, such as architects, conservators, technical consultants, and operations technicians, may also be involved as needed. This routine suggests actors who should be included, as well as those who may be beneficial to involve in the reuse inventory. To gain an overview of various reuse actors available and potentially relevant, services advertised on CCBUILD, for example, can be utilized¹.

Process steps for conducting the reuse inventory

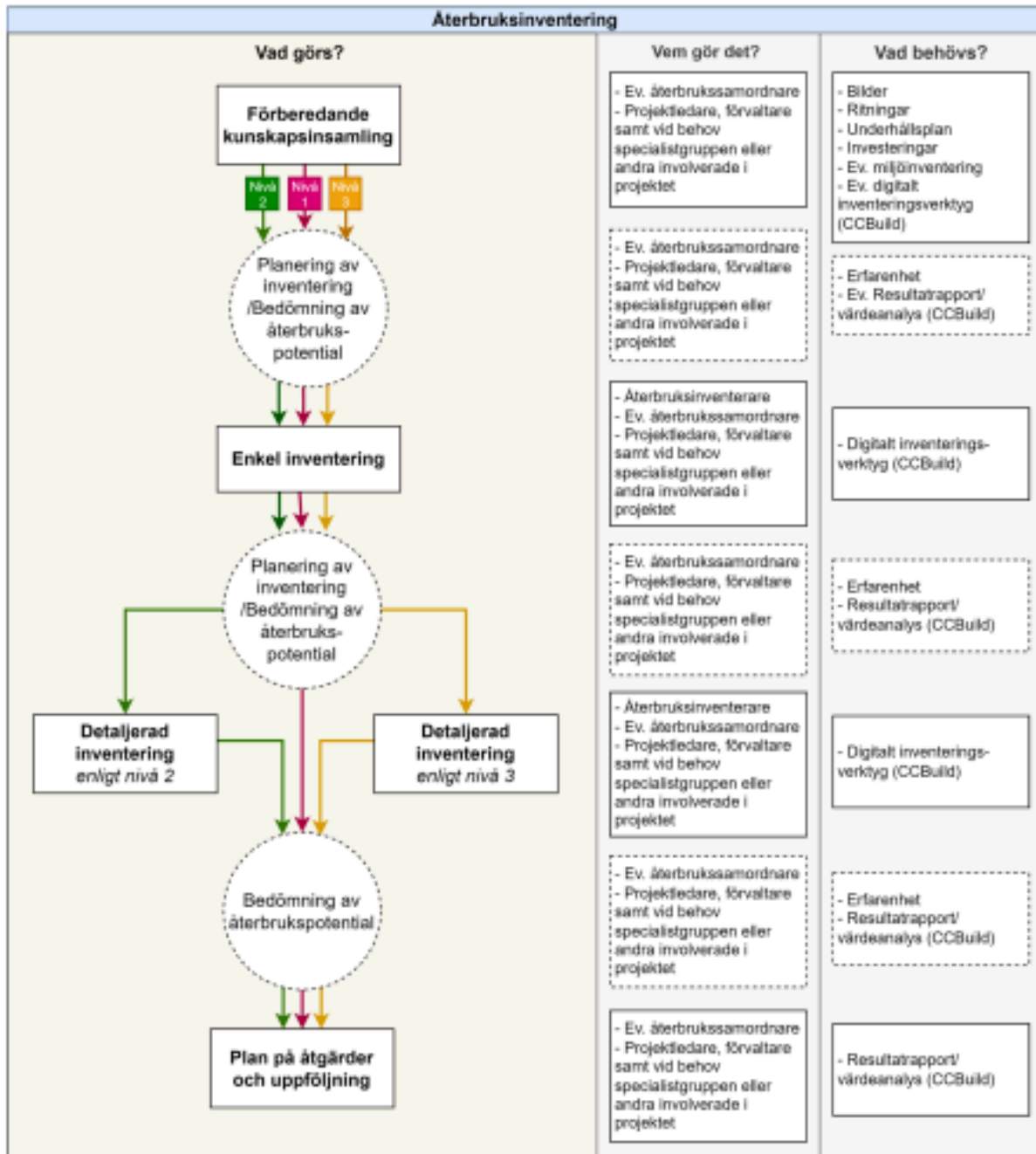
Below are described each process step to be applied in the reuse inventory. The appropriate level of ambition for the reuse inventory can, for example, be determined after a simple reuse inventory has been conducted. Figure 2 shows the process steps along with the sub-steps performed in between, as well as the actors and support involved. However, individual project conditions may make it suitable to mix parts from different ambition levels. In other words, the descriptions of the ambition levels are a guide that can be adjusted as needed².

²<https://ccbuild.se/anslut-till-ccbuild/>

³www.ccbuild.se/hjalpsida/

⁴<https://ccbuild.se/sv/marknadsplats/Tj%C3%A4nster>

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Figur 2 Processdiagram för återbruksinventering.

Preparatory Knowledge Gathering

As a first step, a preparatory knowledge gathering is conducted for the project. The purpose is to create a common understanding of the project and the upcoming reuse inventory. Knowledge gathering involves:

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- Information is gathered, including:
 - Type of building and year of construction
 - Information about any previous renovations and reconstructions.
- Existing documentation is collected, such as:
 - Pictures
 - Drawings
 - Any conducted environmental inventory
 - Logbook and other relevant documentation.
- The minimum involved actors are the project manager and administrator, and, if necessary, representatives from the specialist group or others involved in the project

Tips during knowledge gathering

- Already at this stage, CCBuild can be used. First, the project is created in CCBuild along with available project information. By then making rough estimates of quantities of parts of the building (such as the number of square meters of floor, roof, facade, or the number of windows or doors, etc.), early key figures on potential values such as climate savings potential can be obtained.
- If possible and if needed (for example, if the inventory is done by an external consultant), a site visit can be advantageously made to gain an understanding of the project

Simple Reuse Inventory

A Simple Reuse Inventory involves rapidly cataloging products, materials, or buildings to gain an understanding of potential reuse opportunities. Products with the highest potential for reuse are identified, and an overview is created of the available materials and products. The inventory is primarily visual, and the focus is on collecting readily accessible information about materials and products.

If applicable, the results are submitted to the supervisory authority to comply with the Planning and Building Act (PBL) (2010:900) Chapter 10, Section 6.

A Simple Reuse Inventory includes the following:

- The inventory is conducted using the digital tool CCBuild.
- Reuse inventory can be done internally. Actors who should be involved for approval include project managers and administrators, as well as representatives from the specialist group or others involved in the project.
- Products included in the inventory are at least those that can be easily quantified. Examples include products like windows, doors, cable trays, interior furnishings, outdoor items such as plants, outdoor furniture, paving stones, ramps, etc. Note that these are just examples of products. See also Tips and more guidance at the end of the document for additional examples of products.

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- The minimum level of information is gathered to get an overview of reusable material. This includes steps 1) General information and step 2) Location, Status, Quantity in CCBuild or at least:
- Product category according to CCBuild.
- Image(s), preferably from different angles showing condition as well as any labels.
- Quantity in a relevant unit for each product.
- An assessment is made regarding whether a detailed reuse inventory should be conducted, including a description of how much information should be gathered about products in a possible detailed reuse inventory. It may be different types of information desired for different product categories, such as sound classification and dimensions for windows and manufacturers of toilet seats, etc.

Detailed Reuse Inventory

If a simple reuse inventory indicates that there is reuse potential, a detailed reuse inventory is also conducted. A detailed reuse inventory is performed after a simple reuse inventory unless the project is small enough to be assessed that they can be done simultaneously. This means that the simple inventory is updated with more information, and the scope of the inventory is expanded according to level 2 or 3 ambitions.

Detailed reuse inventory involves:

- The inventory is carried out in the digital tool CCBuild, where the existing inventory is updated.
- Products are labeled with QR codes. This is preferably done by printing QR codes from CCBuild's website on labels and then matching them with the digital product using CCBuild's inventory app.
- Actors involved include a material-savvy reuse inventory expert, project manager, and administrator, as well as potentially representatives from the specialist group, other project stakeholders, or other expert support, such as architects, conservators, technical consultants, etc.
- Reuse inventory can be conducted internally or by a reuse consultant.

Detailed reuse inventory according to level 2 or 3 is described below.

Level 2 entails:

- Products included in the inventory also cover items where calculations are required for quantification, such as sheet materials, insulation, load-bearing structures, and facades, in addition to the products included in a simple reuse inventory.
- Information to be included is easily accessible information according to steps 1) to step 4) in CCBuild or at least the following (in addition to what is included in a simple inventory):
 - Three pictures (or more) from different angles
 - Placement
 - Assessment of reuse potential such as condition/quality and dismantling capability o Easily accessible product properties (such as dimensions, color, sound class, etc.)

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- Easily accessible product information (such as manufacturer, article number, etc.)

⁵<https://ccbuild.se/sv/Produktbanken/markning>

Level 3 entails:

- Products included in the inventory cover all products suitable for reuse.
- All available information that can be obtained about the inventoried products is included.

Action Plan and Follow-up

The Action Plan and Follow-up involve:

- Formulating an action plan for the inventoried products and determining how they should be handled. Actions are identified according to the 'reuse ladder' (see page 5).
- Tracking what has actually been reused. This should include quantities as well as relevant values (such as potential climate savings, economic savings, and reduced waste quantities). This is achieved by specifying and continuously updating the status of each product in CCBuild's product bank during the inventory process and generating result reports. This provides values automatically, allowing for project-level and aggregate-level tracking across all projects.
- Actors involved include at least the project manager and facility manager, and, if necessary, representatives from the specialist group or others involved in the project.

Tips for Action Plan and Follow-up:

- When contracting with a contractor, it should be specified that documentation of reuse must be provided

Tips and Additional Guidance

General Tips for Reuse Inventory

-Early reuse inventory is key to enabling as much actual reuse as possible.

-Plan the reuse inventory well.

-Set specific and clear reuse goals in connection with the reuse inventory.

-Take many photos from different angles, preferably with labels and markings. The more information documented, the greater the chance of reuse. See buildings as material banks - inventory existing and document new for future reuse

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Examples of Products That Are Easy to Start With

Fixed Interior Products:

- Doors
- Glass partitions
- Windows
- Interior walls
- Ceilings
- Floors
- Forged iron and grilles
- Stairs
- Hardware and door automation

Others:

- Façade material
- Brick and masonry
- Roofing sheet
- Wood products
- Plants
- Ground materials
- Some installations"

Examples of Product Categories to Reuse for Significant Climate Impact:

- Large product volumes, heavy materials
- Products with significant emissions during extraction/manufacturing
- Products that are frequently replaced – common flows

Read more: Climate Effects of Recycled Building Products and Furniture: Methods for Assessing Climate Effects and Products in Intermediate Storage and Sales

Link: <https://www.ivl.se/download/18.4ea83c64182fa47c266c88b/1663756934359/696.pdf>

Products that may be less suitable for reuse:

Guide focusing on hazardous substances in reusable building materials: Building Reuse Guide - a guide to facilitate the reuse of building products in homes

Link: https://www.ccbuild.se/media/3etbdqx5/bygg%C3%A5terbruksguiden_220117.pdf

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CCBuild's Digital Tools

Guidance and instructional videos on the tool are available on the help page:

<https://www.ccbuild.se/hjaelpsida/>

User guide for inventory with CCBuild:

<https://ccbuild.se/media/5iinufmx/anv%C3%A4ndarguide-inventera-ccbuid.pdf>

Download the app through the App Store/Google Play and search for CCBuild

QR codes: <https://ccbuild.se/sv/Produktbanken/markning>

Labels for printing QR codes can be purchased from, for example, Avery:

<https://www.avery.se/avery-produkter/etiketter/etikettshop>

Other

Knowledge Base <https://ccbuild.se/kunskapsbank/>

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