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Level(s) indicator 2.4: Design for deconstruction

User manual: introductory briefing, instructions and guidance

(Publication version 1.1)

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Title

Level(s) indicator 2.4: Design for deconstruction user manual: introductory briefing, instructions and guidance (Publication version 1.1)

Abstract

Developed as a common EU framework of core indicators for assessing the sustainability of office and residential buildings, Level(s) can be applied from the very earliest stages of conceptual design through to the projected end of life of the building. As well as environmental performance, which is the main focus, it also enables other important related performance aspects to be assessed using indicators and tools for health and comfort, life cycle cost and potential future risks to performance.

Level(s) aims to provide a common language of sustainability for buildings. This common language should enable actions to be taken at building level that can make a clear contribution to broader European environmental policy objectives. It is structured as follows:

1. Macro-objectives: An overarching set of 6 macro-objectives for the Level(s) framework that contribute to EU and Member State policy objectives in areas such as energy, material use, waste management, water and indoor air quality.
2. Core Indicators: A set of 16 common indicators, together with a simplified Life Cycle Assessment (LCA) methodology, that can be used to measure the performance of buildings and their contribution to each macro-objective.

In addition, the Level(s) framework aims to promote life cycle thinking. It guides users from an initial focus on individual aspects of building performance towards a more holistic perspective, with the aim of wider European use of Life Cycle Assessment (LCA) and Life Cycle Cost Assessment (LCCA) methods.

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Figure 1. The Level(s) document structure

How this indicator user manual works

Level(s) is a framework of core indicators of sustainability that can be applied to building projects in order to report on and improve their performance. The supporting documentation has been designed to be accessible to all the actors that may be involved in this process.

If you are new to the assessment of building sustainability, we recommend reading the **first part of the Level(s) user manual**. This will provide you with an introduction to the basic concepts behind Level(s) and how you can apply it to a building project.

If you haven't yet set up your building project to use Level(s), including completing the project plan and the building description, then we recommend reading the **second part of the Level(s) user manual**.

This indicator user manual forms part of the third part of the Level(s) user manual where you will find instructions on how to use the indicators themselves. It is designed to help you apply your chosen indicator to a building project. It will help you to do this in the following way:

- **Introductory briefing:** This section provides an overview of the indicator, including:
    - ✓ why you may wish to measure performance with it,
    - ✓ what it measures,
    - ✓ at which stages in a project it can be used,
    - ✓ the unit of measurement, and
    - ✓ the relevant calculation method and reference standards.
- **Instructions on how to use the indicators at each level**: This section provides:
    - ✓ step by step instructions for each level,
    - ✓ what is needed to make an assessment,
    - ✓ a design concept checklist (at Level 1), and
    - ✓ the reporting formats.

  The instructions often refer to the guidance and further information section, which can be found after the instructions.
- **Guidance and further information for using the indicator**: This section provides more background information and guidance to support you in following specific steps in the instructions, including the design concepts introduced at Level 1 and the practical steps to calculate or measure performance at Levels 2 and 3. They are all cross-referenced to specific instruction steps at either level 1, 2 or 3.

This indicator user manual is structured so that once you are familiar with using the indicator and you know how to work with it, you may no longer need to refer to the guidance and background information, but only work directly with the instructions at the level of your choice.

Technical terms and definitions used

Term	Definition
Accessibility	The ability to allow for easy access to building components for disassembly, refurbishment, replacement, or upgrade.
Assembly	An arrangement of more than one material or component to serve specific overall purposes
Building fabric	All construction works that are fixed to the building in a permanent manner, so that the dismantling or replacement of the product constitute construction operations
Building component	Construction product manufactured as a distinct unit to serve a specific function or functions.
Deconstruction	A process of selectively and systematically dismantling buildings to reduce the amount of waste created and generate a supply of high value secondary materials that are suitable for reuse and recycling.
Disassembly	The taking apart of a constituent element of a building or assembly at the end of its useful life in such a way that allows components and parts to be re-used, recycled or recovered.
In-use condition	Any circumstance that can impact the performance of a building or assembled system under normal use.
Life cycle inventory analysis	Phase of a life cycle assessment involving the compilation and quantification of inputs and outputs for product throughout its life cycle.
Material separation	Operation to separate materials, including mechanical, chemical or thermal processes (e.g. shredding, smelting, sorting etc.) other than dismantling or disassembly.
Recovery	Any operation by which waste serving a useful purpose by replacing other materials, which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in a plant or in the wider economy.
Recycling	Any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes.
Reuse	Operation by which a product, or a part thereof, having reached the end of one use stage is used again for the same purpose for which it was conceived.
Recyclability	Ability of waste product to be recycled, based on actual practices.
Scenario	Collection of assumptions and information concerning an expected sequence of possible future events
Selective demolition	Removal of materials from a demolition site in a pre-defined sequence in order to maximize recovery and recycling performance.

Introductory briefing

Why measure performance with this indicator?

Building elements such as structures, envelopes and facades account for the majority of the embodied environmental impacts of constructing a building. Multiple renovation cycles for the internal fit out of a building are moreover likely to take place along the intended service life.

As a result, any progress to achieve 'circularity' by designing for the recovery of these building parts and materials for reuse (either in situ within a new building or on another site), or by recycling them to make new building products, will contribute to a progressive reduction in the embodied life cycle impacts and natural resource consumption of the building sector as a whole.

A major barrier to design for deconstruction is the disconnect between decisions made at the design stage of a building and those that may be made several decades later when the building reaches the end of its life. Studies of demolition and deconstruction practices have identified four main barriers to material reuse and recycling:

- **Building designs**: Current construction methods and materials do not support the recovery of materials. Examples includes contamination with hazardous materials, entanglement of services in structural elements and the use of composite steel and concrete systems.

- **Demolition processes**: Current schedules and practices do not support the recovery of materials in a useable state. Examples include the use of shears to cut steel sections because of welded joints or the limit of time.

- **Logistics systems**: There is a lack of space to store reclaimed materials. One example is the storage of reclaimed steel sections before they may be required in new construction. Even if sections are recovered, the types of modifications required may be prohibitive.

- **Markets**: There is a lack of demand for reclaimed materials. This may be constrained by the limited supply and variability in sizes of elements or sections versus those which may be required. Changes in standard specifications over time have resulted in a greater variety of building elements. Uncertainty about material properties and use history may also play a role.

Whilst building assessments cannot address all of these aspects, they can have an important role to play in identifying aspects of building design that can influence future end of life recovery processes and decisions.

What does it measure?

The indicator provides a semi-quantitative assessment of the extent to which the design of a building could facilitate the future recovery of materials for reuse of recycling. It therefore provides a proxy for:

- the contribution of the building to the circular economy, and

- the practical potential to access the material value reported under Module D of indicator 1.2 of the Level(s) framework.

The indicator measures the ease of disassembly for a minimum scope of building parts, followed by the ease of reuse and recycling for these parts and their associated sub-assemblies and materials.

At what stage of a project?

Level	Activities related to the use of indicator 2.4
1. Conceptual design (following design principles)	✓ Key design aspects for the architect, structural engineer and contractor to take into consideration and to include in later specifications. ✓ Value appraisal of the design aspects by the building promoter and cost surveyors.
2. Detailed design and construction (based on calculations, simulations and drawings)	✓ Assessment of the structure, façade and building design and specification for deconstruction. ✓ Assessment of renovation building parts and fit out materials for their deconstruction potential on a shorter timescale.

Level	Activities related to the use of indicator 2.4
3. As-built and in-use (based on commissioning and inspection)	✓ Awareness and information relating to circular design features and their potential future value.

The unit of measurement

The common unit of measurement is a **dimensionless scoring of the deconstruction potential** of a building. Scores may be reported for each of the three deconstruction aspects that have been incorporated into the building design – ease of recovery, ease of recycling and ease of reuse.

System boundary

The assessment boundary is the building and its complete bill of quantities and materials, if they are addressed in the design assessment by a Level(s) user.

Scope

The building's bill of quantities and materials, in so far as they are encompassed by the design assessment and the minimum scope of building elements that is identified in the instructions for level 2 and 3.

Calculation method and reference standards

A transitional calculation method is proposed for use, based on the German Green Building Council's (DGNB) ease of recovery and recycling criterion TEC1.6. The full method provided by the DGNB may be used to allocate and report on a score.

The instructions for each level and guidance additionally make reference to the principles and design aspects that are included in ISO 20887.

Instructions on how to use the indicator at each level

Instructions for Level 1

L1.1. The purpose of this level

This level is for those users who would like to:

- Understand how the design of a building could facilitate ease of future deconstruction in order to access, disassemble and dismantle parts and materials.
- Consider the extent to which these building parts may be recovered for either reuse and/or for recycling.

L1.2. Step-by-step instructions

These instructions should be read in conjunction with the accompanying Level 1 technical guidance and supporting information (see page 15).

1. Make sure to have completed the Level(s) building description in User Manual 2, as some of the information may be needed to check the relevance of design concepts
2. Consult the checklist of deconstruction design concepts in section L1.4 of these instructions and read the associated technical guidance and supporting information that appears later in this document.
3. *Optional step:* Seek advice from a demolition contractor or waste management expert with relevant knowledge of the building type and the state of the art in deconstruction techniques and local, regional and/or national end-markets (as relevant to the bill of quantities and materials).
4. Within the design team, review and identify how the deconstruction design concepts could be introduced into the design process.
5. Once the design concept is finalised with the client, record the deconstruction design concepts that were taken into account using the L1 reporting format at the end of these instructions.

L1.3. Who should be involved and when?

Actors involved at the conceptual design stage, led by the concept architect. The deconstruction design concepts can be further explored once professionals such as the structural engineers as well as contractors, including fit-out specialists, have become more involved in the project.

L1.4. Checklist of relevant design concepts

The following deconstruction design concepts have been identified from surveys of professionals reported in literature, building research and building certification tools. They provide proxies for a building design that is easier to deconstruct and may provide improved long-term environmental performance.

General deconstruction aspect	Specific design aspect to address	Description
1. Ease of recovery	1.1 Elements and their parts are independent and easily separable	The potential to separate elements that are connected to each other[1] and to disassemble elements into their constituent components and parts. *The nature of the connections are addressed by design aspects 1.2 and 1.3.*
	1.2 Connections are mechanical and reversible	The use of mechanical, non-destructive connections as opposed to chemical bonding.
	1.3 Connections are easily accessible and sequentially reversible	Easy and sequential access in order to reverse mechanical connections and remove elements.
	1.4 The number and complexity of	The disassembly should not suppose the need for complex

[1] For example, the façade and building services can be easily removed without damaging the structure of the building or generating significant material waste from inside the building.

General deconstruction aspect	Specific design aspect to address	Description
	the disassembly steps are low.	preparatory steps, the intensive use of manpower and machinery and/or off-site processes.
2. Ease of reuse	2.1 Specification of elements and parts using standardised dimensions.	Specification of elements and parts that are of a standardised specification in order to provide consistent future stock
	2.2 Specification of modular building services.	Specification of modular systems that may retain value upon de-installation or which may be more easily swapped out and upgraded.
	2.3 Design supports future adaptation to changes in functional needs.	Design of the building parts to support ongoing use in the same or a different design configuration in the same building.
3. Ease of recycling	3.1 Parts made of compatible or homogenous materials	Specification of components and constituent parts made of homogenous materials, the same materials or materials mutually compatible with recycling processes. Finishes, coatings, adhesives or additives should not inhibit recycling.
	3.2 Constituent materials can be easily separated	It should be possible to separate components and parts into their constituent materials.
	3.3 There are established recycling options for constituent parts or materials	The part or material is readily recyclable into products with a similar field of application and function, thereby maximising their circular value.

L1.5. Reporting format

Deconstruction design concept	**Addressed?** (yes/no)	**How has it been incorporated into the building design concept?** *(provide a brief description)*
1. Ease of disassembly		
2. Ease of recycling		
3. Ease of reuse		

Instructions for Level 2

L2.1. The purpose of this level

This level is for those users who wish to set design targets or who are at the stage of making design decisions and wish to compare design options for their deconstruction potential.

L2.2. Step-by-step instructions

These instructions should be read in conjunction with the accompanying Level 2 technical guidance and supporting information (see page 18).

1. Bring together the architect as well as the structural engineers, service engineers and fit-out contractors in order to review the design concepts and aspects that will be assessed, starting with the minimum scope.
2. *Optional step:* Seek advice from a demolition contractor or waste management expert with relevant knowledge of the building type and the state of the art in deconstruction techniques and local, regional and/or national end-markets (as relevant to the bill of quantities and materials).
3. *For renovation projects:* those building parts that are within the influence of the scope of the proposed works shall be identified.
4. Develop the design options for appraisal, taking into account the different deconstruction design concepts and aspects.
5. For residential developments with several housing typologies, make a representative selection of the building designs and fit-outs. For apartments, the whole building shall also be assessed.
6. Identify and gather the relevant architectural and structural design drawings, service plans and fit-out plans required to make the scoring.
7. Use the transitional method to allocate a score for the ease of recovery and the ease of recycling and reuse.
8. Record those building parts from the minimum scope in 2 that have been checked for their ease of recovery, reuse and recycling, together with design solutions.
9. *Going a step further:* In order to explore the potential for trade-offs in the life cycle environmental performance of different deconstruction design concepts, a life cycle GWP assessment or full LCA assessment may be carried out.

L2.3. What do you need to make an assessment?

The main items needed are as follows:

- ✓ A building design with a bill of quantities, as well as structure and servicing plans. These should be sufficiently advanced to provide the detailed information on which to make a scoring for the deconstruction design aspects.
- ✓ *For renovation projects:* an agreed scope of building parts and fit-out that will allow for those deconstruction design aspects that can be influenced to be identified.

L2.4. Who should be involved and when?

Those actors involved at the detailed design stage, led by the architect and with the involvement of the structural engineers, services engineers and contractors. Supporting life cycle Global Warming Potential (GWP) or Life Cycle Assessment (LCA) may be carried out by the energy/sustainability consultants or those within the design team with in-house competencies.

L2.5. Ensuring the comparability of results

A single transitional method is provided for making the assessment which shall be used by all Level(s) users. The methodology can be downloaded here.

L2.6. Going a step further

Two options can be pursued in order to optimise designs for the deconstruction of a building:

1. **Life cycle performance**: Indicator 1.2 Life cycle GWP or a cradle to grave LCA may be used to assess the performance of different building design options or to optimise the life cycle performance of a design. To do this, designs shall be developed and tested and the rules laid down for end of life scenario modelling under L2.4: Step 4 of the indicator 1.2 instructions (which can be found in the user manual for that indicator) shall be followed.
2. **End of life scenarios**: Project-specific scenarios should be built up from primary data for deconstruction techniques and technology that is applied by the construction and demolition sector to the building type/design and, as specifically as possible, in the geographical location.

Note that for option 1, if the life cycle GWP or LCA results are to be publicly reported, it is recommended that input is sought from a demolition contractor and/or a waste management expert and that their opinion is appended to the reporting.

L2.7. Format for reporting the results of an assessment

Part 1 - Ease of recovery reporting

Ease of recovery	***Overall score obtained***	
Building part	***Design aspects checked/implemented***	
	Ease of recovery aspect	***Description of the design solution(s) used to facilitate recovery***
Of the parts in table 2 list those that have been addressed	*Aspect x*	

Part 2 - Ease of reuse and recycling reporting

Ease of reuse and recycling	*Overall score obtained*

Building part	***Design aspects checked/implemented***	
	Ease of recycling/reuse aspect	***Description of the design solution(s) used to facilitate recovery***
Of the parts in table 2 list those that have been addressed	*Aspect x*	

Part 3 – (Optional) Demolition and waste management expert check

Expert check carried out?	*Yes/no*
Have any additional design aspects been identified and addressed?	*List any additional aspects identified and addressed:* - *Aspects x* - *Aspects y* - *Aspects z*

Instructions for Level 3

L3.1. The purpose of this level

This level is for those users who wish to compare the final as-built design with the earlier detailed designs. It can also form the starting point for preparing the technical content of a building passport or building material bank record.

L3.2. Step-by-step instructions

Since the approach for Level 2 and Level 3 is very similar, these instructions should be read in conjunction with the accompanying Level 2 technical guidance and supporting information (see page 18).

1. Bring together the architect and contractor as well as the structural and service engineers in order to identify the design concepts and aspects that have been addressed.
2. Identify and gather the relevant architectural and structural design drawings, service plans and fit-out plans as well as supporting calculations required to check on and confirm the as-built scoring.
3. Ensure that the same representative selection of house or apartment types is used if a scoring was made at Level 2.
4. Use the transitional method detailed in L3.5 to allocate a score for the ease of recovery and the ease of recycling and reuse.
5. Record those building parts from the minimum scope in Table 2 that have been checked for their ease of recovery, reuse and recycling, together with design solutions.
6. *Going a step further:* In order to finalise an assessment of the potential for trade-offs in the life cycle environmental performance of different adaptability design concepts, a further life cycle GWP assessment or full LCA assessment may be carried out.

L3.3. What do you need to make an assessment?

The main items needed are as follows:

- ✓ A building design with a bill of quantities, as well as structure and servicing plans, that are sufficiently advanced to provide the detailed information on which to make a scoring for the three deconstruction design concepts – ease of recovery, ease of recycling and ease of reuse.
- ✓ For renovation projects: an agreed scope of building parts and fit-out that will allow for those deconstruction design aspects that can be influenced to be identified.

L3.4. Who should be involved and when?

Those actors involved in the completion of the building, led by the architect and with the involvement of the contractor(s) and structural and services engineers. Supporting life cycle GWP or LCA assessments may be carried out by the energy/sustainability consultants or those within the design team with in-house competencies.

L3.5. Ensuring the comparability of results

A single transitional method is provided for making the assessment which shall be used by all Level(s) users. The methodology can be downloaded here.

L3.6. Format for reporting the results of an assessment

Part 1 - Ease of recovery reporting

Ease of recovery	*Overall score obtained*	
Building part	***Design aspects checked/implemented***	
	Ease of recovery aspect	***Description of the design solution(s) used to facilitate recovery***
Of the parts in table 2 list those that have been addressed	*Aspect x*	

Part 2 - Ease of reuse and recycling reporting

Ease of reuse and recycling	*Overall score obtained*

Building part	***Design aspects checked/implemented***	
	Ease of recycling/reuse aspect	***Description of the design solution(s) used to facilitate recovery***
Of the parts in table 2 list those that have been addressed	*Aspect x*	

Part 3 – (Optional) Demolition and waste management expert check

Expert check carried out?	*Yes/no*
Have any additional design aspects been identified and addressed?	*List any additional aspects identified and addressed:* - *Aspects x* - *Aspects y* - *Aspects z*

Guidance and further information for using the indicator

For using level 1

Additional background guidance and explanations are provided for the three deconstruction design concepts, ease of recovery, of recycling and of reuse.

In this way, users can obtain a better understanding of why design for deconstruction is important to address and how it can influence the circularity of a building in the medium to long term.

L1.4. Checklist of deconstruction design concepts

A major barrier to design for deconstruction is the disconnect between decisions made at the design stage of a building and those that may be made several decades later when the building reaches the end of its life. In this respect, assessment schemes and reporting tools may therefore have an important short to medium term role to play in incentivising such practices and providing reference to tools and guidance.

Identifying the main barriers to reuse and recycling

A study carried out by Charlson (2013) for Arup and the Chartered Institute of Building (CIOB) provides useful insight on that factors that would support deconstruction practices. The study comprised an international literature review and survey of 26 demolition industry professionals [2]. The most commonly cited actions in currently available guidance were also compiled. Table 2 lists the actions with the greatest number of citations. These potential actions were verified with demolition industry professionals in a survey. This resulted in two main actions being identified that should be encouraged, and which indicator 2.4 can be used to make progress on:

1. **Building information**: Information about the building should be passed on, to include full as-built drawings and a deconstruction plan.
2. **Design stage actions**: A number of specific design actions should be taken to enable the separation of materials and elements.

In relation to the second point above, the design actions identified as being of greatest potential significant were:

- Independent and easily separable elements of the building *e.g. structure, envelope, services & interior finishes*;
- Ease of access to connections;
- Mechanical and reversible (not chemical) connections;
- Avoidance of resins, adhesives or coatings on the elements to be disassembled;
- Avoidance of poured in-situ concrete structures;
- Avoidance of composite floor constructions;
- Prefabricated elements should be permanently marked with details of their properties.

VTT and TUT (2013) came to broadly similar findings, with the additional focus on long life and easy-to-maintain structural elements and on the ease of removal and recyclability of external and internal cladding materials and coatings applications that have to be renewed. Avoidance of the use of hazardous materials that may hinder recycling was also highlighted.

[2] Charlson.A, *Designing for the deconstruction process*, Final report produced for the Sir Ian Dixon Scholarship, 25th February 2013, UK

Table 1. Design for deconstruction actions cited in current guidance

Actions cited as contributing to design for deconstruction	Number of sources that cited action
Use reversible mechanical/non-chemical connections	15
Ensure elements of the building are independent and separable (structure, envelope, services, fit out)	12
Use standardised elements	10
Use non-composite floor systems	10
Permanently mark materials with properties	10
Ensure as-built drawings are available	9
Develop a deconstruction plan during design phase	8
Avoid use of resins, adhesives and coatings	8
Ensure post-construction ease of access to fixings	8
Do not use in-situ concrete	7
Avoid use of hazardous materials	7
Use modular elements	6
Use prefabricated elements	6
Use lime-based mortar with masonry	6
Minimal number of materials and components	6
Think about early in design process (scheme & design development)	6
Use components of singular materials	5
Train all team members on Design for Deconstruction	5
Establish feasibility of element reuse	5
Design in tie offs for deconstruction	4
Provide construction plan	4
Use durable materials	4
Size components for manual handling	4
Include information on deconstruction techniques	3
Do not use structural grout with precast elements	3

Source: Charlson (2013)

Understanding the potential for greater reuse

The Finnish ReUSE project is a useful source of information to understand the practical potential for re-use. The project sought to address the potential and challenges currently facing the reuse of elements from existing buildings and design for reuse in new buildings [3]. Although the findings are relatively generic, and related to the nature of local and regional construction practices as well as end markets for products and materials, it means that it is always important to look at design for deconstruction solutions in the local context.

The ReUSE project had a specific focus on larger structural elements in commercial, industrial and residential buildings (columns, beams, wall panels, and floor and roof elements) including those made from timber, steel and concrete. The project's findings broadly agreed with those of Charlson (2013). Figure 2 serves to illustrate the complex interactions between the different actors involved in the re-use process.

[3] VTT Technical Research Centre of Finland and Tampere University of Technology (2014) *Re-use of structural elements of building components.*

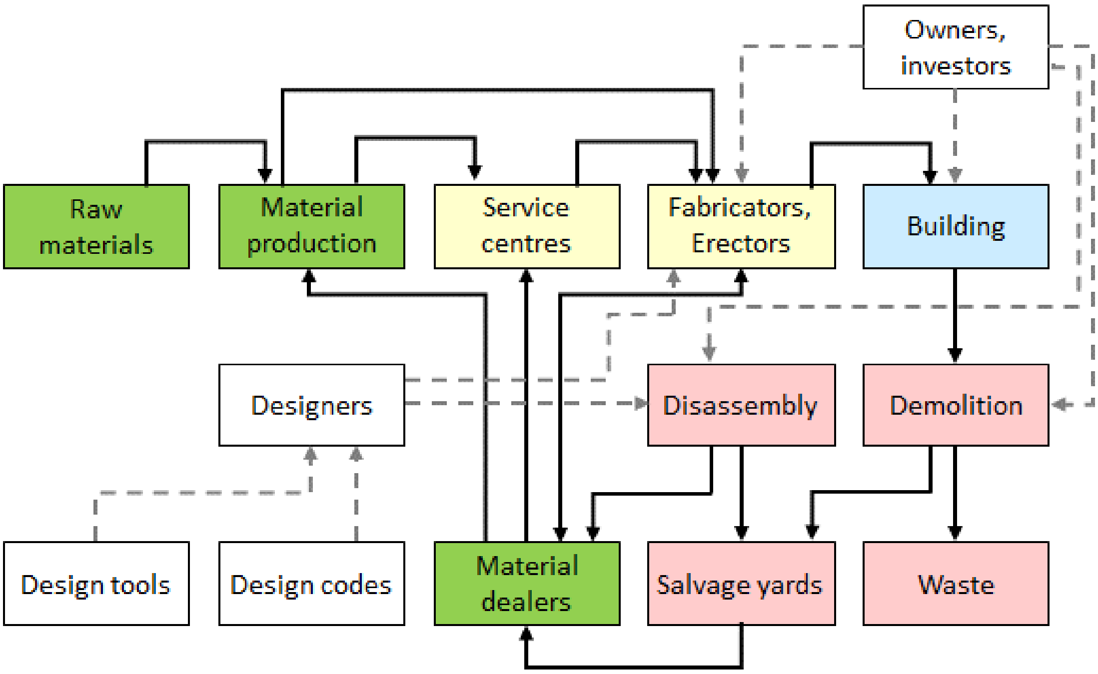

Figure 2. Major roles in the re-use process and their interaction

Source: VTT (2014)

The accompanying survey of construction and demolition professionals in Finland highlighted that beams and columns made of steel or concrete offered the best near term reuse potential. Timber beams, columns and cross laminates could have improved potential in the future. The following additional observations were made:

- Timber: Beams, columns and CLT were highlighted as having potential.
- Concrete: Beams and columns were seen to have good prerequisites for reuse, but the lack of an established market was seen as a major obstacle. For panels and slabs, the difficulty of deconstruction was seen as the first obstacle followed by market-related issues.
- Steel: Construction technology was not seen to hinder the reuse of steel components, but rather the lack of established practices.

The study also identified the practical potential to re-use concrete panels from the 1960's and 1970s panel built (prefabricated) lower rise detached housing, reflecting similar practices in the former East Germany [4].

[4] IEMB (2007) *Recycling Prefabricated Concrete Components – a Contribution to Sustainable Construction*, Neue Ergebnisse, Germany

For using level 2

In this section of the guidance, additional background explanations and information are provided in order to support use of the instructions for Level 2. The following steps in the instructions are specifically addressed:

- L2.2. Step 1: Identifying the scope of assessment
- L2.2. Step 9: Assessment of the life cycle environmental performance of building designs

L2.2. Step 1: Identifying the scope of assessment

Users should first consult the minimum building parts identified in table 2, and identify which building parts will be assessed. Each building part will then need to be scored according to the transitional method.

Table 2. The minimum scope of building parts to be assessed

Scope of parts	Building parts
Structure	o Load bearing structural frame o Load bearing external walls o External and internal columns o Floor and roof structures o Foundations
Shell	o Non-load bearing external walls o Facades (including windows and doors) o Cladding and internal linings of external walls o Roof coverings and linings
Core	o Fit out (flooring, ceilings and linings) o Non-load bearing internal walls o Services: - Lighting - Energy - Ventilation - Sanitation

L2.2. Step 9: Assessment of the life cycle environmental performance of building designs

Some of the deconstruction design concepts may involve trade-offs between improved ease of recovery and environmental performance. These trade-offs cannot be capture by the deconstruction score and can only be quantified by making a life cycle GWP assessment or a cradle to grave LCA for the building. This will allow for the performance of designs to be calculated and compared. To do this, possible future scenarios for the end of life of the building should be developed and tested drawing upon expert input. In doing this, the specific rules provided in L2.4: Step 4 of the indicator 1.2 instructions shall be followed. The can be found in the indicator 1.2 user manual.