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Circular Housing Asset Renovation & Management

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Circular Asset Management Implementation Guideline

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1 Introduction

In this deliverable we give guidance for housing associations for circular asset management. The guidance is based upon the circular asset management practises of the CHARM partners, demonstrating circularity in renovation and new construction projects, and the development of material exchange platforms (MEPs). Also, general insights in circular asset management practises have been used.

Circular Economy in the built environment is related to concepts, derived from economic, environmental and management theories, e.g.:

- People – Planet – Profit or Prosperity;
- Life-Cycle Thinking;
- Revalue Elements – Products – Materials (EPMs);
- Ownership and Sharing economy;
- Performance-Service-Systems.

One should realize that the conditions, barriers and enablers to develop and apply circular asset management by housing associations in (North-West) Europe differ a lot. This results from the institutional frameworks, the national legislation, the construction culture and the availability of knowledge and financial resources. Intra-organisational barriers and enablers are critical developing circular strategies, i.e., policy-making and prioritizing of circularity, the availability of human resources and top management support, and education on circularity. Also the behaviour and interaction with internal stakeholders (tenants) and external stakeholders is a critical point.

Although circularity is on the agenda for some years, the CHARM project starting in 2018, overall circular asset management practises are for social housing organisations not 'business-as-usual' yet. The timeline between awareness, piloting and demonstrating, and organisational change is long. All internal and external processes, procedures, rules, decision-making processes, budget, planning and control systems should be altered and aligned differently, other resources are needed, new relationships with external stakeholders have to be established and contracted.

2 Circular Asset Management CHARM partners

Because this guidelines especially builds forward on the experiences of the circular practises of the CHARM partners, we especially focus on circular procurement for renovation and new construction projects, and material exchange platforms. The material exchange platforms being tools for re-using materials on the portfolio level of the housing association. First we briefly describe some typical characteristics of the CHARM social housing organisations.

GreenSquareAccord is a housing association in the UK that owns their own factory (LocalHomes) to construct off-site closed panel timber frame constructions, allowing for easy assembly, disassembly and reassembly and re-use of components. Also they employ internal architects to draw the specifications for the panel frame constructions and

dwellings. One of the CHARM projects are virtually-plastic free dwellings making use of the closed panel timber frame constructions. This make their approach quite unique for especially procuring for circularity. The way how *GreenSquareAccord* is working with their own factory is even for the UK situation quite unique. It offers them economic and social value. Social value by employing low-educated people in their own factory. For them this is the way to construct dwellings fast, with a higher quality and cheaper. Also this way of working offers good possibilities for quality control and in this special case to realise virtually-plastic-free houses.

Paris Habitat is a very large social housing organisation in Paris with strict ties to the city of Paris that has high circular ambitions. Also the legislative framework in France gives direction to circularity, especially by the Anti-Waste and Circular Economy law of February 2020 that came into force in 2023. This law compels a PEMD diagnosis: a diagnosis of to be reused materials, if renovating or demolishing properties. (*PEMD: Produit, Équipement, Matériaux, Déchet (Products, Equipment, Materials, Waste)*) *Paris Habitat* is by its size and the immense flow of projects in new construction, renovation and maintenance, a very interesting organisation to cooperate with. Architects, consultants and contractors like to work with *Paris Habitat* and exchange insight in circular projects and the reuse of building components. Also, *Paris Habitat* can explore a material exchange platform for their own organisation with a constant offer and demand of re-used materials.

Zonnige Kempen (in 2023 merged into *LeefGoed*) is a small social housing organisation in Flandres that is very active in searching for new solutions for energy efficiency and renewable energy, and circularity, to be applied in their housing stock. The awareness, knowledge and support of circularity in the whole internal organisation is very high.

The approaches developed by the CHARM partners do not lead to additional financial revenues. Mainly, there are costs involved in making materials re-useable and to construct for future re-usability and waste prevention as well as to develop and maintain the material exchange platforms. For the CHARM partners those costs were partly covered by the InterregNWE program. However, there are approaches that are cost-effective. We will showcase them in this guideline. Also circular practises will become more cost-effective if external costs will be incorporated in economic decision-making, e.g. by the use of CO2-pricing.

3 Circularity definition and ambitions

Organisations like social housing organisations can set circular ambitions for the whole organisation, their portfolio and/or individual construction projects for maintenance, renovation, new construction and demolishing. Circular building and asset management strategies have to be derived from the circularity definition and ambitions.

There exist plenty of definitions of circular economy, circularity, circular construction and circular buildings. We give one definition that clearly describes what a circular building is that gives direction for circular strategies. The Dutch Circular Construction Economy

Transition Agenda 2018 defines a circular building as: “a building developed, used and reused without unnecessary resource depletion, environmental pollution and ecosystem degradation. It is constructed in an economically responsible way and contributes to the wellbeing of people and biosphere. Here and there, now and later. Technical elements are demountable and reusable, and biological elements can also be brought back into the biological cycle”.

For the implementation of circularity several frameworks and strategies have been developed. Circular strategies for buildings can be grouped under four core resource management principles: *regenerate* (i.e., improving human-nature interaction and biodiversity), *narrow* (i.e., reducing primary resource use), *slow* (i.e., extending lifetime of products and buildings through repair and maintenance) and *close* (i.e., recovering materials from downcycling through reuse or recycle) (e.g. Çetin et al., 2021b). The ReSOLVE framework was developed by the EllenMacArthur Foundation to outline key principles of the circular economy. The framework consists of six actions to guide transition towards a circular economy:

1. Regenerate: Regenerating and restoring natural capital;
2. Share: Maximising asset utilisation;
3. Optimise: Optimising system performance;
4. Loop: Keeping products and materials in cycles, prioritising inner loops;
5. Virtualise: Displacing resource use with virtual use;
6. Exchange: Selecting resources and technology wisely.

The ladder of circularity with the ‘R-strategies’, ranging from Refuse to Recover is probably the most known strategies among social housing organisations (Çetin et al., 2021a). Figure 1 shows ten R strategies from high to low potential for circularity.

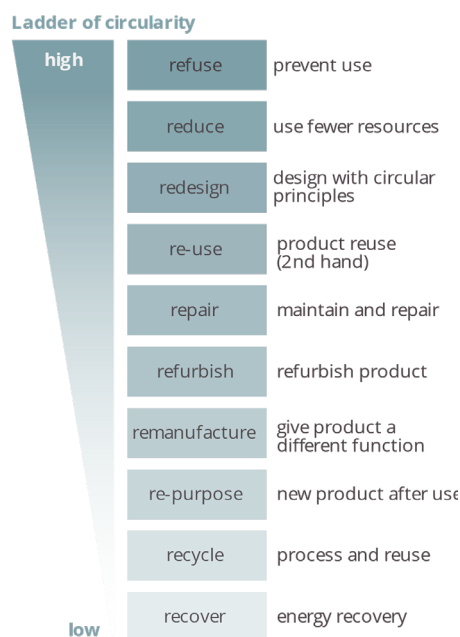


Fig. 1 R-strategies

GreenSquareAccord

GreenSquareAccord applies the 'Waste Hierarchy'. In order to apply the principles of circularity GSA wants to be proactive in thinking about the future use of products and how they can be reused after their life in an initial installation. In developing this view of circularity it is also necessary to be mindful of the final disposal of a product. It is in this context that they have focussed upon the use of plastic.

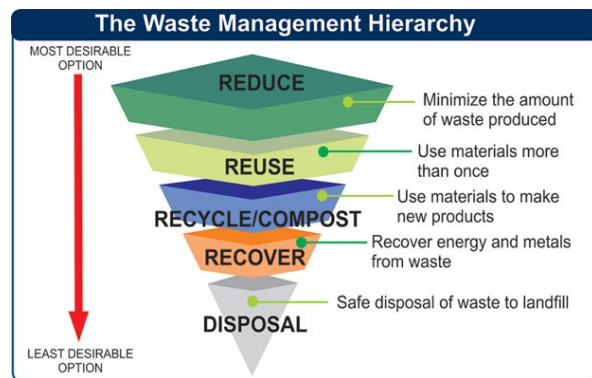


Fig. 2 Waste Management hierarchy applied by GreenSquareAccord

Paris Habitat

The definition of circularity by *Paris Habitat* focuses on reusing materials from construction and renovation operations. One of the circular strategies of Paris Habitat is to converse and repurpose obsolete buildings into affordable housing as part of its core strategy to generate new social housing.

Zonnige Kempen/LeefGoed

Zonnige Kempen has a six-step approach to circularity:

- 1 Decrease the demand of all resources, not only energy and (building)materials, but also time, people, space, maintenance
- 2 Use of renewable sources: materials that are used are as much as possible biobased, healthy, flexible in use and multi-purpose
- 3 Efficient use of resources/ non-renewable resources:
 - co-housing
 - collective use of space and functions (garden, storage, laundry-room, HVAC)
 - re-use and upcycling
 - renovation rather than demolition (because of embedded energy)
- 4 Measure, monitor and evaluate:
 - to increase knowledge of technics
 - testing technics with trial and error because there is no standard
 - adjusting parameters of the collective system to improve outcome (better living conditions and lower energy-cost)
- 5 Coaching, capacity building to the users
- 6 Sharing output, info and experiences with the stakeholders

Recommendation

Make sure that there is one (strategic) vision on circularity. Otherwise, the focus of the organisation will get lost and it will be more difficult to reach the targets.

4 Circular asset management

Circular asset management implies that there should be a policy coherence between clients' circular ambitions and implementation plans, with resources addressing other sustainability objectives, especially carbon neutrality, ecological regeneration and climate adaptation. Starting at the project level might be too late to explore the possibilities to realize the circular objectives, to make proper use of the knowledge of suppliers and others stakeholders, and to learn across the own organisation.

A strategy for learning is first understanding the business-as-usual situation and then by participating in collaborative circular networks, engaging designers, contractors and suppliers in the process.

Sustainable business model canvas

Generally, a business model canvas is used to map how a company creates, delivers, and captures value. The sustainable business model canvas could be used as a tool to educate and inspire the internal and external stakeholders, and becoming aware of all activities, (new) relationships, and financial models within the organisation that should be aligned to implement a circular strategy.

As shown in Figure 3, *the sustainable business canvas* places the triple bottom line – people, planet & profit—at the center of the value proposition and targets to positively impact both society and the natural environment while making profit.



Fig. 3 Sustainable business model canvas (Source: (Bocken et al., 2018))

The sustainable business canvas consists of four distinctive aspects:

- **Value proposition:** It is the core element of a business model that outlines the unique value of a product or service that is offered by a company.
- **Value creation:** It consists of the activities and processes a company undertakes to design, produce, and deliver its products or services.
- **Value delivery:** It relates to how a business ensures that the value promised in the value proposition is effectively delivered to customers.
- **Value capture:** It is the aspect of a business model that addresses how a company generates revenue from the value you provide to customers.

Re-use of materials on portfolio-level using Material Exchange Platforms

Paris Habitat has developed a *digital platform* called Reflexe¹ that covers three digital functions: (1) To list building materials and products in existing buildings that can potentially be reused in another project in the future; (2) To provide stakeholders with reliable and detailed information on the reusable materials and products and (3) To enable stakeholders exchange or trade reclaimed building materials and products. The platform is being used in *Paris Habitat*'s daily operations to reduce waste and downcycling and increase reuse and upcycling.

Zonnige Kempen/LeefGoed created a *physical platform* as a storage place to allow their one employees of the maintenance department to reuse building components in maintenance operations. See also *CHARM D.LT 4.2 Business Plan Material Exchange Platforms*.

The size of *Paris Habitat* guarantees a constant flow of offered and requested materials. Smaller SHOs could cooperate on a local and regional scale within a MEP, and/or cooperate with contractors and re-sellers of 2nd hand materials.

Conditions for the reuse of components (and materials) are:

- Qualities
- Code conformance new regulations
- Easily disassembled / removed
- Easily repaired
- Costs for disassembly, repair/upcycling and storage.
- Users' acceptance
- Storage possibilities.

Re-use of materials on portfolio-level during voids

Paris Habitat is experimenting the re-use of sanitary equipment during void repairs before re-rentals. This approach started with a pilot and is gradually being implemented throughout their portfolio. To do this, the contractors of *Paris Habitat* responsible for void repairs in a specific area work together with specialized resellers of sanitary fittings.

¹ <https://reflexe.parishabitat.fr/>

5 Circular procurement

In “Public Procurement For A Circular Economy - Good Practice and Guidance” the EU (2017) defines circular procurement as: “... the process by which public authorities purchase works, goods or services that seek to contribute to closed energy and material loops within supply chains, whilst minimising, and in the best case avoiding, negative environmental impacts and waste creation across their whole life-cycle.”

There are several ways to apply CE principles in the procurement process that depend on the market conditions and the way supply chain partnerships are organised. Clearly, a traditional procurement approach will not result in the most circular projects. Often circular projects have characteristics of innovation projects. A lot of literature mentions collaboration and engagement as factors of success in innovation projects. A clear definition of circularity understood by all stakeholders, functional open specifications, early collaboration with market actors (‘early contractor involvement’), knowledge of re-use markets, clear and measurable circular indicators and professional contract management is needed.

Ambitions

Several frameworks, guidelines, roadmaps etc. have been designed to realize (high) circular ambitions in new construction and renovation projects, e.g.: ‘Circular Procurement in 8 Steps: Guideline for residential and Non-Residential Construction’ (Van Oppen and Bosch, 2020). The 8 steps are:

1. Define ambition;
2. Creation internal support;
3. Needs setting;
4. Collaboration with market;
5. Procurement process;
6. Measuring and assessing circularity;
7. Secure circularity;
8. Contract management.

Kamp C, partner of CHARM, is partner in the Interreg North Sea Region project ProCirc.² The core of the pilot that Kamp C runs within ProCirc can be summarized as: A package of openly formulated ambitions with a fixed budget challenges the market to form building consortiums and to come up with innovative building solutions themselves. Another guideline was developed in the Interreg Project FCRBE, especially focusing on the reuse of building element and materials: *Reuse toolkit procurement strategies: Integrating reuse in large-scale projects and public procurement* (FCRBE, 2022).

Project delivery methods

The integration of building process phases in project delivery models and contracts is recommendable, think about Design-Build, but – as proven by CHARM partners especially *Paris Habitat* and *Zonnige Kempen/LeefGoed* - circular contracting and tendering is possible

² <https://northsearegion.eu/procirc>

if SHOs use a traditional project delivery method like Design-Build-Build. Especially the specification phase of circular projects is of the utmost importance here.

Before project procurement takes place it is recommended that clients have a market consultation with prospected contractors and designers (and/or consortia) about the circular ambitions and the knowledge of the implementing circular strategies.

Use of framework agreements

Framework agreements with architects and contractor could be used to agree on common circular objectives in a multi-project approach or on the portfolio level. This agreement could be followed by project-based mini-competitions.

Procurement procedures

Within the range of procurement procedures some procedures give more (negotiation) room for the mandatory and voluntary agreements on circular ambitions and e.g. the re-use of materials, being:

- Restricted procedure;
- Competitive dialogue;
- Innovation partnership.

In framework agreements, that could be followed by project-based mini-competitions, main starting points about circular specifications, and measuring and assessing circularity, could be agreed upon.

Specifications

Specifications especially targeting circularity demonstration exemplars / avoiding down-cycling:

- Reuse of materials from demolition on-site or other projects;
- Design and construct for reuse after first use period;
- General specifications re-use of circular components and materials (e.g. % re-use, % bio based materials);
- Amount of plastic use avoided (either volume or weight).

Additional specifications for reuse after first period could be:

- Type of connections between building components and materials;
- Documentation and the use of material passports.

6 Circular procurement CHARM partners

The SHOs faced a lot of common challenges that have to do with a lack of knowledge of circularity amongst (current) stakeholders and supply-chain partners, lack of circular products, and the value and performance of re-used materials and products, including the liability of suppliers because of unknown qualities of re-used materials.

For *GreenSquareAccord* looking for applying non-plastic circular materials, warranty issues and the supply chain seeing additional risks leading to overpricing was a main obstacle.

The knowledge and knowhow of product suppliers could be needed to find solutions for re-use. For the re-use of glass *Paris Habitat* and *Zonnige Kempen/LeefGoed* work directly together with the manufacturer (glass panel suppliers).

GreenSquareAccord: Specifying and designing virtually plastic-free dwellings

Formulating plastic-free specifications and designing plastic-free houses had never been done before. *GreenSquareAccords'* project-specific specification is in essence 'reversed' descriptive: functional and open specifications with a single criterion of the use as little plastic as possible, preferably being plastic-free. Specifications are based upon: (1) plastic-free, (2) functionality, (3) easy to use and (4) cost. Next to those specifications the demo is based upon the detailed descriptive specifications e.g. around safety, comfort, health, durability for the 'traditional' timber-panel dwellings being produced by the self-owned factory LocalHomes.

To source part of the materials was difficult and prolonged. *GreenSquareAccord* had to take different approaches in some of the materials, due to material shortages or it did not meet building requirements, especially regulations on fire safety. They had to work with warranty providers at the very beginning to solidify the specification. GSA applied market innovation contests, by using the principles of 'Dragons Den', to offer non-plastic solutions for common building elements. New plastic-free products were being evaluated on the ease of instalment, further work, service life and maintenance. Also the ease of dismantling for a 2nd use period of the product was an important issue. The factory should be able to work (easily) with the alternatives, e.g. other insulation materials. Also on-site workmen should be able to work with the alternatives. *The show Dragons Den allows several entrepreneurs an opportunity to present their varying business ideas to a panel of five wealthy investors, the "Dragons" of the show's title, and pitch for financial investment while offering a stake of the company in return* (Wikipedia, retrieved July 2020).

The procurement of subcontractors was difficult and prolonged. Due to its unique nature, the procurement should have been done way before the build start. The procurement rules are long and can deter SMEs from applying due to its long process and requirements. So, there was a lack of interest. GSA had to get the construction team on board early on project to allow them to know the practicalities of the build and the different materials used. However, some issues only become apparent when doing the project and some changes have knock on effects that could not be foreseen, i.e. fire regulations.

ZonnigeKempen: Selection of market parties

Zonnige Kempen/LeefGoed became aware of a lack of experienced architects and other supply-chain partners in circularity. *Zonnige Kempen* and knowledge partner Kamp C organised inspiration days and design contests for architects and contractors. In this way contractors and architects were informed about the circular ambitions and working practises of *Zonnige Kempen* and were challenged to become a partner for several new construction and renovation projects in a 'Bouwteam' (early contractor involvement) project delivery method. They articulate that the architect should be 'on board'. This is why *Zonnige Kempen* has made a pool of architects with the same 'DNA' as *Zonnige Kempen*. In the circular projects of *Zonnige Kempen* architects play a very important role, to diagnose the existing situation for the re-use of elements as well as to look for available elements on the second-hand market that could be used in the project. The architects have to design with reused (and biobased) materials and instruct the contractors. Belgium architects have a legal role in applying for the building permit and often they act as supervisors during execution. Maintenance of re-used components and materials

could be part of the contract for a period of 20 years. This could be used as an incentive for the general contractor to implement circularity.

Paris Habitat: Resource diagnosis and the role of architects

The architects play a very important role in the specification phases of the circular projects of *Paris Habitat*. The project-specific specifications are closely related to the diagnosis phase that proceeds the draft and final design. This 'resource diagnosis' is partly steered by the new French Law (2020) on circular economy. Creativity of the architect is of the utmost importance. The architect has to draw scenario's for upcycling, re-use and eventually recycling of reclaimed products, as well in the same projects, the preferable scenario, as in other projects. Part of the scenarios is also the location of the handling of the reclaimed products, storage, cleaning, upcycling activities; preferably at the project site.

Recommendations

- There is a major difference between circular specifications for new construction and for (major) renovation and maintenance. Especially in renovation, re-using elements reclaimed on-site, the specifications process is an iterative process. In renovation projects the diagnosis phase proceeding the design is very important. The assessment itself is hardly to standardise, and depends on the expertise of the assessor (architect) and the given conditions of the client.
- To tender for circular projects it is important to put open questions, to give time for diagnosis and searching for solutions.
- Involve all parties at forehand, such as: architect(s) and demolish partner(s). Zonnige Kempen has created a pool of (circular) architects. But you have to create an incentive to increase the internal motivation as well. The selected architects should have a guarantee getting work for – at least – one construction project.
- Craftmanship is getting more important in reusing materials. The quality of work and knowledge of materials has got to be on a higher level.
- Stimulating and enforcing building product developments based upon circular principles (e.g. non-plastics, non-toxic), the re-use of materials and bio-based materials, can be done by asking open questions and to invite market players to contest and to demonstrate. New products (as in: innovative or alternatives) will take a lot of time to get approved, warranted and used. Just because the product is less or not known in the sector.
- Generally, circular tendering and contracting takes more time than traditional projects. This is especially the case if innovative contractual arrangements are made about the ownership and life-cycle of building products, e.g. by implementing the 'concepts' of product-as-a-service, take-back and buy-resell contracts. This is not surprising for an immature innovative market where demand-side and supply-side actors have to learn.

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