Output Factsheet

Output title:

1.1: DECORATOR Model

DECORATOR – Future for the Planet – Future for Mankind

Implementing a holistic design approach in the building construction industry in the Danube region by connecting the New European Bauhaus (NEB) with the Cradle-to-Cradle (C2C) principles.

Foreword and Context

The DANUBE region can be characterized by specific socio-economic and development challenges of which the most important are migrating flows, aging of population, lack of awareness about sustainability as well as social housing neighborhood to revitalize.

In the EU context, the situation is exemplary for many rural regions facing similar challenges. Results and insights that can be gained from DECORATOR can therefore be adapted to the specific cultural and climatic conditions of other regions.

In the following, a path is described on how a collaborative approach can achieve the target of circular economy in the New European Bauhaus (NEB X C2C).

1. DECORATOR in the New European Bauhaus
2. The DECORATOR Framework
3. DECORATOR Canvas: Basis for NEB X C2C business models
4. The DECORATOR Model: A pathfinder

1 DECORATOR in the New European Bauhaus

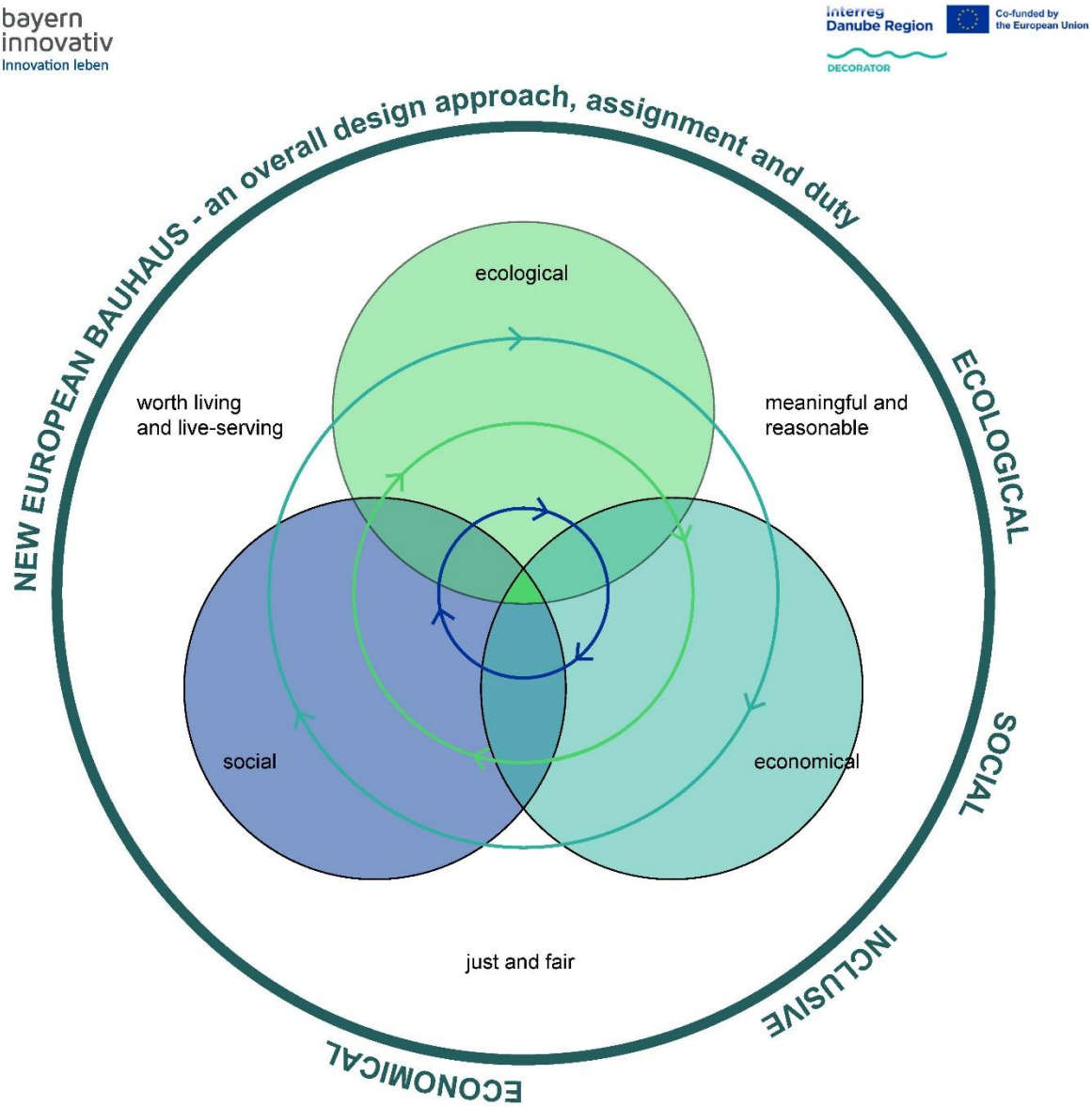
The New European Bauhaus (NEB) initiative as the framework for DECORATOR is an overall design approach that is being developed in an understanding of “design” that goes beyond mere aesthetic solutions. It is a comprehensive design philosophy that addresses the responsibilities and duties necessary to tackle today's challenges. A central role in this approach is played by the Cradle-to-Cradle (C2C) concept, which

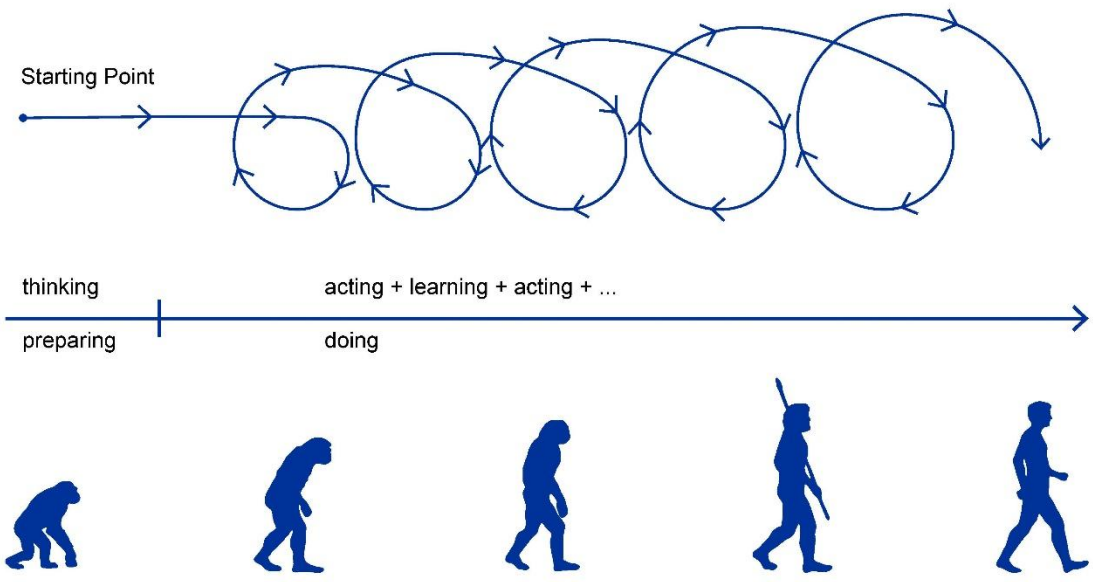
serves as a consequent decision-making structure for the construction industry in the Danube region.

The goal is to create conditions for a good life for as many people as possible in the Danube region. Buildings—whether for living, learning, or working—are a central component of this vision. Moreover, sustainability must not only be a goal but also a desirable state. It is essential to include not simply a facile appeal but in the conception of ethical aesthetics to foster broader awareness and acceptance.

The NEB framework makes the C2C principle accessible and connectable. Here, cultural competence regarding climate issues is indispensable. Ultimately, it is about rethinking the issue of "sustainability": economic, ecological, and social aspects must be interconnected in a way that resonates with people's everyday realities: Ecological and economic solutions should be both meaningful and reasonable. Environmental and

social solutions must be livable and life-serving. Additionally, economic and social





solutions must be just and fair.

The DECORATOR model describes not a recipe, but a consistent decision-making chain aimed at implementing circularity in the construction sector. Cradle-to-Cradle does not mean achieving a slight improvement in sustainability; it demands a radical rethink where excuses are not an option. Therefore, the DECORATOR model is a tool that acts as a companion for decision-making in the construction industry, facilitating the circular economy by fostering the twin transformation.

Regarding the development status on the path to C2C, we must understand that we are still in the preparatory phase. It is crucial to recognize this starting point clearly and to approach the first steps into genuine Cradle-to-Cradle metabolisms with humility. We need to identify where real progress can be made, and from these insights, we must continuously advance through iterations of learning and action. This development can be compared to the evolutionary step of upright walking in humans—it represents a next evolutionary step aimed solely at the survival of our planet.

2 The DECORATOR Framework

The DECORATOR framework aims to integrate sustainability into the construction sector within the Danube region by aligning with the New European Bauhaus (NEB) principles. It emphasizes a holistic approach that includes technical, aesthetic, cultural and inclusive considerations, while applying Cradle-to-Cradle (C2C) principles across three core metabolisms.

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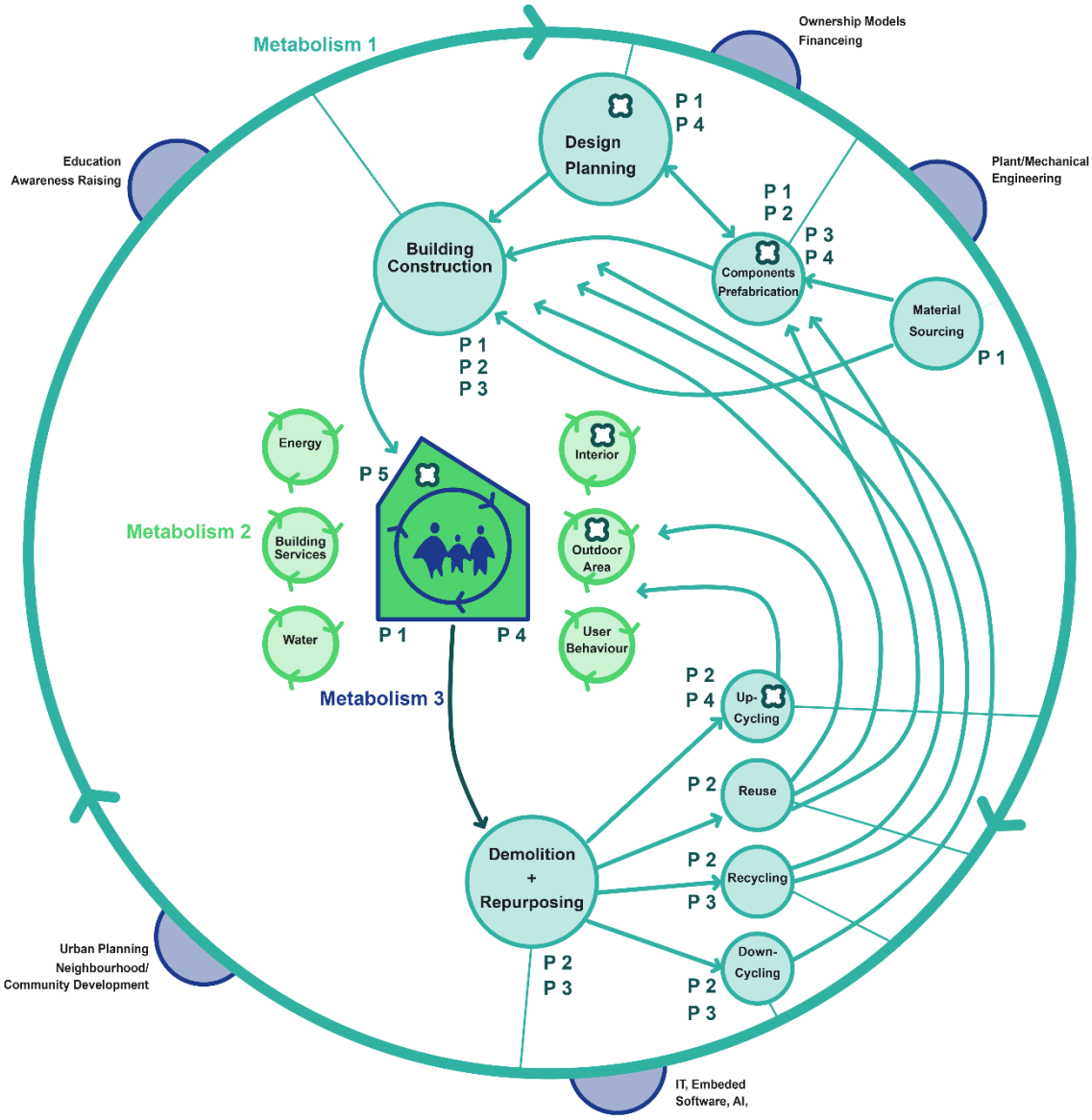


Cradle-to-Cradle Metabolisms

Metabolism 1: Building Construction over Building lifespan

Metabolism 2: Use and Consumption

Metabolism 3: Human being in lifespan

Aspects of Aesthetics

Cross-Disciplinary Connections

5 Pilots

P 1: Materials and Techniques

P 2: Business Models

P 3: Demolition and Repurposing

P 4: Design

P 5: New Vision

In the following the components are described:

A. Metabolisms in the Construction Sector
    1. Building Construction Phase Metabolism
    2. Use and Operation Phase Metabolism
    3. Change of Needs in Human Lifespan Metabolism
B. The 5 Pilots
C. Aesthetics in the DECORATOR Framework
D. The Synapses: Cross-Disciplinary Connections

A. Metabolisms in the Construction Sector

1. Building Construction Phase Metabolism

This phase encompasses the entire lifecycle of a building, from initial design to its end-of-life stages and – most important – re-purposing. Key aspects include:

- **Planning**: Evaluating the actual need for new buildings to avoid unnecessary construction.

  Aspects to be considered:
    - Design for energy efficiency including passive methods;
    - Minimization or elimination of the need for new construction materials by reducing space and multi-tasking space
    - Planning for long term climate change due to weather-related risks such as flooding;
    - Planning for long-term climate change by choosing flexible heating and cooling;
    - Enhancing lifespan maintainability;

- **Design**: Prioritizing materials that can be repurposed and avoiding those containing hazardous substances as well as using Alternative Raw Materials (ARM).

  Aspects to be considered:

  - Substitution of non-renewable energy supply with purchased or produced renewable energy;
  - Use of local and culturally significant materials;
  - Consideration of environmental impact scenarios in design selection (produced and avoided wastes, embodied energy and emissions);
  - Increasing or maintaining green spaces;
  - Design must achieve green building certificates (LLED, BREEAM, GBC, DGNB);
  - Structuring of foundation and building corpus to make it ready for different uses in the future;
  - Design for disassembly;
  - Enhancing of material durability to extend lifespan;
- **Components and Prefabrication**: Utilizing prefabricated elements to optimize resource consumption, bundle processes, create synergies and thus reduce construction time. Above all, this is a precious field for innovation through co-creation of architecture and design, construction companies as well as demolition and re-purposing companies.

  Aspects to be considered:

  - Substitution of fossil fuel intensive materials with bio-based materials;
  - Substitution of new materials with used materials wherever possible;
  - Recovering of waste and energy;
  - Implementation of materials passports to facilitate reuse;
- **Material Sourcing**: Focusing on sustainable, local, and recycled materials, e. g. urban mining. This also includes the question of transport and logistics in general.

Aspects to be considered:

- Reduction of transport by choosing and using local sourcing;
- Recovering of waste and energy;
- Implementation of materials passports to facilitate reuse;

- **Building Construction**: Implementing eco-friendly practices during construction and working in close and cooperative partnership with upstream and downstream areas.

  Aspects to be considered:

  - Limitation of the disturbance of trees, soils and habitat (in terms of impact on the existing quality of land and landscape);
  - Revive traditional construction techniques and materials;
  - Use of abandoned or neglected industrial or cultural heritage sites, prioritizing reuse instead of new constructions;
  - Implementation of brownfield development through hazardous waste remediation and/or solid waste removal on-site;
  - Reuse of salvaged materials from other demolitions;
  - Recovering of materials from project itself (as in the traditional building site).

- **Demolition**: Involving demolition companies as partners, promoting new business models around deconstruction and working closely together with designers and components manufacturers to identify (new) re-purposing possibilities. This also includes the question of storage space and deposition connecting with urban planning and logistics

  Aspects to be considered:

  - Implementation of materials passports to facilitate reuse.
  - Evaluation of options for transformation and adaptive reuse.
  - Implementation dismantling and disassembly and recovery rather than complete demolition.
  - Use of materials for energy recover when no alternative to landfill.

- **Repurposing**: Redefining "waste" through practices like up-cycling, reusing, recycling, and down-cycling, taking into consideration the development of new sustainable business models.

  Aspects to be considered:

  - Creation of new value chains from demolition wastes, e.g. gypsum to fertilize, lumber to wood flooring, reselling of furniture, reselling of building components such as doors, windows, sinks, toilets, etc..
  - Up-cycling can create high-quality design objects that enable increased added value and at the same time contribute to raising awareness.

2. Use and Operation Phase Metabolism

This phase focuses on the sustainable management and operation of buildings during their use, emphasizing energy efficiency and resource conservation. The consumer behavior of the users plays a decisive role here. Therefore, the question of awareness raising is crucial.

Key components include:

- **Energy**: Promoting the use of renewable energy sources, enhancing efficiency and encouraging energy-saving behaviors.
- **Building Services**: Managing heating, cooling, ventilation and water supply through advanced control systems.
- **Water Management**: Using rainwater, promoting infiltration and treating wastewater by integrating blue-green infrastructure.
- **Interior Design**: Prioritizing sustainable furniture and appliances that are designed and manufactured according to the C2C-principles.
- **Outdoor Areas**: Enhancing the micro climatical situation through façade greening, planting trees and shrubs and promoting biodiversity through sustainable gardening practices.

- **Human Behavior**: Frugal consumption, shared economies and the use of common spaces.

3. Change of Needs in Human Lifespan Metabolism

This phase recognizes that human needs change over time, and buildings should adapt accordingly. Key considerations include:

- **Flexible and periodical living models**: Adaptable living spaces and room concepts (flexible, modular, hybrid, floating) that respond to changing family structures, living models or work needs.
- **Universal Design**: Designing spaces that are accessible and usable by all people, regardless of age, needs or ability.

B. The 5 Pilots

DECORATOR implements five pilots, each focusing on specific topics within the framework to test and refine strategies. Suggestions and thoughts on it:

- **Pilot 1: Materials and Techniques**: Emphasizes design, planning, and the use of innovative materials and prefabrication, while also considering human behavior. The regional, cultural and climatic context plays an important role in this field, on the one hand regarding the use of typical regional building materials, which must be tested for their recyclability. On the other hand, the principles of traditional building techniques and methods can make a valuable contribution in dealing with the geographical and climatic conditions of the Danube region.
- **Pilot 2: Business Models**: Focuses on developing new business approaches for components, construction, demolition and repurposing, such as reuse, up-cycling, recycling and own-cycling. The basis is given by answering the questions

from the DECORATOR Canvas (see below) so as not to lose sight of the cradle-to-cradle principles and the context of the New European Bauhaus.

- **Pilot 3: Demolition, Recycling and Repurposing**: Aims to optimize the processes around building deconstruction and the reuse of materials. Demolition companies are becoming important partners in the construction value chain and waste is increasingly becoming a raw material.
- **Pilot 4: Design**: Integrates innovative design practices and explores the role of aesthetics in sustainable construction. Moreover, considering C2C as an overall design approach.
- **Pilot 5: New Vision**: Establishes a broader conceptual framework that connects all elements into a cohesive vision for sustainable construction according to the NEB. The Danube house of the future will become an important prototype from which rural regions in Europe can learn future construction principles.

C. Aesthetics in the DECORATOR Framework

The aesthetic aspect of the New European Bauhaus is central to the DECORATOR project. Rooted in Cradle-to-Cradle principles, the project combines sustainability, functionality, and beauty with a strong focus on ethical values and inclusion. By including artistic approaches, it fosters innovative solutions that are culturally resonant, socially inclusive, and environmentally conscious, aligning aesthetics with ethics for a circular approach.

Therefore, the emphasis on aesthetics within DECORATOR goes beyond functionality, aiming to create spaces that are both aesthetic, inclusive and sustainable. Aesthetics are particularly addressed in:

- **Design/Planning**: Ensuring that the visual appeal is integrated from the start.
- **Components and Prefabrication**: Balancing the aesthetic quality with sustainability.

- **Interior Design**: Choosing circular materials and arrangements that enhance both comfort and style.
- **Outdoor Areas**: Utilizing greenery and landscaping to create pleasant, biodiverse surroundings.
- **Up-cycling**: Transforming old materials into aesthetically appealing new and use- and meaningful products.

D. The Synapses: Cross-Disciplinary Connections

DECORATOR emphasizes the integration of various fields to enhance the holistic approach into areas closely connected to the construction sector:

- **IT, Embedded Software, AI, Robotics**: Applying advanced technologies in material classification, in prefabrication, in logistics, in construction, in use and maintenance and in demolition and repurposing.
- **Plant/Mechanical Engineering**: Improving the efficiency of building components, building construction and repurposing processes.
- **Finance and Ownership Models**: Developing innovative partnerships, like civic-public and private-public partnership and promoting co-housing models including co-operatives.
- **Urban Planning**: Encouraging blue-green infrastructure at neighborhood and city levels by establishing effective environment services. By fostering neighborhoods in community space including room for appliances, co-working and shared guest rooms as well as an effective sharing economy, perspectively less space is needed on household level. Common space should be established by consequently applying C2C. By experiencing C2C in shared surroundings, awareness raises for the added value of sustainability. This contains also the field of development of communities and social awareness around the question “What

are our assets?" This will be translated and transmissioned into different social contexts.

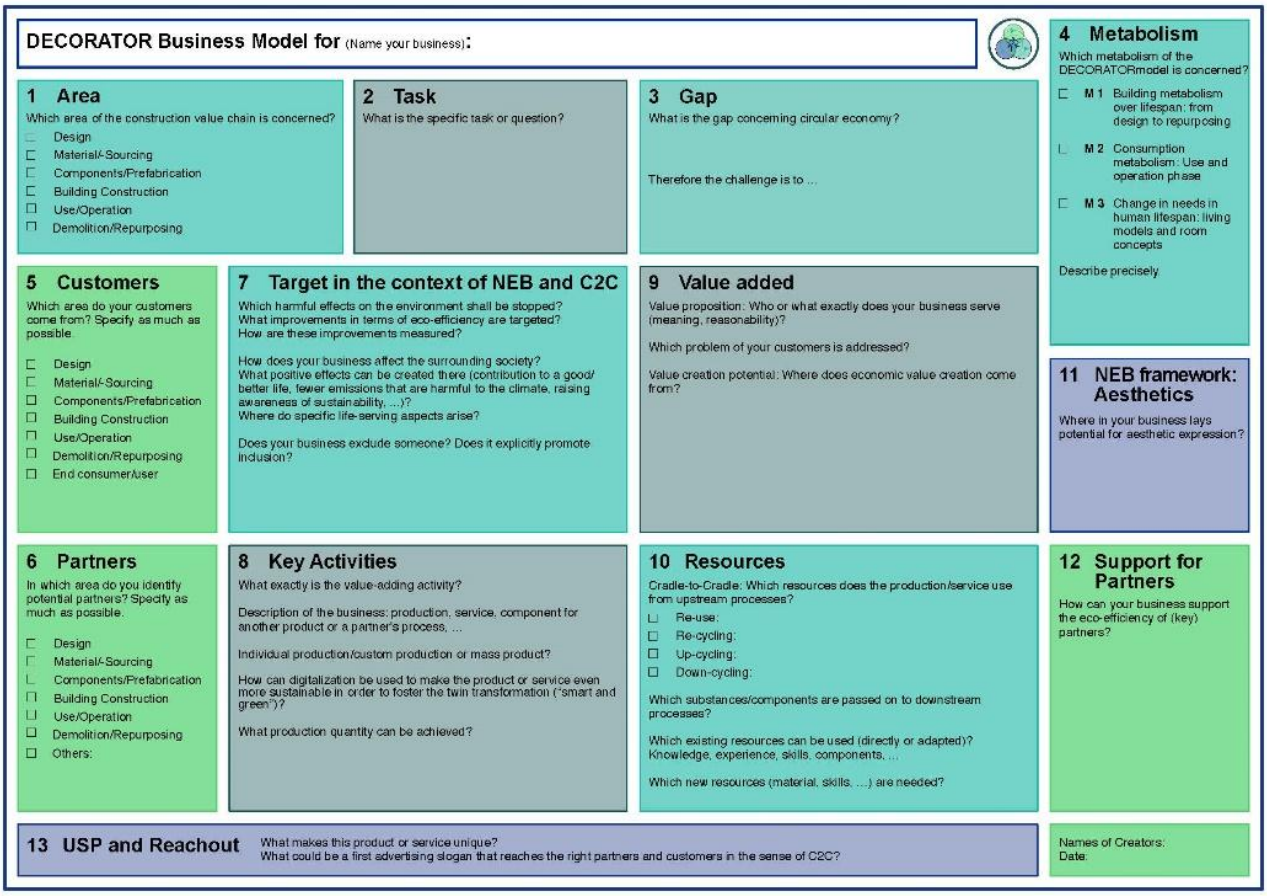
- **Education**: Raising awareness of the value of sustainability in all areas of life and across all levels of society. This needs to be fundamental already in basic education. Education and awareness raising are vital to achieving Cradle-to-Cradle goals. They empower individuals and communities to understand sustainable design, promote responsible consumption, and adopt circular practices. Building knowledge fosters innovation and drives the cultural shift needed for a circular economy.

A Business Model Canvas is a strategic tool for developing and visualizing a business model in a single, clear, and concise template. It helps entrepreneurs, startups, and established businesses outline their key business elements and determine how these parts work together to deliver value.

The Business Model Canvas helps teams visualize all aspects of a business on one page, making it easy to analyze and improve upon the model iteratively. The tool's layout is designed to be simple and intuitive, enabling teams to brainstorm and communicate ideas effectively.

In the context of DECORATOR, a business model has to be developed within the NEB framework and with the uncompromising commitment to the circular economy in the sense of the cradle-to-cradle approach. For that, the DECORATOR Canvas was developed to develop sustainable business models that correspond to the circular approach of C2C and at the same time incorporate the core aspects of the New European Bauhaus. It poses the questions that must be answered in advance to be able to serve this consistently sustainable approach.

DECORATOR Canvas visualization:



The DECORATOR Canvas calls on the following components:

1	**Area** Which area of the construction value chain is concerned? More than one area can be affected. – Design – Material/-Sourcing – Components/Prefabrication/Building Construction – Use/Operation – Demolition/Repurposing
2	**Task** What is the specific task or question?
3	**Gap** What is the gap concerning circular economy? What is therefore the challenge?
4	**Metabolism** Which metabolism of the DECORATOR Model is concerned? Describe precisely. M1: Building metabolism over lifespan: from design to repurposing M2: Consumption metabolism: Use and operation phase M3: Change in needs in human lifespan: living models and room concepts
5	**Customers** Which area do your customers come from? Specify as much as possible. – Design – Material/-Sourcing – Components/Prefabrication/Building Construction – Use/Operation – Demolition/Repurposing – End consumer/user
6	**Partners** In which area do you identify potential partners? Specify as much as possible. – Design – Material/-Sourcing – Components/Prefabrication/Building Construction – Use/Operation – Demolition/Repurposing – Others:
7	**Target in the context of NEB and C2C** Which harmful effects on the environment shall be stopped?

	What improvements in terms of eco-efficiency are targeted? How are these improvements measured? How does it affect the surrounding society? What positive effects can be created there (contribution to a good/better life, fewer emissions that are harmful to the climate, raising awareness of sustainability, ...)? Where do specific life-serving aspects arise? Does it exclude someone? Does it explicitly promote inclusion?
8	**Key Activities** What exactly is the value-adding activity? Description of the business: production, service, component for another product or a partner's process, ... Individual production/custom production or mass product? How can digitalization be used to make the product or service even more sustainable in order to foster the twin transformation ("smart and green")? What production quantity can be achieved?
9	**Value added** Value proposition: Who or what exactly does your business serve (meaning, reasonability)? Which problem of your customer is addressed? Value creation potential: Where does economic value creation come from?
10	**Resources** Cradle-to-Cradle: Which resources does the production/service use from upstream processes ("fruit or fertile soil")? – Re-use – Re-cycling – Up-cycling – Down-cycling Which substances/components are passed on to downstream processes ("nutrient or fertilizer")? Which existing resources can be used (directly or adapted)? Knowledge, experience, skills, components, ... Which new resources (material, knowledge, skills, ...) are needed?
11	**NEB framework: Aesthetics** Where in your business lays potential for aesthetic expression?

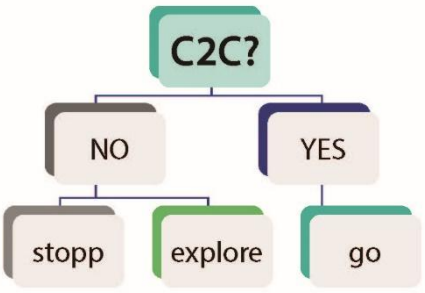
12	**Support of Partners** How can your business support the eco-efficiency of (key) partners?
13	**USP and Reachout** What makes this product or service unique? What could be a first advertising slogan that reaches the right partners and customers in the sense of C2C?

4 The DECORATOR Model: A Pathfinder

The DECATOR model develops and tests a new model of collaboration and intervention structured around the cradle-to-cradle (C2C) approach: Building materials as nutrients in metabolic building cycles and processes designed to prolong quality of raw materials to eliminate idea of waste altogether.

It is a model that breaks professional silos, nurtures collaboration between sectors and functions, forms new alliances between technology and culture, and incorporates social innovation. At the same time, it combines digitalization, green technologies and aesthetic elements to push the sustainable innovation of the construction sector.

The DECORATOR model is therefore a supportive frame tool encompassing a consistent decision-making chain aimed at facilitating circularity in the construction sector. The following steps correspond with the DECORATOR Canvas.



1. Identification of area concerned (Section 1 Area)

To apply the DECORATOR model, begin by identifying the area of the respective concern, problem or question. This step seems simple, but it is important to name the basis situation and consider, that one or more areas can be affected.

The concern can come out of the area of

- Design

  - Need of construction and building design (e.g. the Circular Building Toolkit https://ce-toolkit.dhub.arup.com/framework can be used)
  - Design for Disassembly (DfD)
  - Process design
  - Project design
  - ...
- Material Sourcing
  - raw material
  - mining
  - logistics
  - ...
- Components and Prefabrication
  - material
  - recycling
  - serial production
  - ...
- Building Construction
  - material
  - technologies
  - specialization
  - ...
- Use or Operation
  - user-/consumption behavior
  - cost efficiency
  - maintenance
  - ...
- Demolition and Repurposing?
  - Up-cycling
  - Reuse
  - Recycling
  - Down-cycling
  - ...

2. Identification of field concerned (Sections 5 Customers, 6 Partners, 9 Value added, 10 Resources, 12 Support for Partners)

Next, determine the specific field involved. Basically, in each area every field below can be concerned according to the value chain and to answer the question of potential partners or customers Moreover, this is the issue where added value is created.

Within the identified area, in which field lays the pain point?

- Material?
    - Database
    - Material passport
    - ...
- Techniques?
    - Adapting tradition?
    - Robotics?
    - ...
- Business models?
    - Value proposition in circular economy
    - Circular supply chain platforms and marketplaces
    - Product-as-a-Service (PaaS)
    - Urban Mining/Resource Recovery
    - Take-Back Schemes
    - Extended Producer Responsibility (EPR)
    - ...
- Repurposing?
    - Up-cycling
    - Reuse
    - Recycling
    - Down-cycling
    - ...

3. Definition of the specific task or question to address (Sections 2 Task, 3 Gap)

Asking the right questions is crucial in the context of C2C. Only in this way can the door to new, sustainable solutions be opened. The consciousness of existing gaps concerning circular economy is the basis for defining the very challenge the new solution must address.

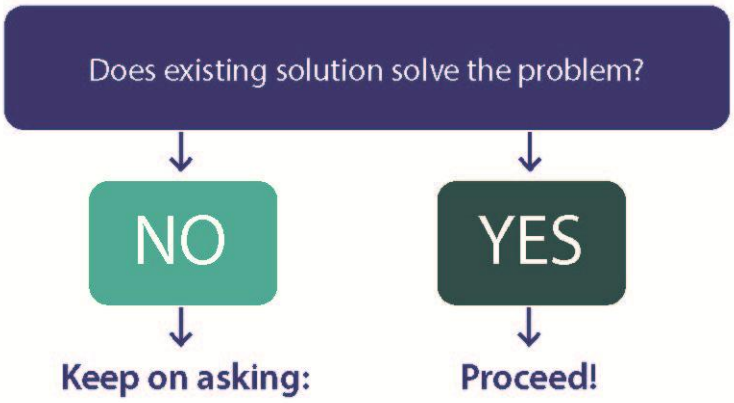
The following questions must be thoroughly and comprehensively answered:

- What exactly is the issue at hand?
- Concerning this issue: What is the existing gap in the circular economy that is associated?
- What is therefore the challenge arising from this gap in respect of finding a sustainable solution?

4. Pathfinder

Within the DECORATOR frame options for appropriate solutions can only be in consideration of the C2C-Principles. This means taking a close and holistic look at existing solutions and their contribution to the goal of a circular economy within the New European Bauhaus. To repeat and emphasize: Cradle-to-cradle requires new decisions that do not include excuses. On this basis, existing solutions are to be evaluated for their utility and appropriateness. If an according solution exists, it can be proceeded. However, many of our problems and challenges exist because the known and established solutions contradict the circular economy. New alliances and partnerships are needed to develop sustainable solutions that require new forms of cooperation and collaboration.

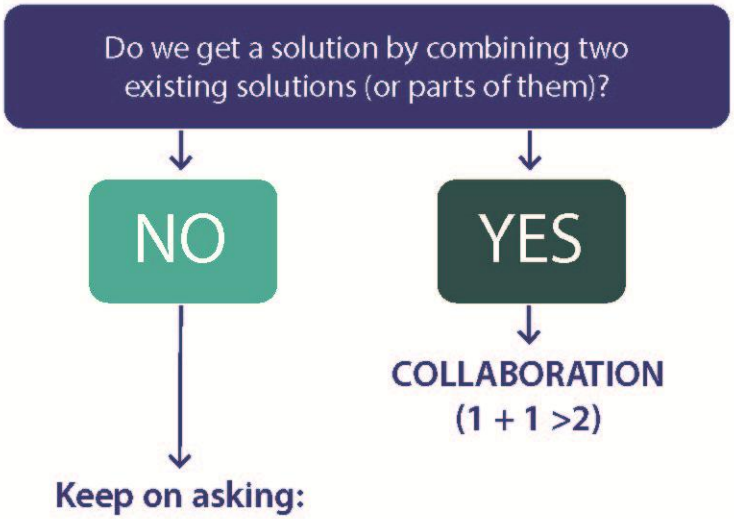
Therefore, the DECORATOR Model drafts an approach that promote the proactive collaboration among different actors in the construction sector to enhance sustainable innovation. Recommendations are given for tools corresponding to the five pilot projects. This toolset emphasizes the effective use and adaptation of existing tools, leveraging extensive research and piloting activities conducted within EU projects and especially in the HORIZON2020 framework. These tools and methods are capitalized on by transferring their insights and applications to new contexts (see also outcomes of the Capitalization Workshop (D1.1.1)), ensuring broader impact and scalability across diverse scenarios.



4.1 Solutions by collaboration (1 + 1 > 2)

Collaboration is to be considered as the constitutive core of the DECORATOR Model, reflecting the underlying idea of DECORATOR. Developing new solutions by combining parts or core principles of existing solutions can lead to new, sustainable approaches that foster the circular economy. This can also mean the synergetic combination of solution parts or strategies from different partners from the same industry or within the construction value chain (so-called horizontal or vertical cooperation). The greatest challenge lies in overcoming existing competitive habits and dynamics, as market competitors may need to become collaborators. This shift opens new opportunities for advancing circular economy goals. The initial phase is particularly challenging, requiring the identification and establishment of new partnerships, guided by sincere answers to the questions of the DECORATOR Canvas. Partnerships may also need to span diverse sectors, recognizing the importance of open innovation processes.

Solutions in the field of collaboration can derive from the combination of elements of existing solutions by leveraging the synergy of collective efforts.



Possible tools for collaboration:

The tools must be understood in their core principles to be transferred to the DECORATOR context in a targeted and added value manner.

- CINDERELA (Business Models, Pilot 2), https://www.cinderela.eu
- BAMB (Materials, Pilot 1), https://www.bamb2020.eu
- RIBA (Repurposing, Pilot 1, 3, 4, 5) https://www.bayern-innovativ.de/de/seite/interreg-projekt-riba-recycling-in-use
- OFFROOM (Materials, Pilot 1, 4) Ofroom - Material Service Tool
- REDUCE REUSE RECYCLE (Materials, Pilot 1, 3, 4) http://www.reduce-reuse-recycle.info
- SMAR CIRCUIT (Circular Innovation, Pilot 4, 5), https://www.interreg-central.eu/projects/smart-circuit/
- KARMA (Pilot 3), https://www.interregeurope.eu/karma

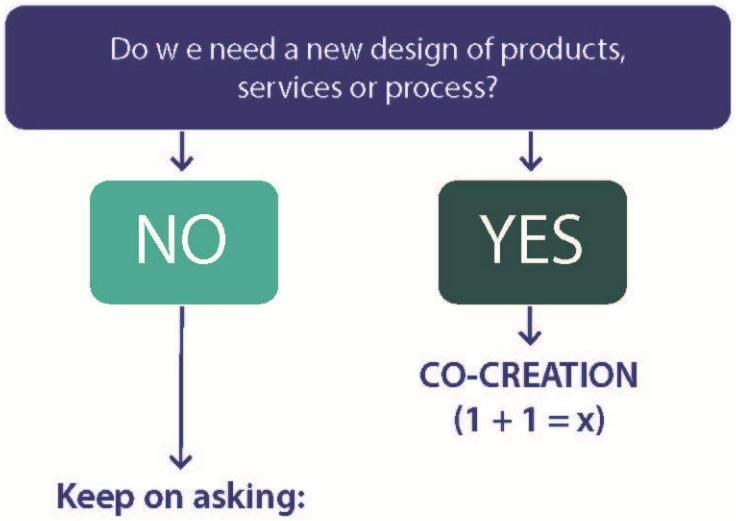
4.2 Solutions by co-creation (1 + 1 + X = Y)

If neither existing solutions nor the combination of parts of different solutions lead to the targeted result, completely new products, services, or processes need to be

designed by fostering innovation through cross-sector collaboration. These approaches emphasize a mindset of possibility and encourage the exploration of creative tools and methodologies to achieve sustainable and circular outcomes.

Established methodological approaches to supporting co-creation are Design Thinking, Open Innovation and Cross Innovation. Design Thinking is a human-centered, iterative approach to problem-solving that combines creativity, collaboration, and analytical thinking to develop innovative solutions tailored to user needs.

Open Innovation focuses on leveraging both internal and external ideas to accelerate innovation, often involving partnerships with external stakeholders like customers or universities. Cross Innovation, on the other hand, emphasizes collaboration across different industries, combining diverse expertise to create novel solutions. While Open Innovation seeks broader input, Cross Innovation thrives on interdisciplinary exchange.



Possible tools for co-creation:

- SMAR CIRCUIT (Circular Innovation, Pilot 4, 5), https://www.interreg-central.eu/projects/smart-circuit/
- ENGANGE4BIO, (Multi-stakeholder engagement, design thinking, co-creation, (re)training and skills development), https://www.engage4bio.eu

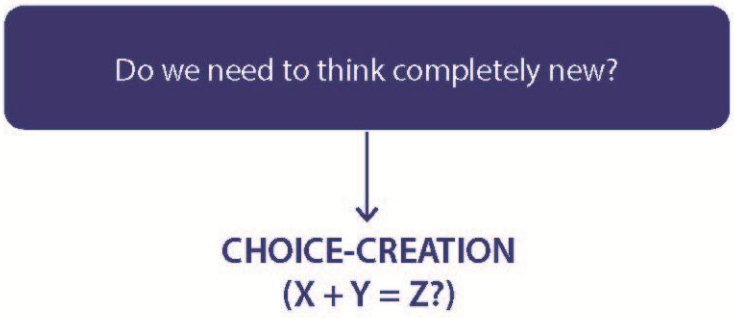
4.3 Do we need to think completely new?

If we do not achieve our goal – realizing the New European Bauhaus by using the green and digital transformation to foster cradle-to-cradle solutions within the construction value chain – then we need to find and develop new possibilities and choices. This requires transforming "impossible" into "potentially possible" thinking – a shift in mindset and approach.

This process often begins by examining the challenge at an earlier stage, where preconceived limitations and rigid structures have not yet solidified. By starting at this foundational level, there is more room for creativity and exploration, enabling the identification of opportunities that might otherwise go unnoticed.

Additionally, adopting a superordinate perspective can provide clarity and insight. By stepping back and viewing the problem from a broader vantage point, patterns and connections that are not immediately apparent can emerge. This holistic view often reveals alternative pathways or solutions that lie outside conventional frameworks.

Equally important is maintaining a heightened awareness for disruptive innovation. Staying alert to unconventional ideas, emerging technologies, and shifts in societal or market dynamics can serve as a catalyst for groundbreaking solutions. These elements, when combined, create a fertile environment for turning seemingly impossible challenges into transformative possibilities.



Afterword

With our current level of knowledge, NEB X C2C is a targeted, holistic approach for the construction sector, but it has high standards. This requires genuine and

uncompromising decisions. With the DECORATOR approach, the members of the construction value chain in the Danube region can take on a pioneering role in Europe.