Coordination of Circular Economy in the construction sector

TRACING & MONITORING

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Notes

Defining circular economy

What? **Decoupling value creation from consumption of finite resources.**

How? The circular economy is a model of production and consumption where existing materials and products are shared, leased, reused, repaired, refurbished and recycled to the greatest extent possible. By doing so, the life cycle of the products can be extended.

In practice, this means reducing waste to a minimum. After a product has reached the end of its lifespan, these resources and materials remain in the economy as long as possible. They can be used productively again and again to continue generating value.

Why? **The European Green Deal explicitly defines circular economy as the instrument for a sustainable urban habitat in the 21st century.**

Rising demand for raw materials and scarcity of resources: A number of important raw materials are only available in limited quantities. As population increases, so does the demand for raw materials.

Impact on the climate: Mining and use of primary materials has a significant impact on the environment. In addition, the consumption of these raw materials increases energy consumption and CO_2 emissions. A smarter use of resources can reduce CO_2 emissions.

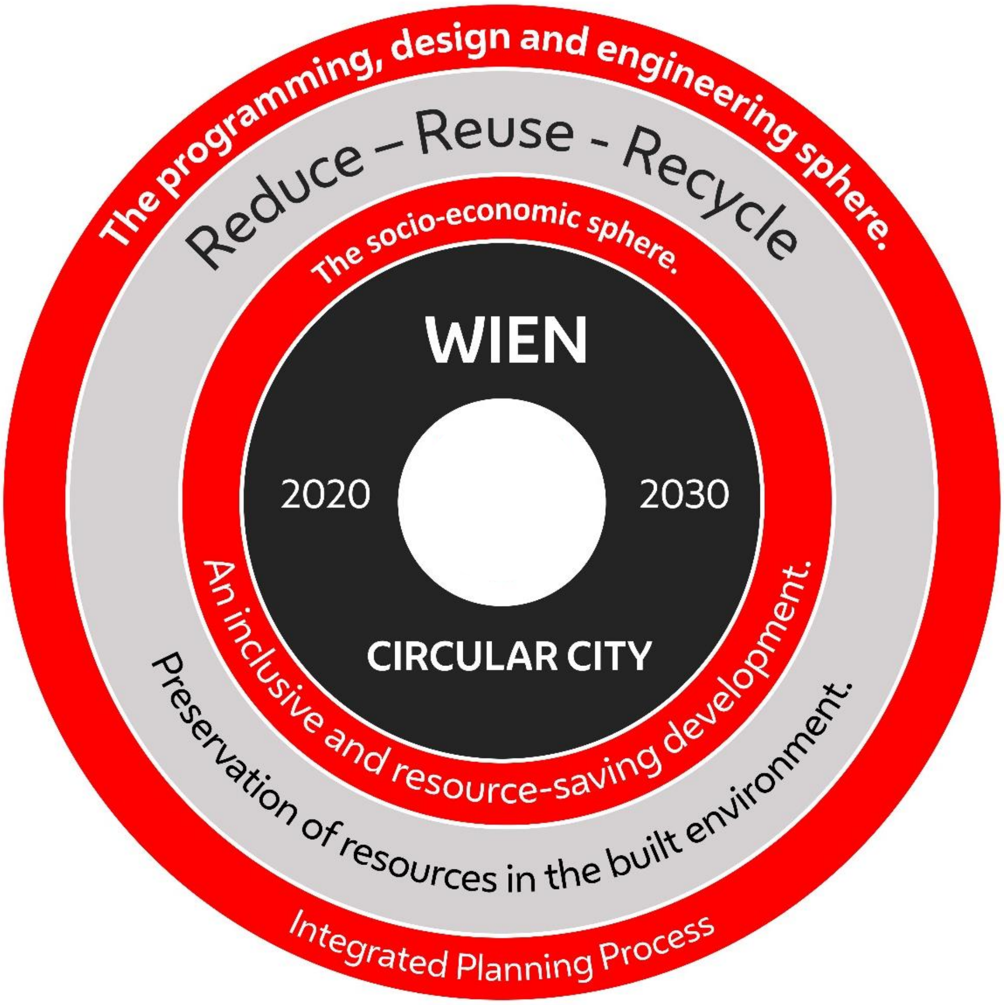
Dependency on other countries: Some EU countries are in need of feedstocks from other markets.

Advantages? **Minimized** pressure on the environment,

Increased security of resource supply,

Enhanced competitiveness,

Innovation, growth and employment.



Two scopes:

CONSTRUCTION Planning, design, technical sphere.
Focus: integral/holistic planning process, life cycle assessment

ECONOMY Socio-economic sphere
Focus: Orientation towards the common good, consideration of secondary resources in tenders

Levers for Transition - DoTank Circular City Wien 2020-2030 (DTCC30)

1. Defining the **VISION**, including roadmap and monitoring
2. **COMMITMENT** awareness raising through role modelling and knowledge transfer.
3. **URBAN MANAGEMENT** anchoring circularity in public procurement, creating a cadastre for urban metabolism.
4. **ECONOMIC BENEFITS** grants, subsidies, public-private partnerships for integral design process and life-cycle execution and sustainable building operation.
5. **GOVERNANCE** Legislation and policy create the conditions for a Circular City, with accompanying information campaigns and European networking.

Transition activities - projects for implementation - scale up!

- Raising awareness of circularity within the administration and civil society, as well as business stakeholders.
- Encouraging circular business models such as "product as a service".
- Embedding circular economy and life cycle considerations into urban planning, building code/regulatory/standards, infrastructure, and asset management processes.
- Public procurement as a lever to promote the market for circular products and services.
- Providing economic, fiscal incentives to stimulate circular behaviour that benefits the public good.
- Improving the local regulatory framework that enables secondary material markets, repair, reuse, and exchange programs.
- Establish appropriate monitoring methods for surveying progress in improving the circularity factor.

Checklist circular economy in construction

(building construction, infrastructure, open space)

1. Basic Evaluation - Programming - Preliminary Planning

a) Approach - according to circular economy principles vs. conventional

Building owners / stakeholders are informed about the following aspects:

☐ Risk avoidance and future-proofing with regard to future developments (e.g., rising material prices due to to shortages),
☐ Health (freedom from harmful substances),
☐ Comfort (convertibility and ease of use),
☐ Disposal challenges.

The project is deconstruction for reuse- and recycling-friendly by considering the following parameters:
☐ Use of sustainable, low-pollutant building materials,
☐ Construction method/manufacture allows for separability and flexibility,
☐ representation of the aforementioned in the integral planning process.

b) Promote visibility of sustainability in the built environment

☐ Is it possible through preserving the existing / in situ to promote identification with the built environment and thus create a lasting value
☐ Is the deconstruction of the existing building structure planned in a way that guarantees maximum reuse and recycling of the building elements, products and materials?
☐ Scaling and narrative framing: does this project actually serve as a model for other planners, builders, etc.?
☐ Will this project create the opportunity for circular living for our citizens (e.g., repair cafe, alteration tailoring, mobility)?

c) Integration of component reuse and use of secondary materials in a holistic concept

☐ Are all the entities contributing to a circular project integrated or at least informed?
☐ Through initial planning sessions, were any areas identified for potential application of reused components or secondary raw materials?

d) Check availability of pre-owned components

☐ Which quantities are available, which are needed?
What are specific possible applications in the project?
Is a component exchange paltform available that offers suitable components in stock?
Are there buildings in the region that will soon be deconstructed?
☐ Are certain components or materials offered for reuse by the manufacturers themselves?
☐ Can manufacturers refurbish reusable components and restore warranty?
☐ Is it known before dismantling where and how a component will be used in the future?

e) Check availability of secondary resources

☐ In the case of deconstruction of building substance / structure, or accumulation of excavated material, etc.: Can the project serve as a secondary resource supplier?

☐ Is in-situ or near-situ reuse recycling of the harvested materials possible?
☐ Is it possible to meet own material demands via trading platforms for secondary resources or other services?

f) Check the feasibility of reusing available components and secondary raw materials

☐ Are any demolition materials recoverable from the existing building suitable for reuse in the specific project?
☐ Which components and materials are most relevant to the specific project, and have alternatives been evaluated for their use?
Criteria: Mass, replacement quantity, material value/requirements, lifetimes, availability, cost

g) Life cycle cost consideration

☐ Are life cycle cost calculations made available to the building owner/stakeholders?
☐ Are disposal costs taken into account during operation - conversion, modernization, change of users, etc.?

2. Design phase and detailed engineering

a) Considering the demolition hierarchy during the planning phase - " Think from the End!"

☐ Dismantling concept: Is future reuse and recycling comprehensively prepared?
☐ Does the design of the project enable sort-clean separation and high-quality recycling or reuse of components and building materials?
☐ Has a life cycle assessment been completed, especially if it is highly unlikely that the components and building materials can be reused or recycled?
☐ Does the engineering ensure the smooth and, if possible, independent removal and replacement of components that need to be renewed frequently (e.g. floor coverings)?
☐ Does the design take into account the "cohabitation of components" with a similar service life?
☐ Is the project designed to be flexible in use so that it can be used "as is" for as long as possible?

b) Recycling /reuse oriented documentation

☐ Is a material or building passport created??
☐ Will Building Information Modeling be used and when completed, will an "As Built Model" be delivered to the building owner?

c) Complexity reduction " building in a simple way"

☐ Can the complexity of the project be reduced? E.g. number and types of joints
☐ Are appropriate (traditional) joining techniques considered?
☐ Is the construction / implementation / design planned to be use-neutral and allows high flexibility with regard to further use?
☐ Is the construction really easily deconstructable and correctly sorted?
☐ Can the joints be released non-destructively even after years of use?
☐ How high is the level of prefabrication?
☐ Are standardized, serialized form factors used that encourage later use?
☐ Can installations be easily accessed so that modifications, replacements and maintenance can be carried out while the system in use?

d) Alignment of lifespans, as well as the sequence of future modernization or refurbishment activities

☐ Are the service lives of used building materials coordinated to ensure no intact component or building material is affected by future refurbishment activities?
☐ Is the choice of materials limited to a minimum of variety and do they match well?

e) Pollutants and contaminants, quality of materials used

☐ Are environmental impacts considered and is single sort separation prepared for composite materials?
☐ Is the value of materials used high and are they suitable in principle for later high-quality use?
☐ Are the building materials used low in pollutants and emissions, and is embodied grey energy taken into account?
☐ Do the manufacturers of the installed products take them back at the end of their service life? What is the expected recycling path according to the take-back declaration?

3. Tendering and contracting

a) Goal setting

☐ Is a clear objective defined to be followed in planning, tendering and contracting? (e.g. "No waste leaves the property")

b) Reuse, deconstructability and recycling as subjects of procurement

☐ Is the reuse of components and the use of secondary resources integrated into the tender? (e.g. by definition of a reference product with x% secondary content)
☐ Is the aspect of deconstructability integrated into the tender? (e.g. via detailed description of the planned reversible joints)
☐ Is the procurement of (selective) demolition focused on the goal of maximum recovery of primarily mineral demolition waste?
☐ Is a deconstruction bill of quantities that takes into account rigorous separation of recyclables and early end-of-waste applied?

c) Involve manufacturers, deconstruction and recycling companies

☐ Does the procurement motivate dismantling companies to cooperate with recycling companies
☐ Are deconstruction experts as well as recycling experts encouraged to actively participate in the integral planning process?

4. Commissioning, use and conversion/deconstruction

a) Create acceptance among users and other stakeholders

☐ Does proactive communication increase acceptance and awareness of circularity among users
☐ Are appropriate formats used to communicate the use that corresponds to the design? (e.g. through introductory events, user guides, webinars, mailings, guided tours, etc.)

b) Preparations for the highest possible use of resources

☐ Is deconstruction/removal truly the agent of choice?
☐ Is deconstruction /removal avoidable through repurposing and/or redevelopment??
☐ Is it possible to determine a future use for the majority of the materials before they are deconstructed?
☐ Is appropriate reuse/recycling anticipated?
☐ Is it possible to reduce the proportion of demolition waste going to the landfill (e.g. by using an expert assessor to allocate components to waste fractions)?

Impact assessment in the area of tension

Climate protection - Climate Change Adaptation - Resource Conservation

Three co-equal goals for a sustainable built environment:

1. **CLIMATE PROTECTION / Zero Emission City:**
   Necessary implementation of greenhouse gas reductions
2. **CLIMATE CHANGE MITIGATION / Resilient City:**
   Adapting our habitat, ensuring future fitness
3. **RESOURCE PRESERVATION / Circular City:**
   Reduction in raw material consumption

☐ Does the project pursue the three goals of climate protection, climate change adaptation, resource conservation?

☐ Is it taken into account that no conflicts of objectives are produced? (e.g. designs that cannot be re-circulated are impossible to retrofit later! Please do not plan any "worse improvements"!)

☐ What is the priority ranking for this project? Please rank the priority:

1 | 2 | 3 | Climate Protection
1 | 2 | 3 | Climate Change Mitigation
1 | 2 | 3 | Ressource Preservation

Explanation of the context:

Global warming is a consequence of a lack of climate protection, or it has been realized too late. Currently we as individuals are beginning to feel the effects of climate change. By walking through the world with open eyes, we can independently discover the effects that science has been warning about for many years.

There is no doubt that decarbonisation – i.e. the reduction of GHG emissions to zero – must be the overriding goal if we want to preserve our habitat.

At the same time, we have to adapt to the changes that are still to come This means designing our habitat to be as resilient as possible to be prepared for future climatic events - e.g. heavy rainfall, longer periods of heat, urban heat islands, etc.
This is precisely where adaptation to climate change comes in, the area that was first identified in the Brundtland Report as a topic of intergenerational justice.

Conservation of resources, Circular City's area of operation, developed from a different insight. Indeed, the industrialised countries have achieved their prosperity partly due to the global exploitation of natural resources. Pleasingly, the standard of living is improving globally, which leads to increasing consumption of resources which the earth can no longer cover from primary resources alone.

Therefore, especially industrialized countries need to drastically reduce their material footprint and at the same time keep the resources already used regionally in circulation. Instead of constantly consuming new primary resources.

An example illustrating this:

If the production of building products is decarbonised, then this has to be added to climate protection. However, when we succeed in reusing these building products instead of recycling them, then an interrelation results.

On the one hand, energy is saved because the product is used as it is elsewhere - climate protection - and on the other hand, no new materials need to be mined for this product - resource conservation.

Furthermore, saving resources contributes to reducing land consumption, preserving biodiversity and natural resources.