Course Unit #4

From Construction Waste to Sustainable Architecture

These FURTHER RESSOURCES are part of the training course "Green Cities for Our Future", Published by GIZ, June 2021.

FURTHER RESSOURCES

CONTENT

Implemented by CONSTELLATIONS International and it's CITYMAKERS China-Europe Team.

Disclaimer: These Further Ressources have been compiled in order to provide supplementary information on the projects and stakeholders, presented in the training programme "Green Cities for Our Future".

The authors refer to existing knowledge and cannot take responsibility for the completeness of the presented material.

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Course Unit: From Construction Waste to Sustainable Architecture

A) Further Resources – Project Profiles

Project Title	**Cradle to Cradle NGO**
About the Project	Cradle to Cradle NGO is a **non-government organisation** based in Berlin, aiming to further integrate the Cradle to Cradle principle into the production of goods and materials. Cradle to Cradle describes the **safe and infinite circulation of materials in cycles**. The re-design of products and materials, becoming fully recyclable is to **prevent the generation of waste**. Cradle to Cradle (C2C) NGO developed several instruments to further strengthen the integration of the principle into economy, science and civil society. Most important instrument is the **educational work and networking activities of the organisation**. In that regard the NGO initiated the C2C congresses, connecting over 1000 actors in the field, and the C2C LAB, an educational centre teaching interested parties the Cradle to Cradle principles. Cradle to Cradle NGO is highly active in the building sector, **aiming to create buildings that are beneficial for the climate, biodiversity, and the environment and ending the waste generation of the building sector by promoting the incorporation of the Cradle -to -Cradle principles into the design of the built environment**. The ground-breaking refurbishment of the C2C NGO headquarters in Berlin, strictly following the C2C principles, demonstrates the potential of C2C in the building sector.
Actors and Financing	C2C NGO is an independent organization operated by the C2C headquarters in Berlin with approx. **30 staff members** and over **1000 volunteers** in 40 regional groups across Germany, Switzerland and Austria. The NGO is financed by donations from the civil society and corporations.
Status & Timing	Cradle to Cradle NGO was founded 2012 and opened up its C2C LAB, an educational center for teaching the principles of the C2C concept in 2019.
Innovative Aspects	The Cradle to Cradle concept is a very innovative approach which helps to combating climate change and thus it is highly relevant for the building sector. By designing building materials and components with the re-use and recycle phase in mind, those **materials and components can be reused in an endless cycle**. A further integration of Cradle -to -Cradle principles into the design of our built environment can therefore **end the generation of waste**, as well as negative impacts on the climate, landscape, biodiversity and health, caused by the mining or production of new building materials and components. Within the Cradle to Cradle principles, **buildings are seen as material banks** in which the value of finite resources is preserved as the buildings are fully removable and C2C-materials can be re-used endlessly. Besides the environmental and health aspects, this enables new, circular business models within the building and construction sector. **C2C NGO is therefore carrying out the important task to further promote this innovative concept through organising informational and educational events**, such as the C2C Congresses or by direct cooperation with companies and municipalities. In this regard the C2C NGO could already **convince several companies and municipalities to integrate C2C principles into their design and planning**.
Contact	Cradle to Cradle NGO, Department for Cities and Towns: MAIL
Further Resources	Link to the Cradle to Cradle Congress programme 2017: C2C future of building and architecture Link to the C2C Summit Building and Architecture

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A) Further Resources – Project Profiles

Project Title	**Reuse of building components, initiated by the State of Berlin** **Case: Disassembly and Reuse of Windows from the Free University of Berlin executed by the company Unnerstall Ltd.**
About the Project	The State of Berlin and the responsible Senate Department for the Environment, Transport and Climate Protection is leading in **adopting and implementing sustainable procurement policies.** In regard to construction material, they **require the use of sustainable and climate friendly materials**, make a **share of recycling material mandatory and promote the reusing of existing materials** in building construction and civil engineering. The systematic reuse of building components and materials in numerous ways is in an **early phase and tested in various projects** In this frame the presented project aims at reducing the consumption of resources and grey energy in regarding the reuse of windows from public buildings. In this case at a large renovation project of the Free University Berlin. Instead of pulling out the windows and demolishing them, the windows are being professionally removed and refurbished. The company Unnerstall Ltd., by order of the State of Berlin is **disassembling 1400 timber windows and doors** from a university building, **storing and refurbishing them, in order to reuse them for both new construction projects and renovation measures.** Thus, the **project aims at demonstrating the potential of reusing building components and materials.**
Actors	The disassembly, refurbishment and reuse of the windows is **conducted by the company Unnerstall Holzmarketing Ltd**., by order of the State of Berlin. The responsible Senate Department for the Environment, Transport and Climate Protection has been initiating and supporting that sort of projects in order to reduce the climate impact of public buildings and to **promote the shift towards an environmentally friendlier construction practice and industry**.
Status & Timing	The presented pilot project is ongoing. The responsible company Unnerstall Holzmarketing Ltd. is currently (State May 2021) in the phase of disassembling the windows.
Innovative Aspects	The pilot project demonstrates the **potential of reusing building components and materials in order to reduce the climate impact**, caused by the construction industry. By reusing building components **disposal costs, as well as resources and grey energy**, which would have been used for the production of new components, **can be saved**. **The support of such projects/ initiatives by the state sector via regulations in its procurement procedures and via pilot projects is advantageous in manifold ways**. Firstly, these initiatives aid the public sector to reduce its climate impact. Secondly innovative **procurement laws and procedures, as well as pilot projects or concepts shape the demand and can serve as a catalyzer in the shift towards a more sustainable production and construction practice**, also from private investors and purchasers. In this frame the State of Berlin adopted various procurement rules, which for instance push the use of timber, as a natural building material. Another example is the **development of innovative concepts, such as the Zero Waste Concept for Berlin**, in which innovative projects, such as a **platform for used building components and materials**, are realized.
Contact	Unnerstall Holzmarketing Ltd. (executing firm): MAIL

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A) Further Resources – Project Profiles

Company	**ZRS Architekten und Ingenieure (Architects and Engineers), Berlin**
About the company	ZRS Architekten Ingenieure is an innovative **architectural practice**, based in Berlin. ZRS provides a wide range of services, such as architecture, structural engineering, building certification, sustainability consultation, specialist assessments, material development and testing as well as academic work in the form of research projects and teaching.[1] With the **goal to reduce the climate impact of the construction industry by designing and planning sustainably**, ZRS specialises on the use of **climate- friendly building materials and the design of circularity in the built environment**. In this regard ZRS has its own **research department and laboratory**, investigating the potential of building materials such as earth, clay, timber or bamboo. Furthermore, ZRS is **involved in several research projects**, such as the European project RE4**,** strengthening circularity in the built environment. In the endeavor to design sustainable buildings, ZRS architects and engineers won several awards, such as the Energy Efficiency Award by the German Energy Agency (dena) in the category "New Eco Quarter " or the "Hans Sauer Award for 'Designing Circularity in the Build Environment".
Actors	ZRS Architekten Ingenieure is a private company, run by leading experts in the field of sustainable architecture, such as Prof. Eike Roswag-Klinge**,** Prof. Dr. Christof Ziegert and Dipl.-Ing. Uwe Seiler.
Foundation	ZRS Architekten Ingenieure was founded in 2003 as an integrated design and engineering partnership in Berlin. [2]
Innovative Aspects	In its endeavor to minimise the climate impact of the construction industry, ZRS architects and engineers integrate various innovative principles into its designs. **Key competence is the use of natural building materials, primarily timber, earth and bamboo**. The use of these natural materials has several advantages: Firstly, they **significantly reduce the carbon dioxide emissions**. In this regard timber for example has the ability to store CO_2, leading to a neutral carbon footprint of the building material. Secondly, natural building materials show **significantly better reuse and recycling characteristics**, compared to conventional building materials, such as concrete or gypsum. Earthen materials can be reused endless times, if not stabilised through e.g., cement. Thirdly, the characteristics of natural building materials, such as earth, timber and wood fibres can contribute significantly to a **healthy indoor climate** and **the reduction of costs for heating and mechanical ventilation**, through its **heat-accumulating qualities and moisture buffering capacities**. Beyond the use of natural building materials, ZRS Architekten Ingenieure aim to reduce the climate impact of the construction industry by **integrating circularity and a higher lifespan into the design of buildings**. **Circularity**, following the understanding of the Cradle-to Cradle **principles is reached by innovative deconstruction concepts, a modular design and the separation of elements with different lifespans, as well as reversible connections**. Circularity in the building sector significantly helps to reduce the environmental and climate impacts of the industry by diminishing waste and reducing the carbon emissions, which would have been needed for the production of new materials and components.
Contact	ZRS architects and engineers: MAIL

[1] Technische Unversität Berlin (2021): Natural Building Lab
[2] Technische Unversität Berlin (2021): Natural Building Lab

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B) Further Resources – List of Studies, Publications and Links

Below is a collection of further knowledge sources, meant as complementary material to the THEMATIC CITY VIDEOS and EXPERT TALK sessions of this course. This collection of publications, studies, webinars and videos provides suggestions to dive deeper into the topic of construction waste and sustainable architecture.

To access the publication/ video etc. simply click on the **bold title of the resource**.

Studies and Publications

Use of Resources in the Construction Sector in Germany

The Use of Natural Resources, Report for Germany 2018 – Published by the German Federal Environment Agency, Author: Stephan Lutter, Stefan Giljum, Mirko Lieber et. Al, 2018

Germany 2049: On its way towards a sustainable resource management. - Published by the Öko-Institut, Author: Dr. Matthias Buchert et. Al., 2017 (In German - The demand and availability of 75 abiotic resources is considered.)

Construction Waste Problems

EU Construction and Demolition Waste Protocol and Guidelines - Published by the European Commission, 2018

Construction and Demolition Waste management in Germany - Published by Deloitte, 2015

Recycling, Reusing and Resource- Efficiency in the Building and Construction Industry

Urban Mining, Resource Conservation in the Anthropocene – Published by the Federal Environment Agency, Author: Felix Müller et. Al., 2019

Protecting natural resources by creating material cycles in the construction sector- Published by the Federal Environment Agency, Author: Claus Asam et. Al., 2018

Regional and local optimization of material flows and cycles, Areas of action, case studies and recommendations for municipalities- Published by the Federal Environment Agency, Author: Maic Verbücheln et. Al., 2019

Magazine of the German Environment Agency "What matters", Recycling- Published by the Federal Environment Agency, 2018

Construction and Demolition Wastes as Aggregates for Structural Concrete: the European Project- Published by RE4, Author: A. Attanasio et. Al, 2020

Design concept for prefabricated elements from CDW timber for a circular building, Published by RE4, Author: A. Klinge, 2019

Valorization of construction and demolition wastes: RE4 building solutions - Published by RE4, Author: A. Attanasio et. Al, 2017

German Resource Efficiency Programme II, Programme for the sustainable use and conservation of natural resources (p. 61- 65: Sustainable building and sustainable urban development), Author: Dr. Thomas Gebhart et. Al., 2016

Manual of Recycling: Buildings as Sources of Materials – Published by DETAIL Construction Manuals 2019. ISBN 9783955534929

Circular Economy

Introduction to Circular Economy- Published by the German Sustainable Building Council, 2021:

Introduction to Circular Cities – Published by ICLEI, Local Governments for Sustainability, 2021

Pathways to a circular economy in cities and regions – Published by the European Union, Author: Kai Böhme et. Al., 2016

City of Amsterdam Circular Economy Policy – Published by the City of Amsterdam, 2021

EU Urban Agenda Partnership on Circular Economy- Published by the Urban Agenda for the EU, 2018

Circular Economy in Cities – Case Studies – Published by the Ellen Macarthur Foundation, 2021

Sustainable Building

2019 Global Status Report for Buildings and Construction. Towards a zero-emissions, efficient and resilient buildings and construction on sector – Published by the Global Alliance for Buildings and Construction, 2019

Guideline for Sustainable Building 2019 – Published by the Federal Ministry of the Interior, Building and Community, Author: Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR), 2019

Plus Energy Buildings & Districts – Published by GIZ and the Sino- German Urbanisation Parnership, Author: Happold Ingenieurbüro GmbH, 2019

Energy Efficiency of Buildings & Districts in Urban Renewal - Published by GIZ and the Sino- German Urbanisation Parnership, Author: Happold Ingenieurbüro GmbH, 2019

Sustainable Building by the Federal Government, Strategies and Implementation – Published by the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR), 2017

Sustainable Construction and Housing, A needs based approach for the future – Published by the Federal Environment Agency, Author: Mark Vallenthin et. Al, 2010

Actors and Initiatives

German Sustainable Building Council (DGNB) is a non-profit organisation based in Stuttgart, Germany, providing its services central knowledge platform for sustainable buildings worldwide. The overarching aim is to promote change in the building and property market, engendering an appropriate understanding of quality as a foundation for responsible and sustainable action.

Cradle to Cradle is a German NGO which promotes the re-use of material, the re-usability of products and buildings, as well as training and education for different types of actors.

Global Footprint Network is an international nonprofit organization and developed the **ecological footprint,** a method to measure human demand on natural capital, i.e., the quantity of nature it takes to support people or an economy and the **Earth Overshoot Day**, marking the date when humanity's demand for ecological resources and services in a given year exceeds what Earth can regenerate in that year.

RE4 is a collaborative research project developing prefabricated energy-efficient building concept that can be easily assembled and disassembled for future reuse, containing up to 65% in weight of recycled materials from CDW.

European Circular Economy Stakeholder Platform is a joint initiative by the European Commission and the European Economic and Social Committee. The European Circular Economy Stakeholder Platform brings together stakeholders active in the broad field of the circular economy in Europe.[1]

[1] European Circular Economy Stakeholder Platform: About, 2021

Information systems and databases for Sustainable Building

Greenbuildingproducts.eu: 1st database for products assessed in terms of LEED and DGNB criteria

Green spec: Information database on low environmental impact building materials for architects and specifiers

Ökobaudat: Information portal on Sustainable Construction, run by the German Ministry for the Interior (in German)

Sustainable Building Information Portal: Information portal on sustainable construction, runned by the German Ministry for the Interior

Center for Resource Efficiency: Information portal on resource efficiency, supported by the German Environment Ministry (BMU), including a section on construction materials

DGNB certification system: Certification System for Sustainable construction