Case study of Circular Economy related construction projects & Public Procurements

Turku University of Applied Sciences
Research hatchery
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LIFE15 IPE/FI/004
circwaste
materiaalitkiertoon.fi

Circwaste-hanke saa EU:lta rahoitusta, jolla hankkeen materiaalit on tuotettu. Materiaaleissa esitetty sisältö edustaa kuitenkin ainoastaan hankkeen omia näkemyksiä, joista EU:n komissio ei ole vastuussa.

Introduction

- In this presentation is presented 7 circular economy related building projects around the world which including public procurement aspects
- Case examples are result of Turku University of Applied Sciences Research hatchery assignment which was implemented by international students
- The assignment relates to Circwaste -project which promotes efficient use of material flows, waste prevention and new waste and resource management concepts

Cases

1. Using recycled concrete in the construction of new buildings (Germany)
2. Building carbon negative student facilities as part of a campus redevelopment (UK)
3. Recycled asphalt used for road resurfacing (Germany)
4. Hyllie Terrass (Sweden)
5. Reducing emissions produced through construction (Norway)
6. Renovating the façade of an unused warehouse as part of plans for a sustainable Youth Centre (Spain)
7. Using old bricks from hospital to extend school (Denmark)

1. Using recycled concrete in the construction of new buildings (Berlin, Germany)

Backround

- In 2013 State of Berlin initiating **a pilot project** which aimed to overcome prejudices against the **use of recycled concrete** in building construction and stimulate demand for recycled concrete in the building materials market

- This pilot used the construction of the research and laboratory building for Life Sciences at the **Humboldt University** (worth app. €33.8 million) as an opportunity to **include recycled concrete as a requirement**

1. Using recycled concrete in the construction of new buildings (Berlin, Germany)

Objectives

- The building was built almost completely of a concrete that is manufactured **with a proportional amount of recycled aggregates from crushed concrete**

Results

- Using recycled concrete saved **880m2** of virgin gravel, **66%** of the energy and **7%** of the associated CO2 (0.6kg CO2 per tonne of recycled concrete)

More information

GPP in practice Issue no 75

2. Building carbon negative student facilities as part of a campus redevelopment
(Nottingham, UK)

Backround

- Nottingham Trent University (nearly 27,000 students) has a target to **reduce carbon emissions by 48%** by 2020

Objectives

- Require that the Pavilion building meet a minimum **BREAM** score of ‘Excellent’. This requires good performance in energy, water, and waste, as well as attention to responsible sourcing, the use of responsible construction practices and stakeholder participation
- Require to be **carbon neutral** as defined by the BRUKL Building Emission Rate (BER) rating of ‘0’ or less (carbon negative)
- A **Pre-Qualification Questionnaire** (PQQ) process was used to ensure that interested tenderers were able to carry out the project to the standards expected

Photo source

2. Building carbon negative student facilities as part of a campus redevelopment
(Nottingham, UK)

Results

- Building has achieved **carbon negative status** and has been **awarded** an Energy Performance Certificate (EPC) rating of **A+** (very efficient)
- The building has been designed to be as **sustainable and energy efficient** as possible:
    - **energy efficient glazing** and a large 94kW array of **solar panels** on the roof
    - built with good **insulation properties** with a high thermal mass
    - uses **sustainably sourced materials** in the construction of the new building.
    - built utilizing a lot of **natural light and LED** lights that switch off automatically when it is sunny
    - **naturally ventilated**, reducing the need for air conditioning units

More information

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3. Recycled asphalt used for road resurfacing
(Hamburg, Germany)

German National Law require the use of any recyclable material in the highest possible position of any value chain → **Asphalt is a recyclable material** and is therefore subject to this legislation

In this specific case, recycled asphalt was used on the same road it was originally taken from.

Objectives

- Increase the use of **granulated asphalt** which had been recycled from existing roads
- Reclaimed asphalt pavement (RAP) consists of approximately **95%** mineral aggregates and **5%** bitumen
- Proceed from using less than **50%** RAP in these layers to recycling of **100%**
- Prescribes the use of a minimum **35%** white aggregates
- Use of recycled asphalt along with warm mix technology greatly reduces emissions

The City allowed a group of private companies, who originally came up with the full recycling technology, to **test its use on public roads** owned by the City State. After the quality was then tested by Hamburg's road construction authority, the City was reassured about the use of the 100% recycling process.

3. Recycled asphalt used for road resurfacing
(Hamburg, Germany)

One criteria was that **low-temperature asphalt** (warm mix asphalt) should be used, which helps to achieve an efficient & environmentally friendly asphalt production and laying process. This implies e.g.

- A lower energy input
- Reduced costs
- Less CO2 and other harmful emissions
- Improved health conditions for operating staff

Results

- The construction method is **economically viable**
- Bitumen only constitutes approximately **5-6%** by weight of the materials used in asphalt
- Hamburg saved **30%** compared to the costs for conventional road resurfacing

More information

GPP in practice Issue no 60

4. Hyllie Terrass (Malmö, Sweden)

- Commercial building is part of the Sweden Green Building Council's pilot study on **NollCO2** (ZeroCO2) certified buildings (2020-2022)
- NollCO2 is a new **certification system** (will be launched 2020) for climate-neutral buildings helping to target and achieve lower operational and embodied carbon in new construction
- Project's high sustainability profile: **LEED, WEEL, NollCO2**
- **Predicted result** of the project is **35%** lower carbon footprint

Picture: Skanska

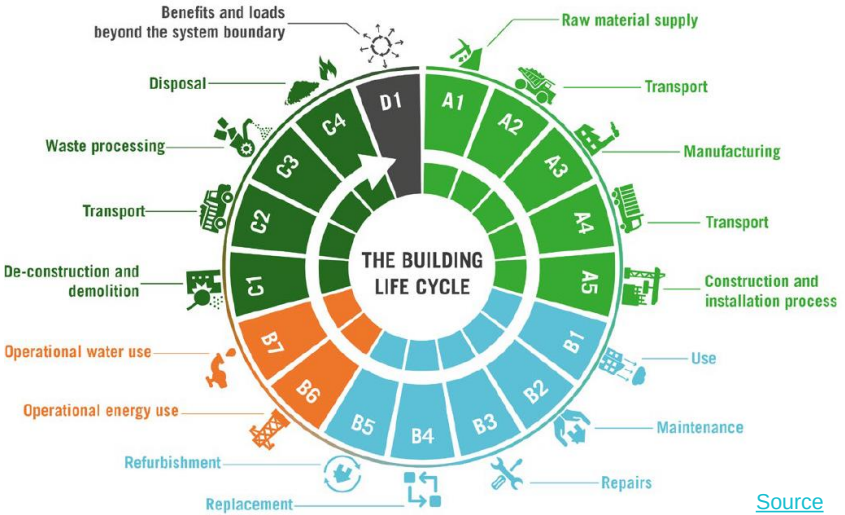
4. Hyllie Terrass (Malmö, Sweden)

- NollCO2 forces to **reduce processes' GHG emissions** as the NollCO2 project must meet a set reduction target of the building materials' and building processes' climate impact

- NollCO2 projects **off-sets** the remaining GHG emissions with climate action in the form of **investments** in Swedish renewable electricity production, increased energy efficiency in Swedish buildings, and traditional carbon offsetting

More information

- NollCO2 information brochure
- Sweden Green Building Counsil NollCO2 sertificate
- Skanska presentation of Hyllie Terrass
- Skanska press release about the project



Source

5. Reducing emissions produced through construction: Construction of 4 kindergarten
(Oslo, Norway)

Backround

- Oslo has a goal of reducing climate gas emissions by **95%** and use of **fossil fuel to zero** by 2030
- Construction machinery accounts for **30%** of Oslo's traffic emissions

Objectives

- Construction of four new kindergartens, requiring contractors to **operate construction sites 100% free of fossil fuel emissions**, through e.g. the use of electrical construction machinery
- **BREEAM** certification & Construction and/or erection of buildings that meet the **Passive House or Plus House requirements**

5. Reducing emissions produced through construction: Construction of 4 kindergarten (Oslo, Norway)

Results

- Diesel driven machinery and equipment **will be replaced** with fossil free alternatives
- Even though not all machinery is available as fully electrical, the market is quickly adapting and developing new solutions
- The experience from the process undertaken suggests that the contractors **did not find any barriers** in terms of delivering fossil free construction sites
- Due to the positive experience with using public procurement strategically to reduce emissions from construction sites, Oslo's City Council has decided to **include fossil free construction sites as minimum criteria in all of its public procurement procedures** from 2017
- Omsorgsbygg (a public building owner of Oslo) was **awarded** with the Innovation in Public Procurement award by Norway's Agency for Public Management and e-Government (DIFI).
  In addition, the project was **voted second best** in the category Best Local Climate Action 2016 at the Zero conference.

More information

Zero emission construction sites (City of Oslo)

GPP in practice Issue no´67

6. Renovating the façade of an unused warehouse as part of plans for a sustainable Youth Centre
(Alzira, Spain)

Objectives

- Sustainably refurbish an unused warehouse and transform it into a Youth Centre
- Use an **innovation procurement** approach for the first time
- Provide innovative façade renovations
- **Reduce** the overall building energy consumption and associated CO2 **emissions**
- This renovation will contribute to an overall aim of achieving a near **zero energy building** (NZEB)
- Included **LCC** analysis

Picture source

6. Renovating the façade of an unused warehouse as part of plans for a sustainable Youth Centre
(Alzira, Spain)

Results

- Contracted solution demonstrated a **15%** reduction in energy demand for heating, **19%** reduction in cooling
- Façade renovation shows a **15%** reduction of the building's energy needs
- Costs are reduced by **924 €**/year

More information
GPP in practice Issue no 92

7. Using old bricks from hospital to extend school
(Copenhagen, Denmark)

Backround

- One of the Copenhagen's Public Procurement environmental criteria is that municipal building projects need to have at least two alternative materials. The chosen one will be with the **lowest environmental impact**, not the cheapest offer.
- Renovation and expansion project at Katrinedals School in Vanløse **using recycled bricks** from the demolition of a hospital building


Photo source

7. Using old bricks from hospital to extend school
(Copenhagen, Denmark)

Objectives & key circular points

- The **greatest possible recycling** of construction waste from old hospital building
- **Improved recycling** of technical material
- **Closing the loop** by requiring recycled material
- **LCA** based information of old bricks available

Results

- The recycling rate with regard to the weight of cleaned stone relative to the weight of the amount of rubble introduced was between **5 and 21%** which was far below the expected result, which they had anticipated a recycling rate of around 50%
  → Experiments were made with improved demolition technique, but the company old bricks did not face capacity to shred the large blocks, which were therefore discarded
- Recycled bricks reduced the project's carbon-dioxide footprint, along with the cement-free, cradle-to-cradle certified mortar, by a **hefty 70 tonnes**
- Through ETA Denmark, a process has been initiated for the **CE marking of recycled brick**, which will be the first CE mark of recycled products
- The school building **was nominated** for ArchDaily's Building of The Year contest of 2019

More information

Circular PP State-of-the-art on Circular Procurement Policy in the Baltic Sea region report 2019