

Circular Business Models in Practice

Making our world a more sustainable place.

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It's time for radical change

Economic growth makes flourish
the construction sector.

But the building sector is also the most
resource-intensive industrial sector.

It uses half of all primary raw materials extracted.

Leading to a huge irreversible negative impact
on our environment.

And scarcity of primary raw materials.

-> We need **sustainable business models.**

-> We need to think **circular.**

Sustainable Business Models

Creating and capturing value for the
Economy - Environment - Society

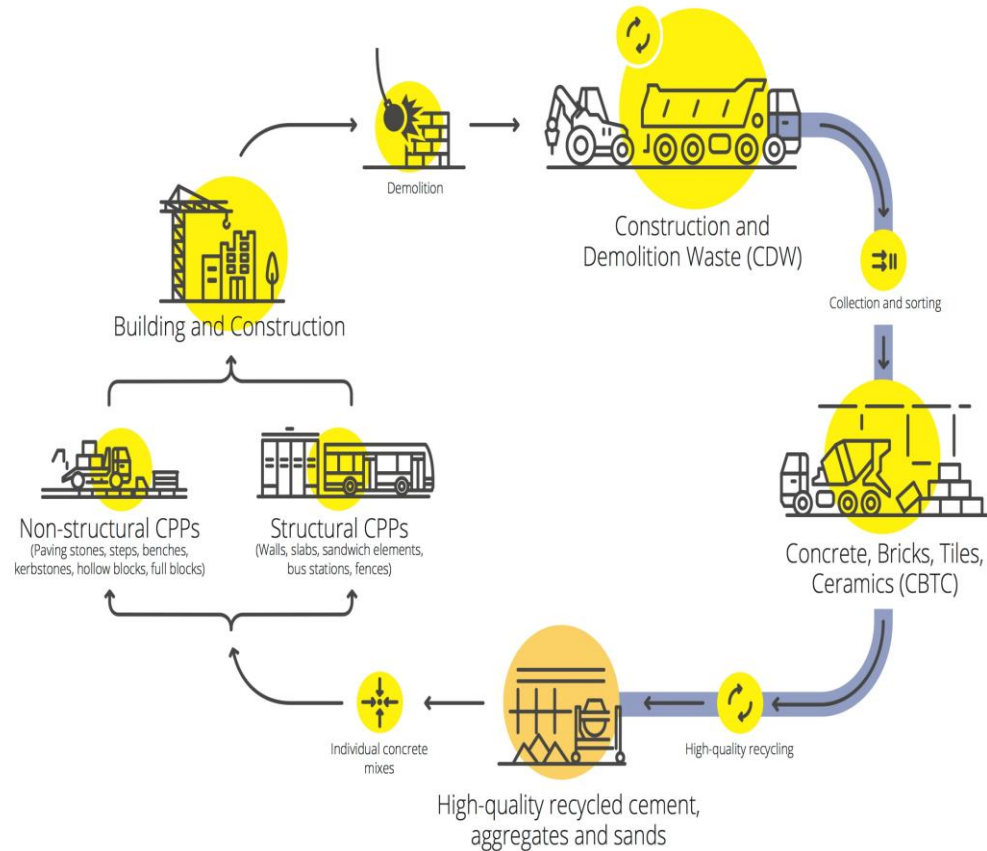
Fostering transition to a sustainable society
through circular products and services

Having a positive impact
at medium- and long-term

Outbalancing
Risk and Return on Investment

Practice
fair, transparent and collaborative business

Circular Recycling Value Chain



Circular Value Chain of Building Materials

Taking a systemic life-cycle approach

Principles:

To retain the value of building blocks and materials as much as possible.

To minimize the use of primary raw materials.

To reduce energy consumption.

To produce zero waste.



How to make building materials circular?

Circular Design:

Use renewable or **reusable building materials** (cradle-to-cradle);
design modularity and **prefab elements**

Circular Recovery:

Buildings as material banks, material passports, **use waste to make new raw materials**

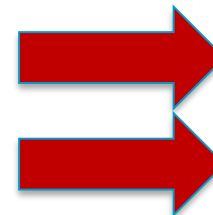
SeRaMCo - Secondary Raw Materials for Concrete Precast Products

Which sustainable business models work in
practice?

Under which conditions?

Where?

Focus on 2 core businesses:



Recycling of CDW

Production of CPP

Business: CDW High-Quality Recycling Plant

Main technologies and processes:

- Sorting, purification and washing;
- Crushing, quality control and certification (all externally)

Revenue mechanisms:

gate fee per CDW input delivered +
output of recycled aggregates and sands (in
tons)

Material streams processed:

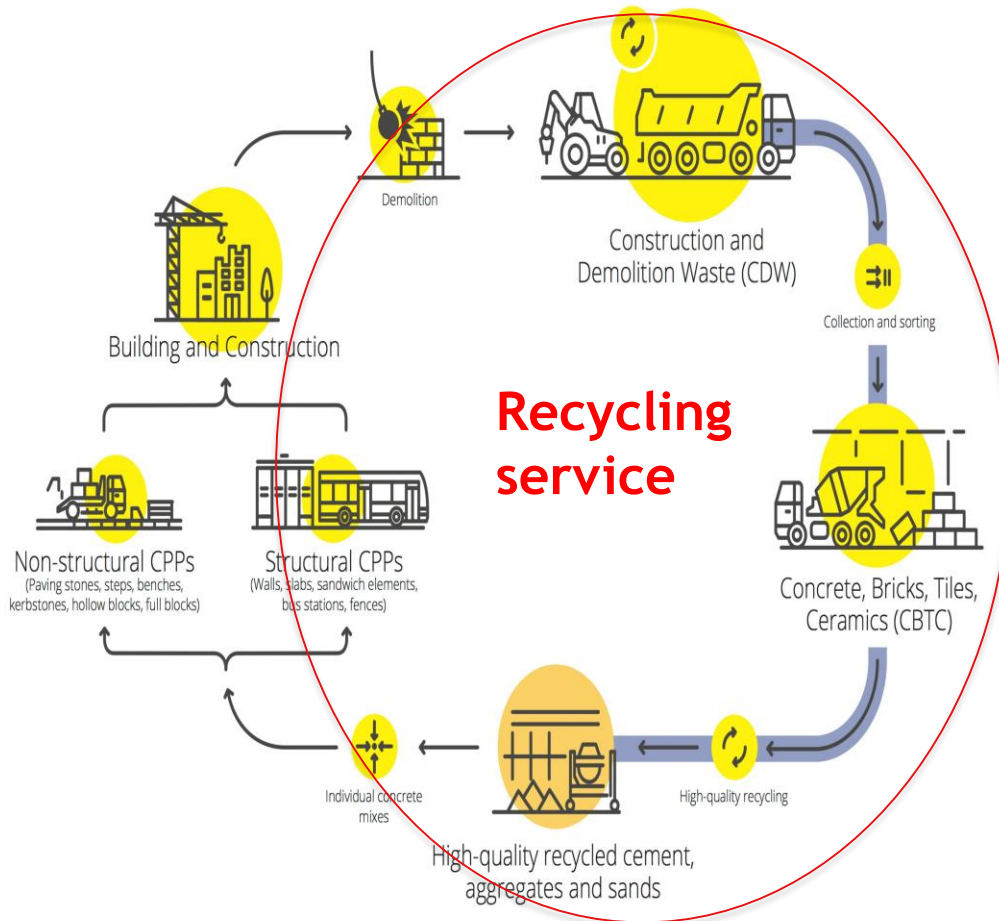
Concrete waste and mixed CDW (170904)

Typical investment: € 2 - 3 million (50% for
equipment and 50% for land/building)



Business Opportunity: Recycler as Service Provider

Circular Recycling Value Chain



CDW-recycling company as **service provider** which recycles materials and provides logistics:

- **Waste analysis**, i.e. evaluation of material values in buildings (material passports)
- **Material flows**, i.e. selective deconstruction and demolition
- **Operating processes**, i.e. sorting of waste and CDW
- **Logistics**: Collection, transport and storage



Best practice: Recycling at Sheehan Group (UK)

Contractor company operating in Oxfordshire.

Main services:

- Aggregates
- Plant Hire
- Groundwork and Civil Engineering

Input: local CDW from Oxfordshire
price: 3-4€/ton

Output: washed recycled aggregates.
15-20€/ton

Recycling capacity:
100.000 tons of CDW per year

Environmental benefit: Landfilling of
annually 50.000 tons of CDW is avoided.



Best practice: Recycling at Sheehan Group (cont'd)

Main products made from recycled CDW:

- Blocks (min 75% of recycled CDW)
- Lego-like blocks,
- Ready-mix concrete.

Sheehan Group uses 50% of the recycled material in its own construction and civil engineering projects and sells the remaining to the local private construction market.

Distance: 25 miles (40 km) radius for Sheehan's own projects.

Initial investment made by Sheehan on the washing equipment: ~£ 2 million.

How to measure the value of CDW recycling business?

Economic factors		
Capacity	CDW processed annually (in tons)	
Revenues	Entry price CDW (per ton)	
	Exit price of high-value recycled aggregates (per ton)	
Costs	Operating and maintenance costs (per year)	
	Labour cost (per year)	
	Certification cost (per year)	
Investment	Initial investment in equipment, buildings and land	
	Return on Investment (per year)	

How to measure the value of CDW recycling business? (cont'd)

Environmental factors	
CDW prevented from landfill (tons per year)	
Natural sands and aggregates preserved (tons per year)	
CO ₂ emissions during recycling process (per ton of CDW)	
Energy consumption (per ton of CDW)	
Water consumption (per ton of CDW)	
Average transport distance to/from construction sites	
Noise and dust impact on the neighbourhood (distance from the nearest village/city (in km))	

How to measure the societal value of CDW recycling business? (cont'd)

Socio-economic factors	
Structural investment in rural region	
Creation of jobs	
Boost for the local construction/demolition business	
Qualitative upgrade of habitat because of zero landfill and less quarries	
Strong commitment to circular economy	

CDW Recycling Business

In sum:



Value
for the
Economy
Environment
Society

Business:

**Production of circular CPPs
using recycled aggregates**

Characteristics of circular products:

Resource - efficiency

Recycled materials

Recyclable products

Local sourcing

Safety & durability

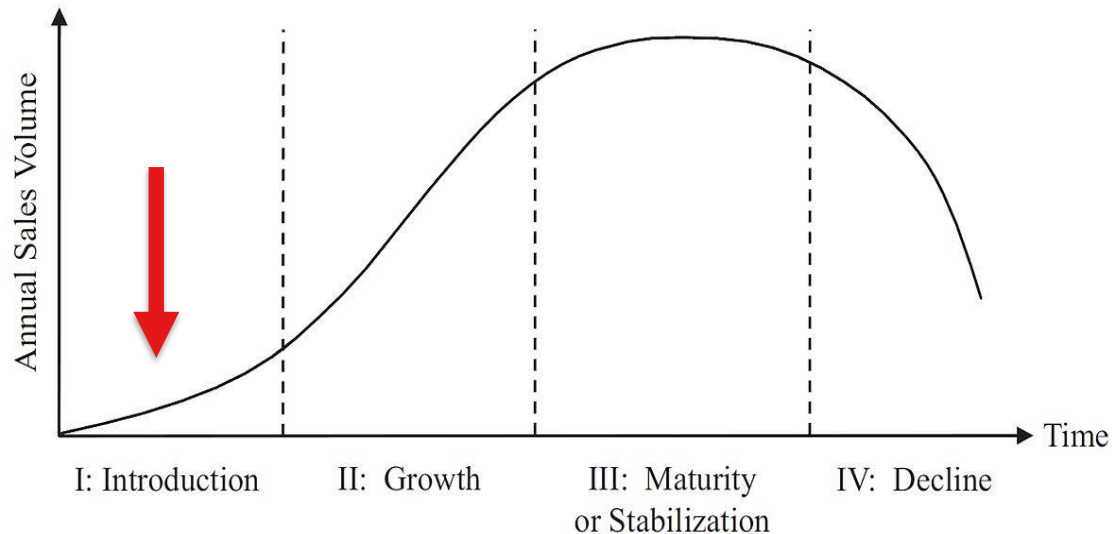
Traceability

Low toxicity

Affordability



Circular CPPs - An emerging market



European precast industry:
€ 24 billion generated (in 2015)

Outlook:

5% of green CPPs: € 1,2 billion in year ...
20% of green CPPs: € 4,8 billion in year ...

Time to market at a large scale depends still on many variables:

- Readiness of technologies
- Regional, national and EU policies and incentives
- Standards and regulations
- **New business models**
- Close cooperation in the circular value chain etc.



Best practice: Life Sciences Institute, Humboldt University Berlin

- 5.400 m³ of recycling concrete were used for construction (70% of concrete)
 - Selective deconstruction, no demolition -> pure concrete debris, no mixed CDW
 - 5-6 times of quantity of concrete debris needed
 - Limited to recycled aggregates 8/16 mm because of lack of storage capacity (silo)
 - 25% / 40% of natural aggregates replaced
 - Demolition building, recycling plant, cement and concrete producers: all local (max. 3 km of transport distance)
- > Neglectable transport distance led to better energy efficiency and reduced CO₂ emissions (distance to quarries >100km)



Best practice: Humboldt University Berlin, Life Sciences Institute (cont'd)

- Communication with all stakeholders in the value chain a year ahead of issuing the call for tender
- Testing and certification needed longer lead times because standards/norms were not available (in 2014)
- Slightly more expensive (16€/t vs. 15€/t)
- Financial incentive: 10€/ton

Quality:

- The recycled concrete split provided the same quality as natural gravel
- Recycling concrete met the requirements such as strength class and consistency and could be used in the same way as traditional concrete

Best practice: Humboldt University Berlin, Life Sciences Institute (cont'd)

Pioneering public procurement:

From 2019 on the Land Berlin will make it **compulsory** to use recycling concrete in public construction projects.

Annually, 100.000 m³ of standard concrete shall be substituted by recycling concrete (1 million m³ of concrete debris per year in Berlin).

Higher demand for RC-concrete will decrease the costs for producing and delivering RC-concrete compared to those of traditional concrete.

Take-home messages:

CDW recycling business which makes ...

concrete (precast) circular

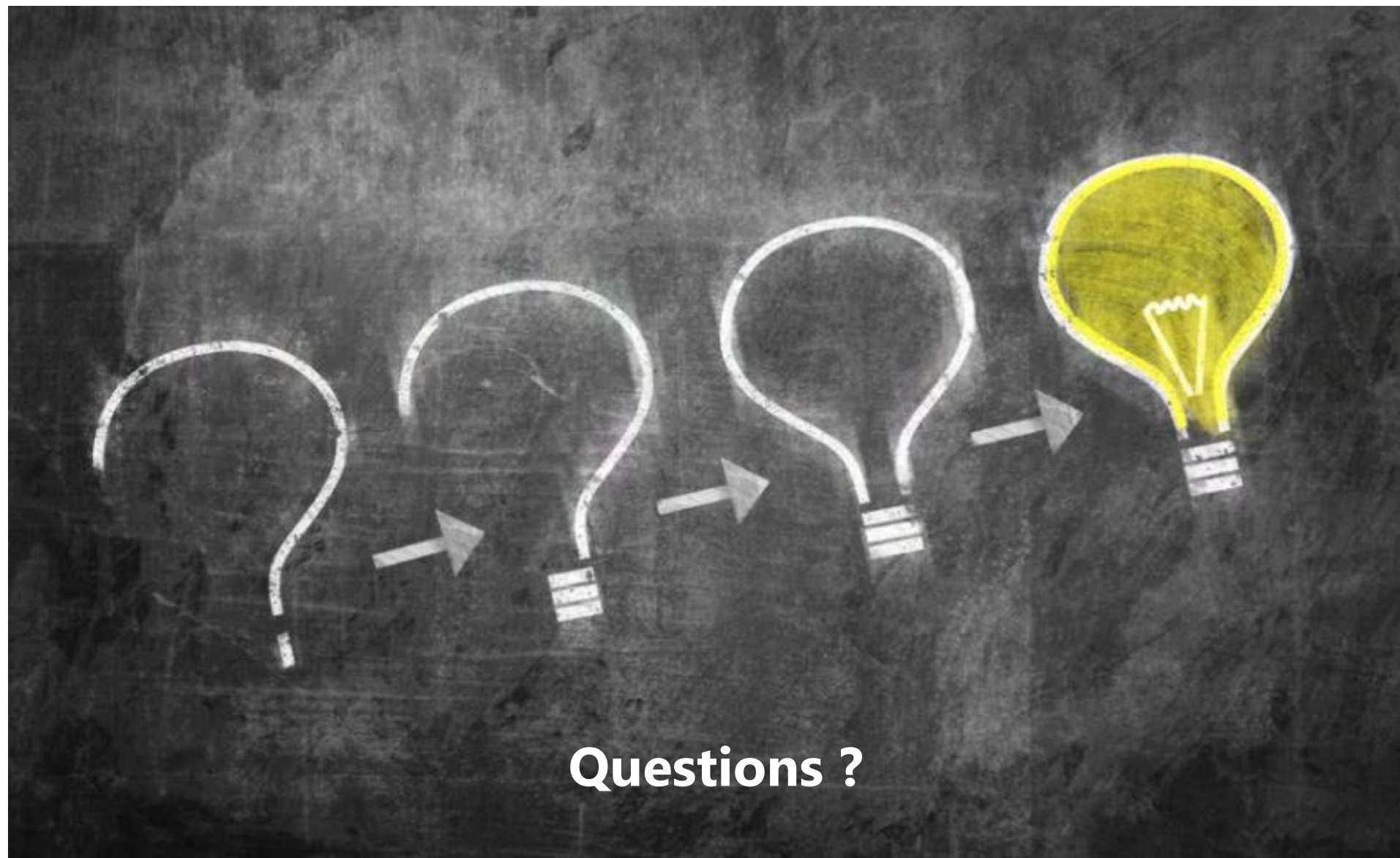
Best practice shows that recycling of CDW for building constructions can be a **profitable** and **sustainable business**.

Including **advice services** may be a way to mitigate risks inherent to a volume-based recycling business which heavily depends on local construction/demolition activities.

EU and national regulations have to be adopted which foster the market uptake of secondary raw materials in the construction industry.

Circular business models will evolve as the need for **fair collaboration on material streams** in the construction industry will increase.

Thank you for listening !



Questions ?