Presentation
Circular Demolition

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Renate Huismans

October, 11th 2017

Introduction

Eric van Roekel

Strukton/GBN

Mr. E. van Roekel is director of GBN, a 100% subsidiary of Strukton Civil, since 2010. He is responsible for the dismantling, demolition, recycling and reuse of waste, secondary materials and circular business models. Examples of materials are C&DW, EoL Concrete, old road constructions, rail ballast, (contaminated)soil and sludge and immobilization. Eric is director of C2CA Technology, a Strukton/TUDelft company developing innovative concrete recycling technologies. From 2011-2014 he was coordinator of the EU funded FP7 project C2CA "Advanced Technologies for the production of cement and clean aggregates from construction and demolition waste" (Grand agreement No 265187). Now he is involved in the HISER project 2014-2017 funded under the Horizon 2020 and VEEP project. Eric is coordinator of the case studies.

Renate Huismans

Strukton/GBN

Mw. R. Huismans is project coordinator with GBN. Her main business is creating a circular economy by re-using and recycling materials from construction projects and demolition projects. With an engineering background, she has the knowledge of all different types of building materials. She is also an active member of the projects HISER and VEEP.

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What we do

We utilized all opportunities to maximize material flows and save costs within our projects:

- circular demolition of various projects
- editing landflows, analysing, taking over of deliver
- producing and supplying high-quality raw materials
- recycle building materials
- asbestos
- inventory

Ambition:

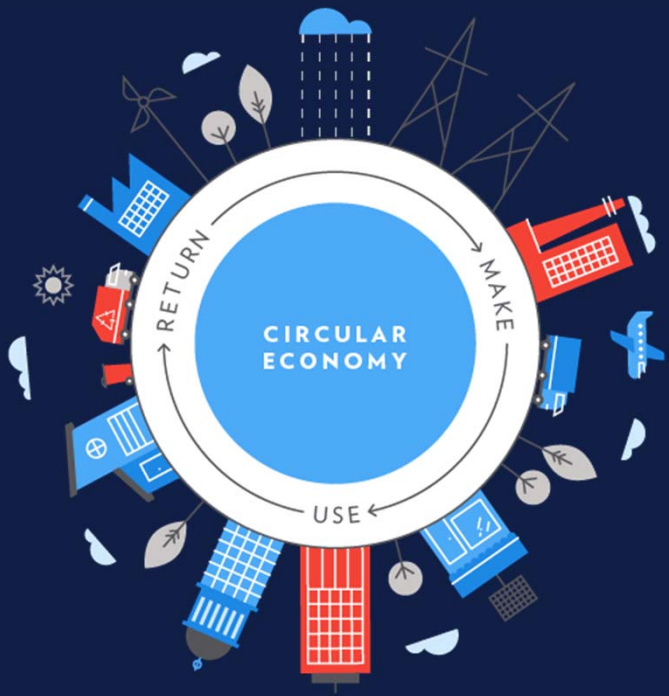
- to achieve market leadership for reuse of materials in the Netherlands

European Projects

- Research on production of new building materials from waste streams (concrete, wood, plaster and bricks)
- processing of old concrete in new concrete

- Development of new recycling technologies for concrete recycling
- Cost-effective recycling of construction and demolition waste and processing this into innovative energy-efficient prefab concrete elements

Concept Circular economy



- Industrial system that is restorative or regenerative by intention and design
- Replaces the end-of-life concept
- Achieving through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, **recycling** and **circular demolishing**

Background

Construction industry:

- 461 million ton waste materials per year in Europe
- Global raw material winning is growing by an average of 4%
- Global demand for energy has doubled in 40 years. The demand is expected to increase by 50% over the next 20 yearsConstruction industry:

Result:

- natural resources are exhausted and the ecological support of our planet is exceeded
- This forces us to make our linear economy circular

Approach of demolition projects

Step 1: materials inventory + quantity determination

Step 2: brainstorming about reuse and recycling possibilities

Step 3: calculate different scenarios

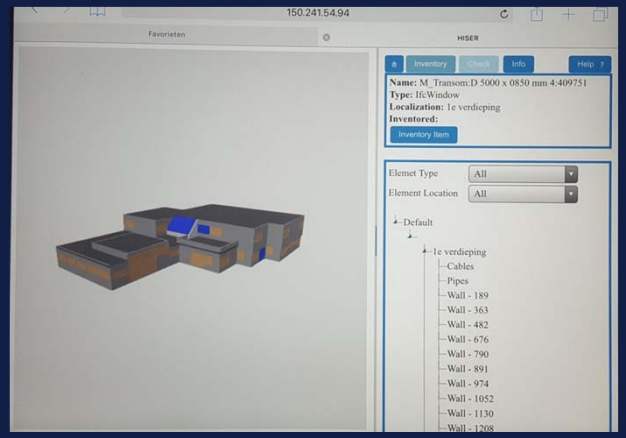
Step 4: choose between the different scenarios

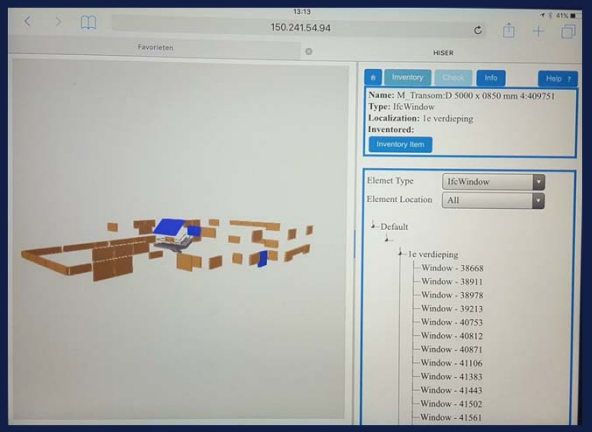
Step 5: guidance and Registration

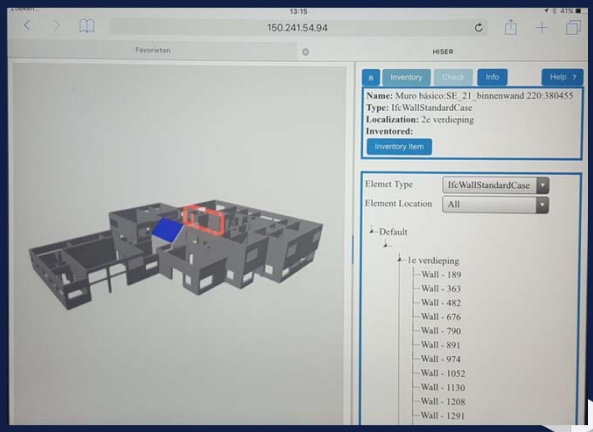
Step 6: documentation and evaluation

Inventory based on SD tool

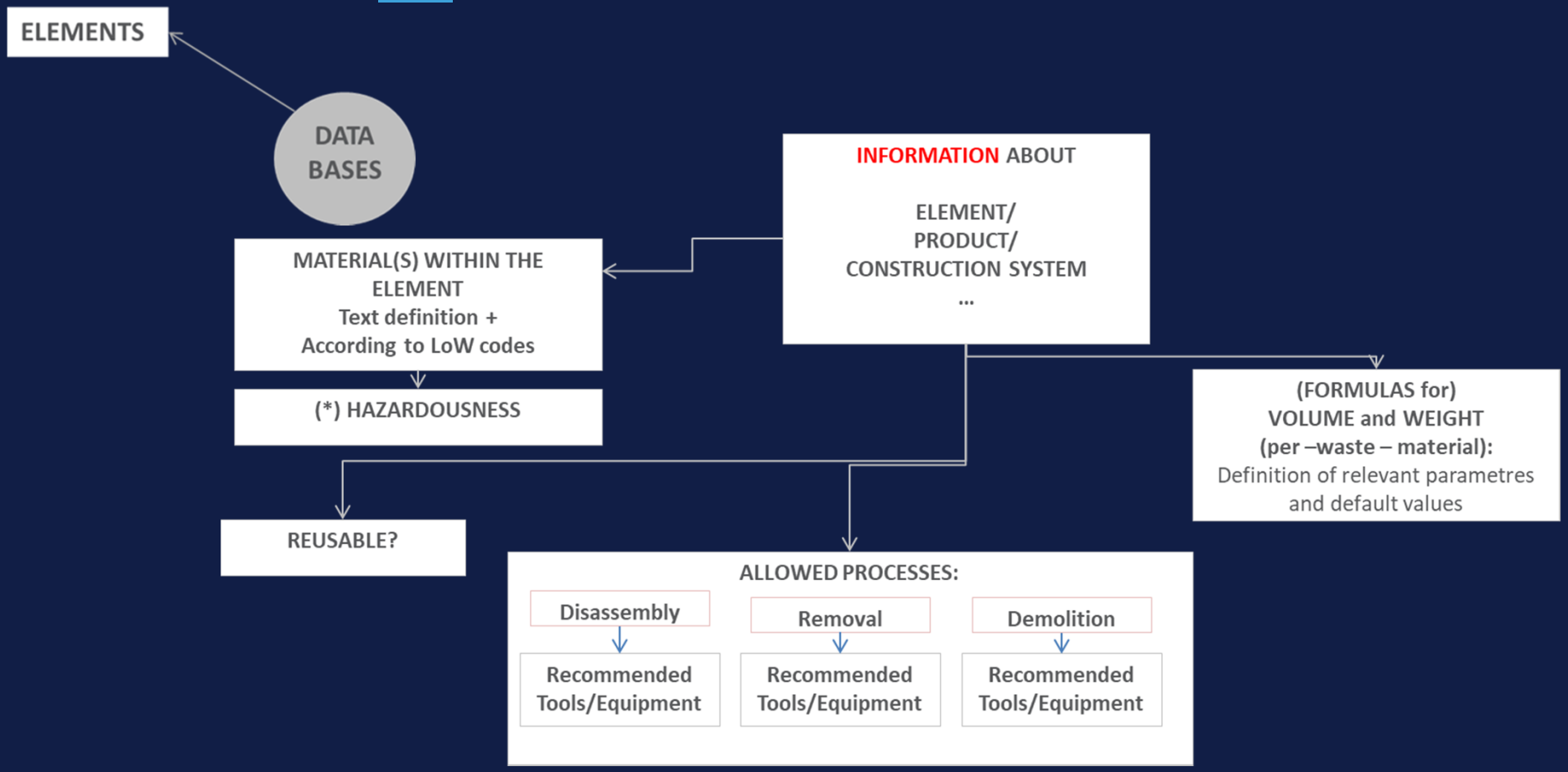
- BIM SD Tool
- Based on 3D drawing (CAD, Revit, etc.)
- Tablet
- Online software







Data BIM SD Tool

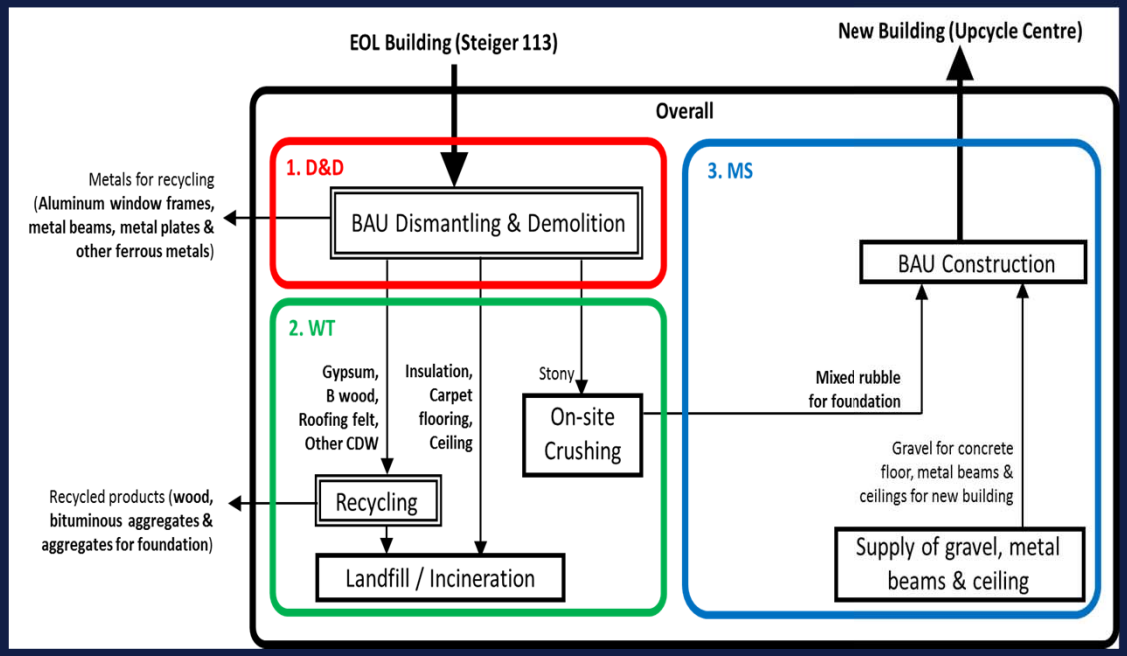


Project in practice

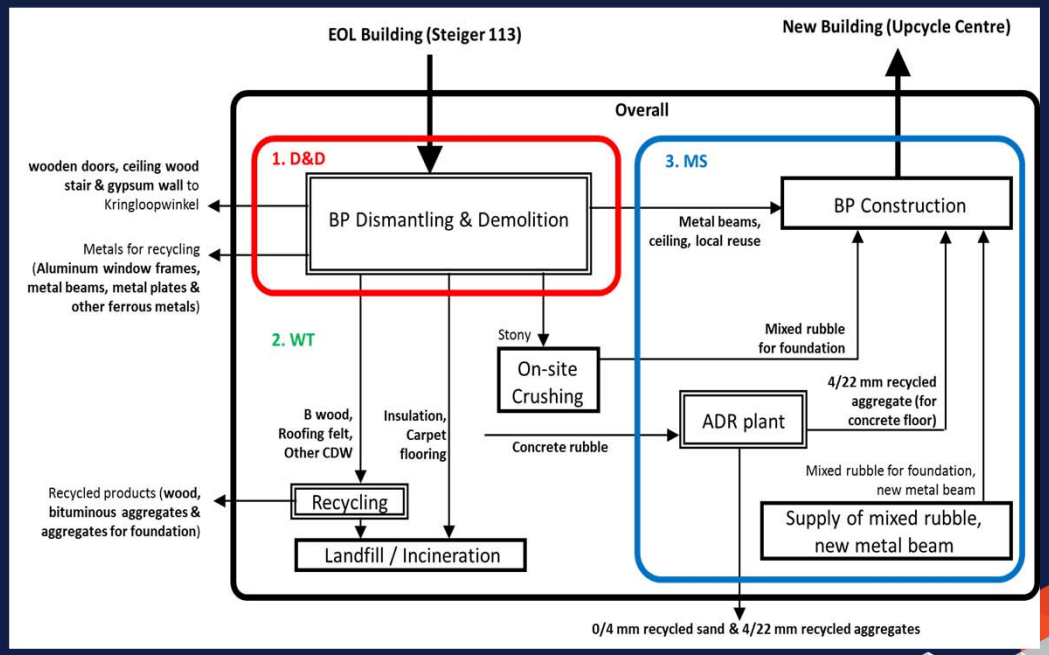
- Detailed material inventory
- Approaching network
  (expand network with every new project)
- Finding second life destinations based on →
- Creating an online trading platform
- Work with developers, architects, foundations

BAU versus BP

BAU Demolition and Material Reuse



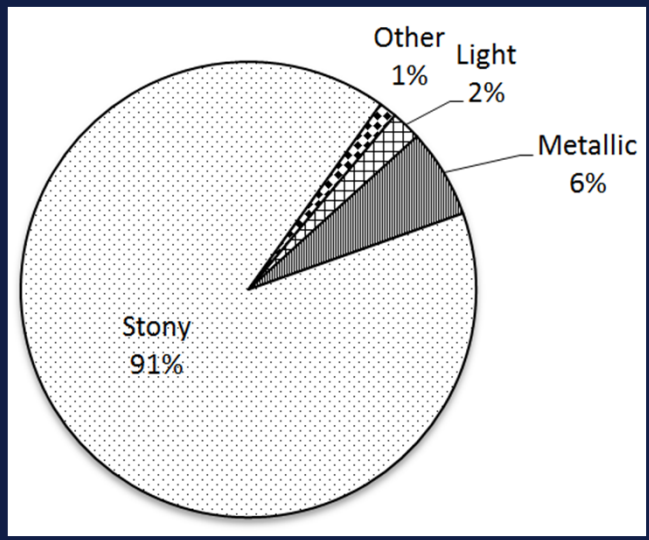
BP Demolition and Material Reuse



LCA / LCC

Life Cycle Analyse / Life Cycle Costing-analyse

Fraction	Material flow	Quantity (t)
Light	ceiling	1.24
	insulation	3.42
	carpet	4.40
	gypsum	6.68
	wood	9.23
	roofing felt	25.12
Metallic	aluminum frames	2.42
	metal plates	36.24
	metal beams	47.52
	other ferrous metals	60.04
Stony	concrete rubble	671.20
	mixed rubble	1,426.20
Other	unsorted CDW	28.84
Total	**Building**	**2,322.55**

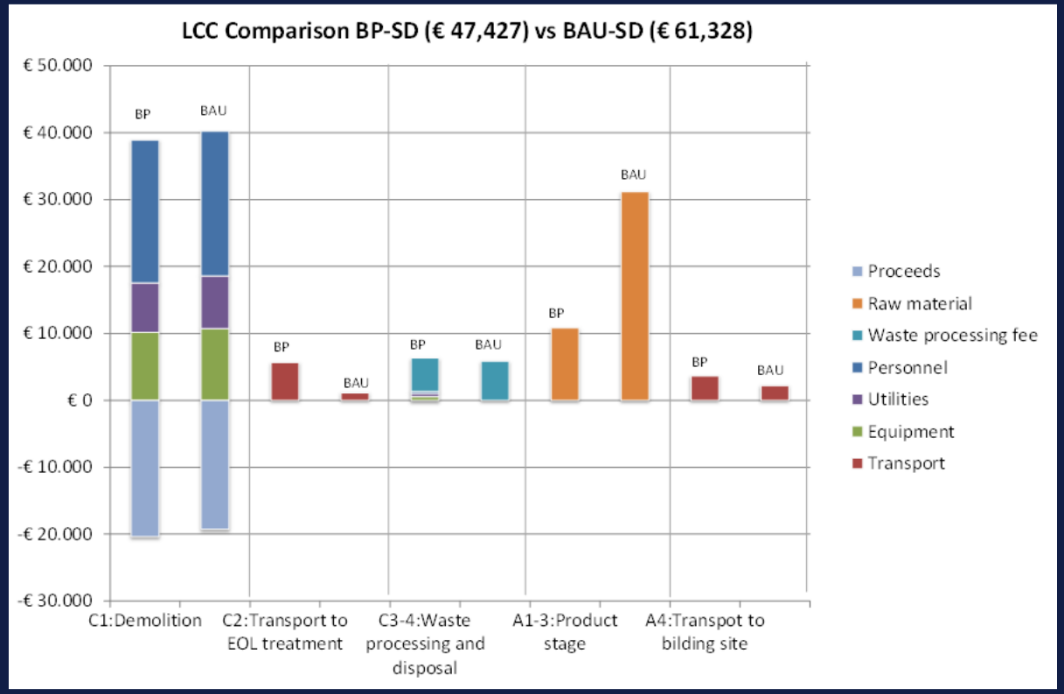


BAU versus BP, financial

- BP 23% cheaper than BAU

Reasons:

- Reuse steel same location
- Recycle concrete for new building
- Saving on man hours (Foundation)
- Smart handling waste materials
- Selling materials



BAU versus BP, environment

- Total CO2 emission reduced with 45%
- BP provides environmental savings from 19% to 78%

Reasons:

- saving on steel production
- concrete recycling by C2CA technology
- complete inventory of materials

Impact category	Unit	BP-SD	BAU-SD	difference (BAU-BP)/BAU; %
Climate change	kg CO2-Eq	47700	87400	45%
Acidification	mol H+-Eq	208	556	63%
Ecotoxicity for aquatic fresh water	CTUh.m3.yr	618000	1470000	58%
Eutrophication-freshwater	kg P-Eq	11.5	33.4	66%
Eutrophication-marine	kg N-Eq	68	116	41%
Eutrophication-terrestrial	mol N-Eq	733	1,230	40%
Human toxicity-carcinogenic effects	CTUh	0.022	0.062	64%
Human toxicity-non-carcinogenic effects	CTUh	0.017	0.051	66%
Ozone depletion	kg CFC-11-Eq	0.003	0.005	38%
Photochemical ozone formation	kg ethylene-Eq	196	344	43%
Prticulate matter/ respiratory inorganics	kg PM2.5-Eq	121	149	19%
Resource depletion- mineral, fossil	kg Sb-Eq	0.512	1.39	63%
Ionising radiation - human health effects	kg U235-Eq	3,540	10,200	65%
Resource depletion - water	m3	265	1,210	78%

BP, changing the business

Other approach than traditional projects, mainly based on:

- Feeling
- Image
- Vision
- Transparency
- Collaborate

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