CRAVEzero

Cost Reduction and market Acceleration for Viable nearly zero-Energy buildings

Co-funded by the Horizon 2020
Framework Programme of the European Union

General information

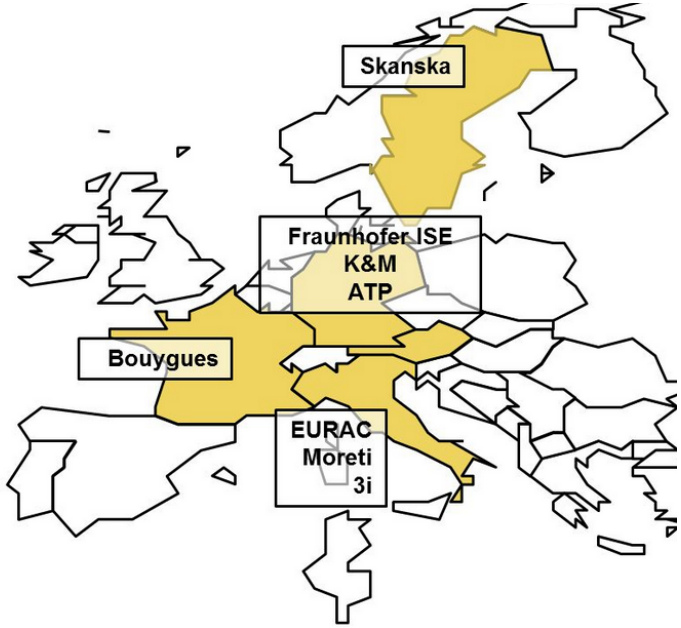
Cost Reduction and market Acceleration for Viable nearly zero-Energy buildings

EE-13-2016: Cost reduction of new Nearly Zero-Energy buildings

Coordination and support action

Start: September 2017

End: September 2020



Coordinator:

Tobias Weiss – AEE INTEC

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Cost Reduction and market Acceleration for Viable nearly zero-Energy buildings

Solutions for identifing and controlling the extra-cost of nZEBs

01 **Life Cycle Costs of NZEBs**
Benchmarks, KPIs and Regulations

02 **Processes**
Cost reduction potentials in processes

03 **Technologies**
Cost reduction potentials for NZEB technologies

04 **Business Models**
Development of new business models

05 **Pinboard**
Life cycle cost reduction of new Nearly-Zero-Energy Buildings

06 **Implementation**
Prototypical Implementation of cost-effective NZEB

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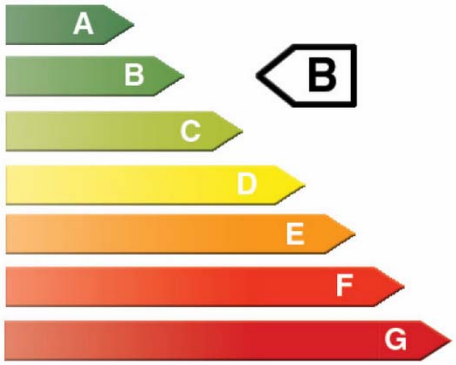
01 Life Cycle Costs of NZEBs

Benchmarks, KPIs and Regulations

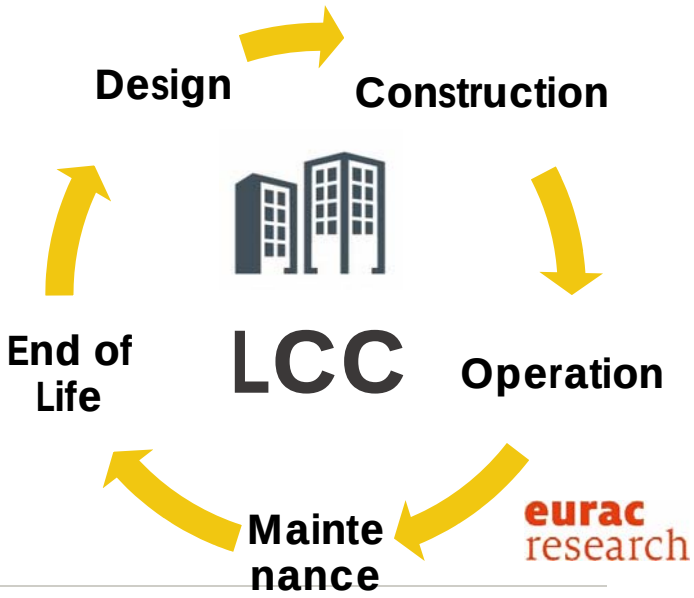
Reliable assessment of the cost effectiveness of existing NZEB Case Studies

Initial investment
Calculated yearly energy demand



Time Dimension

Life Cycle Cost
Resilience



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CRAVEzero NZEB Frontrunner Buildings











11 case studies – actual data

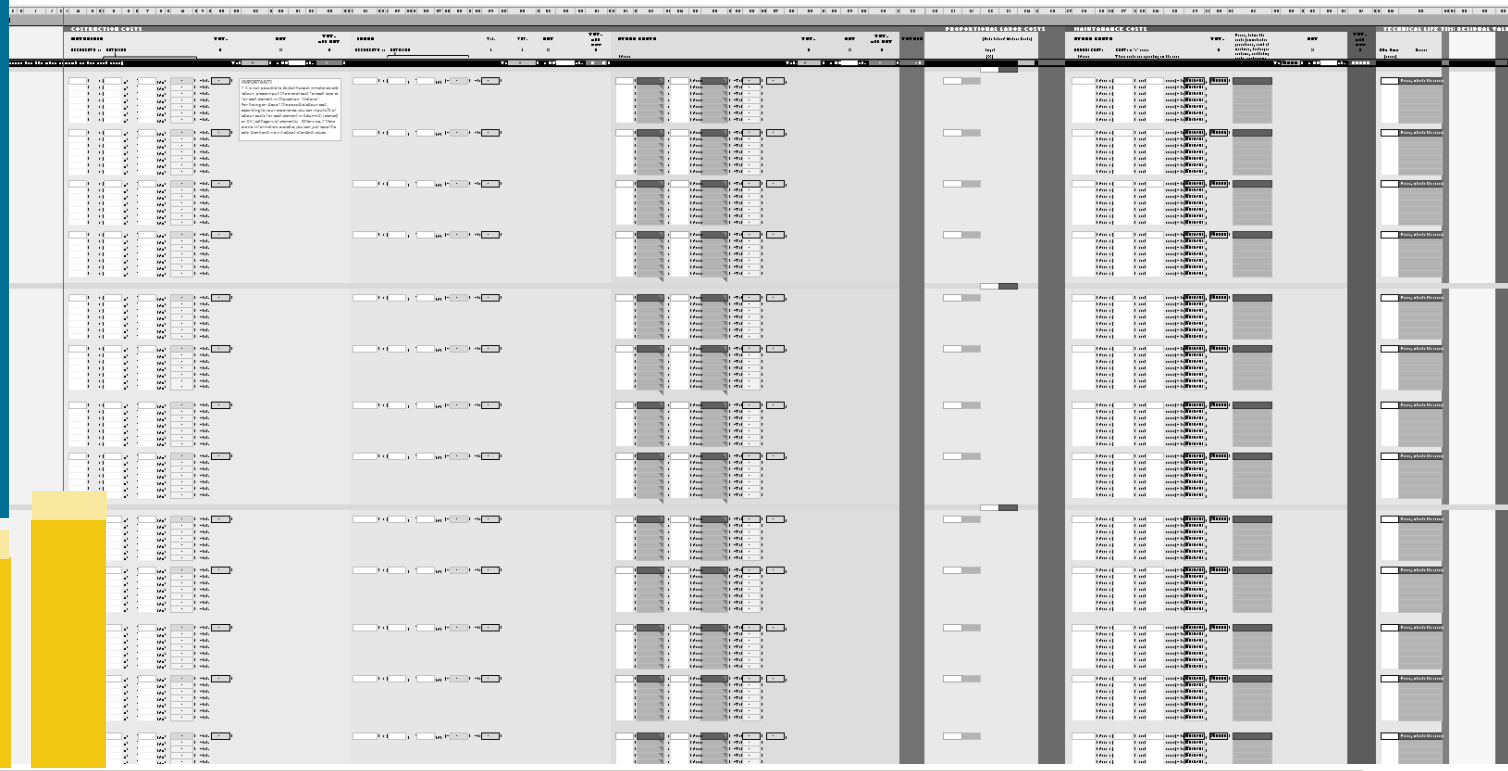
First Results:

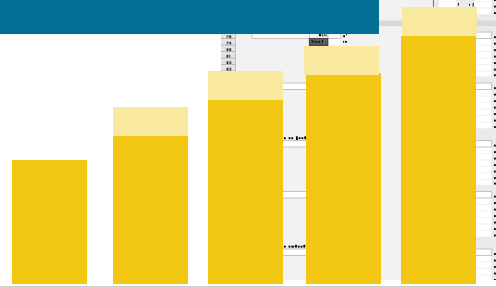
Case Study Benchmarks Now Online

- **Spreadsheet with LCCs - A database for benchmarking actual NZEB life cycle costs of the case studies**
- **Harmonised approach and normalisation**

Main references:

- ISO 15686
- Code for measurement cost planning





04

LCC Case Study analysis

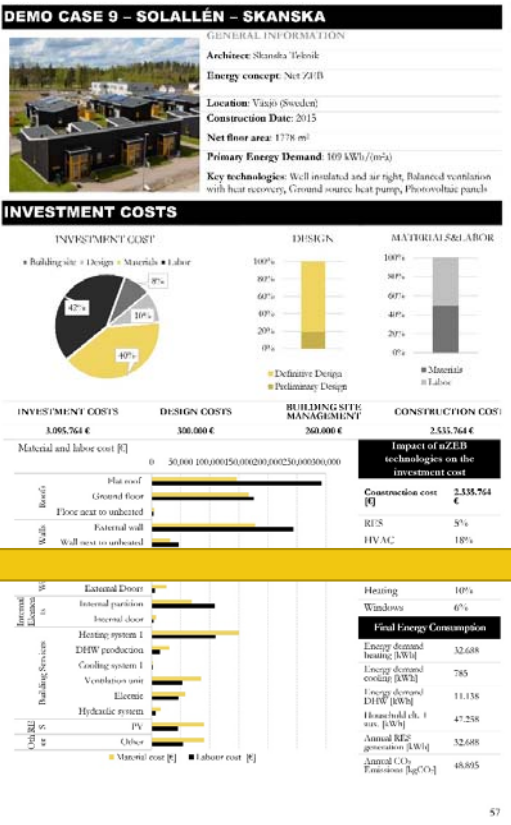
CRAVEZero nZEB spreadsheet

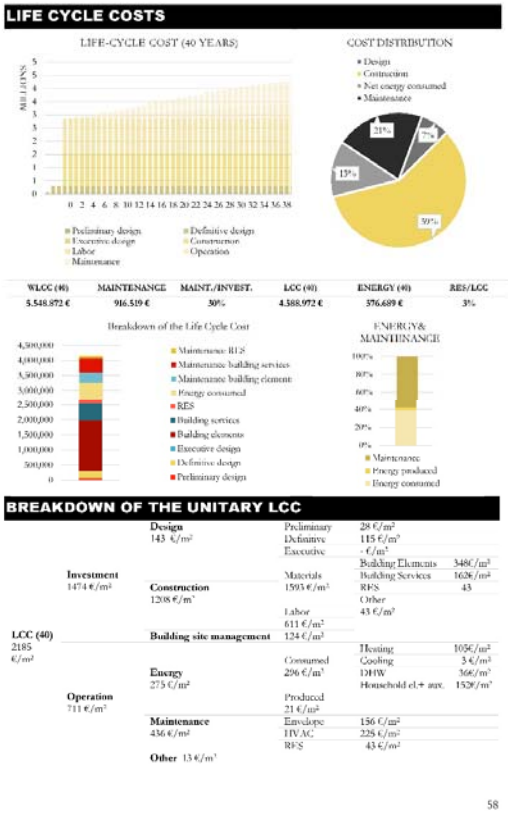
Section 1: Investment cost

- Share for design/materials/labour
- Design cost (preliminary, etc.)
- Cost for materials and labour
- Brakedown for building elements

Section 2: Life Cycle Cost

- Yearly LCC
- Brakedown for life cycle phases
- Energy and maintenance



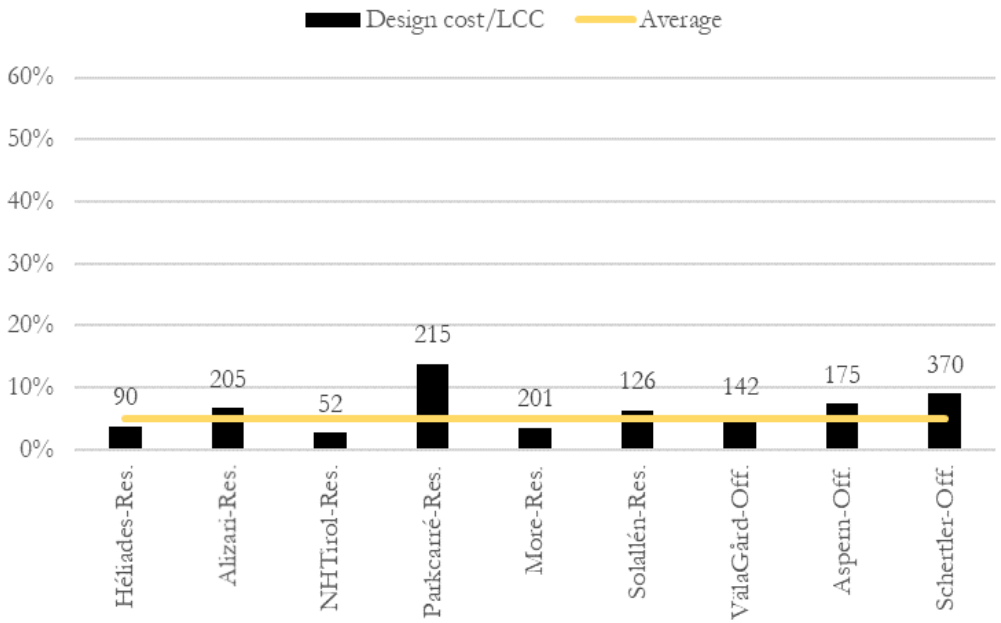


04

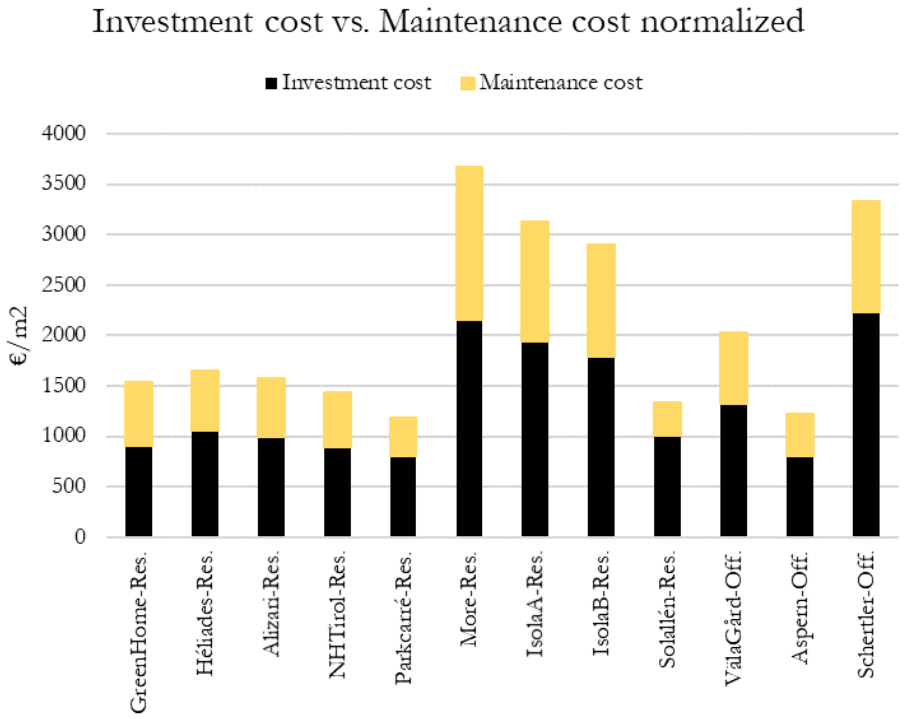
LCC Case Study analysis

Comparative analysis – case studies

Design cost (% - €/m²)



Investment/maintenance €/m²



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02 Processes

Optimal Processes towards cost optimal NZEBs

- To reduce costs and to accelerate the implementation

02 Processes

☐ Indirect Influence

☑ Direct Influence

Stakeholders	Urban Planning / spatial planning	Planning	Construction	Operation	Maintenance and repair	Renovation	End of life
	Lifecycle Phase						
Tenant / user				☑	☑	☐	
Real estate agents			☐	☑			
Builder/ construction company			☑			☑	☑
Planner	☑	☑	☑			☑	
Property management				☑			
Investor			☐	☑			
Building owner / landlord		☑	☑	☑	☐	☑	
Building owner (public)		☑	☑	☑	☑	☑	
Society	☑	☑	☑	☑	☑	☑	☑

Different stakeholders

Different needs

02 Processes

Indirect relationship

Direct relationship

Stakeholders	Marketability	Lettability	Value development	Rental income	Comfort	Durability	Arch. quality	Image	Energy Savings	User satisfaction	Climate protection	Energy autonomy
	Co-Benefits											
Tenant / user		☐			☑	☐	☑	☑	☑	☑	☐	☐
Real estate agents	☑	☑	☑	☑	☐		☐	☑	☐	☐		
Builder/ construction company						☑	☐			☐		
Planner		☐	☐		☑	☑	☑	☑	☑	☑		
Property management		☑	☑			☑			☑	☑		
Investor	☑	☑	☑	☑			☐	☐				
Building owner / landlord	☑	☑	☑	☑	☑	☑	☐	☑	☑	☑		☐
Building owner (public)	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Society	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑

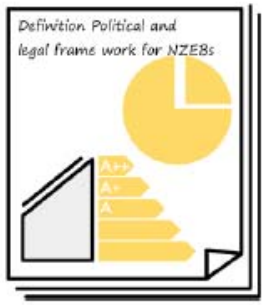
Not only costs but also revenues

02 Processes

Interactive process map:

- Actions/connections
- Stakeholders
- Main driver
- Influence on cost
- Influence on other actions
- Pittfalls&bottlenecks

1.1 Definition of the political and legal framework for nZEBs



Lack of a political and legal nZEB framework might lead to higher follow-up costs: This is the case, if economically feasible and energetically reasonable solutions are inhibited due to legal limitations. Increased investments in energy-related nZEB technologies and services derive most likely from legal framework stimulating socio-economic development.

MAIN DRIVER	STAKE-HOLDERS	INFLUENCE ON PLANNING COSTS	INFLUENCE ON INVESTMENT COSTS	INFLUENCE ON FOLLOW-UP COSTS	CO-BENEFITS
Authorities	Citizen groups/NGOs; Society; Politicians	- € 2		- €€	Energy savings and CO_2-reduction

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03 Technologies

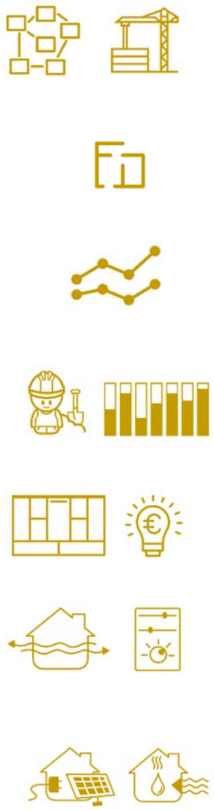
Cost reduction potentials for NZEB technologies

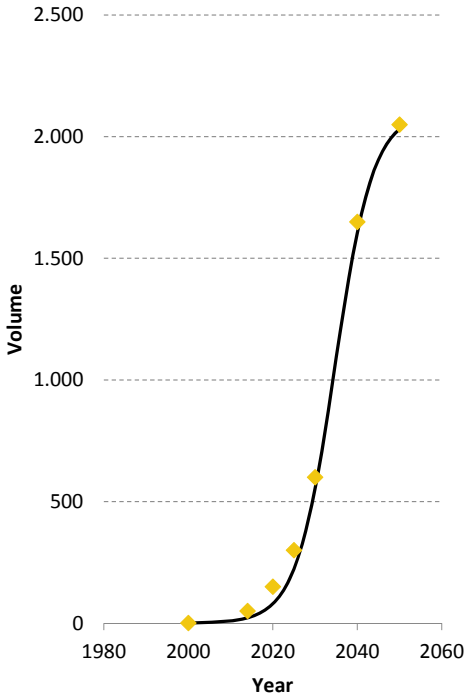
- Collection of materials and information, to the definition of effective low-cost technology solution sets for new NZEBs.

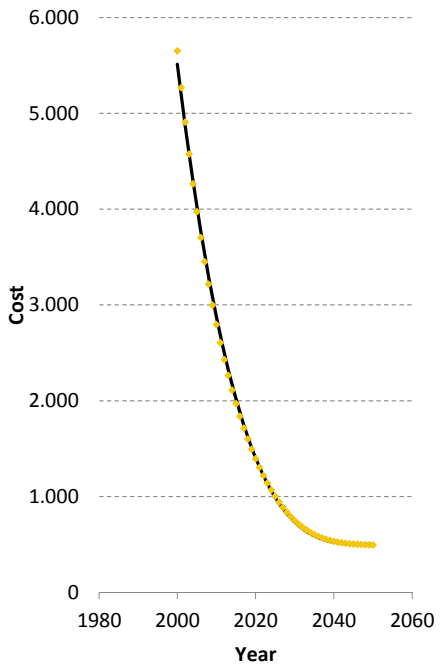
Database of technolgies and related costs

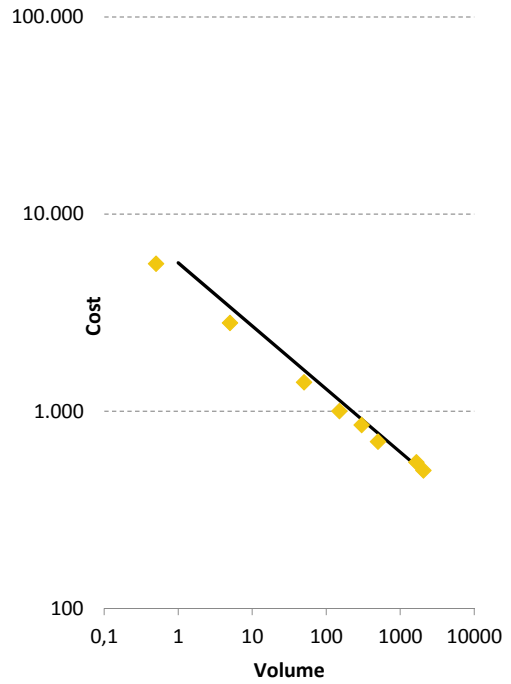
Actions

NZEB TECHNOLGIES AND SOLUTION SETS









03 TECHNOLOGIES

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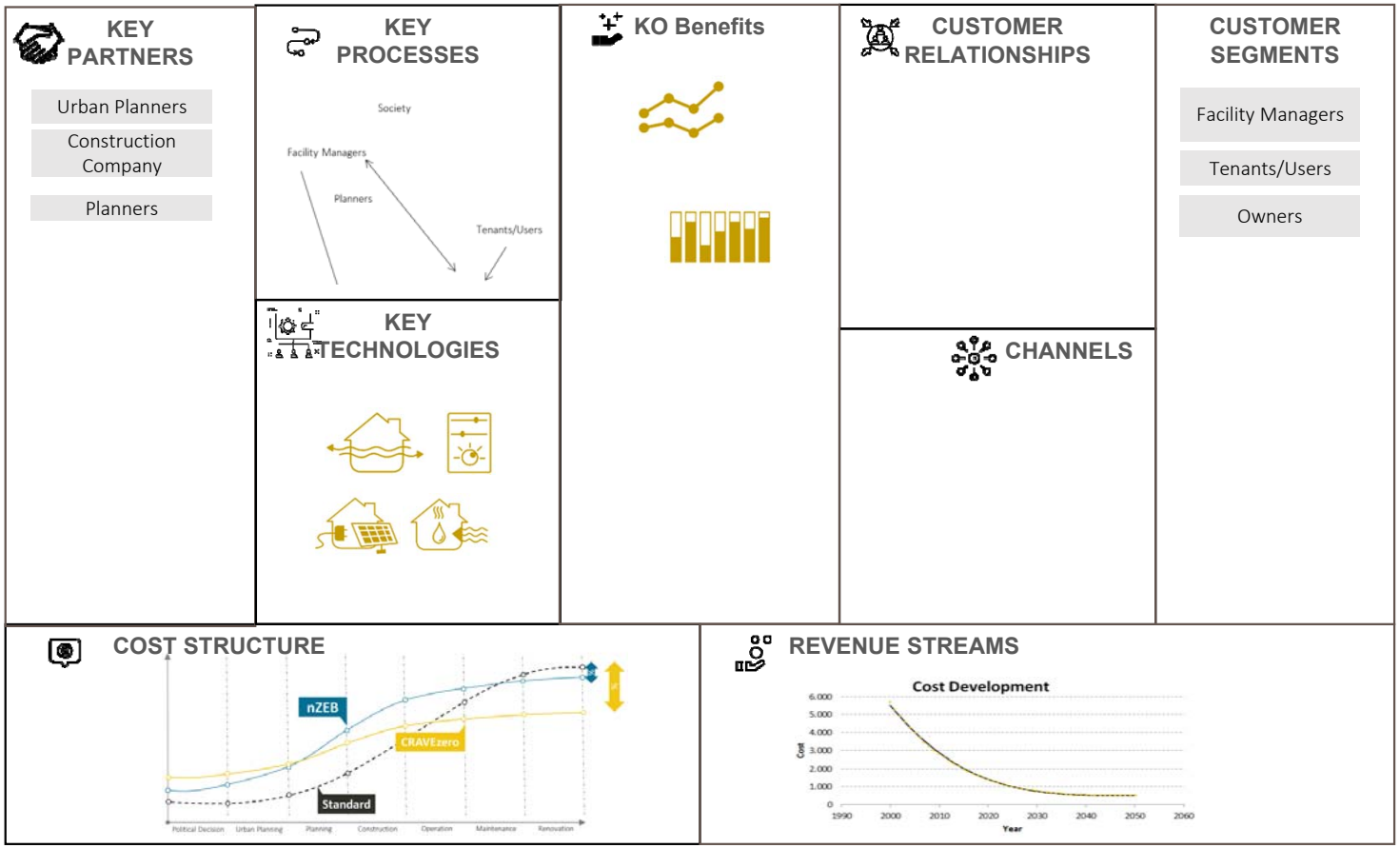
04 Business Models

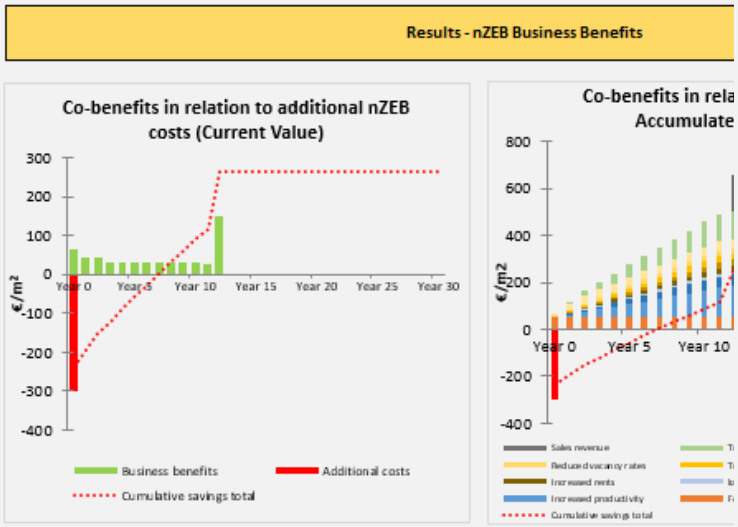
- Analysis which business models exist, and what frameworks (market and policy) accompany them.

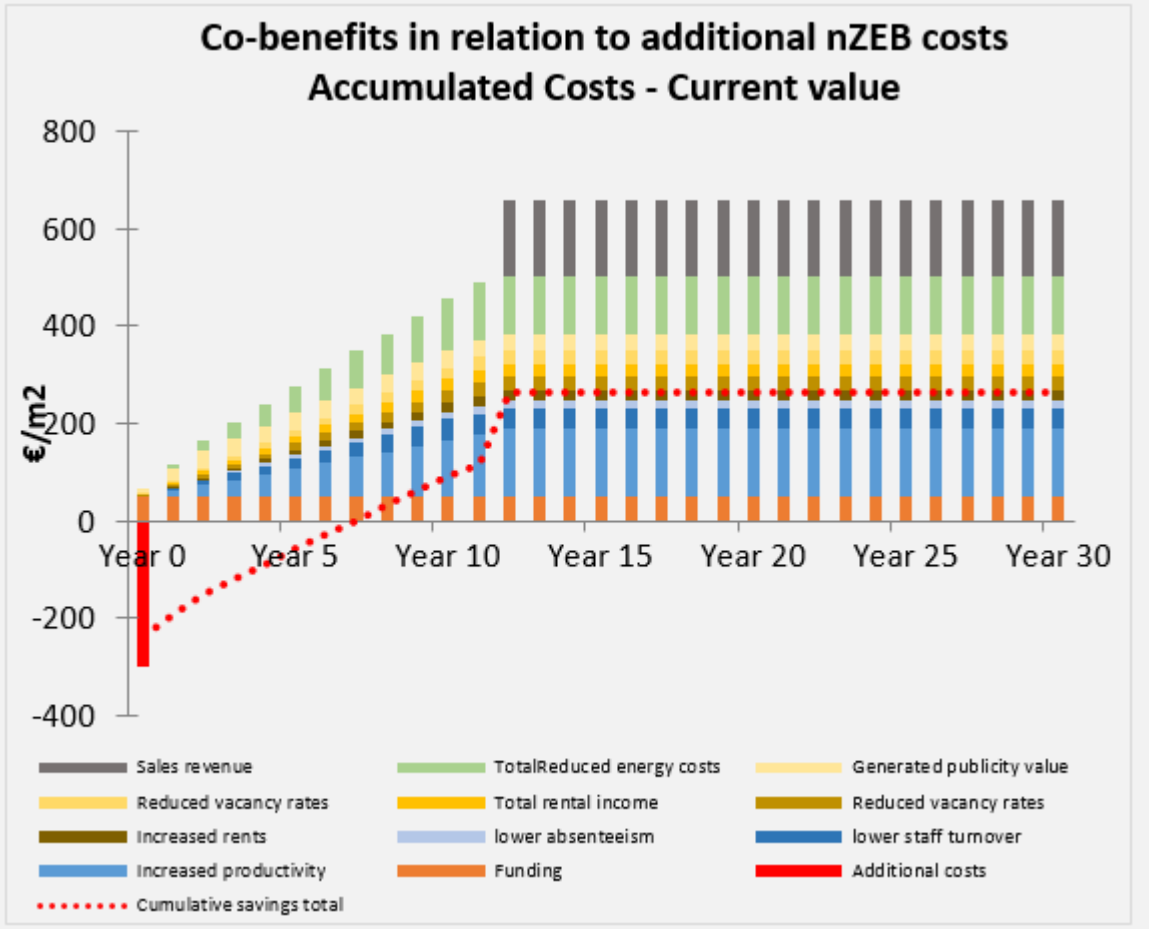
- Define guidelines for policymakers to allow a more effective up-scaling of proven business models and services.

04 Business Models



04 Business Models





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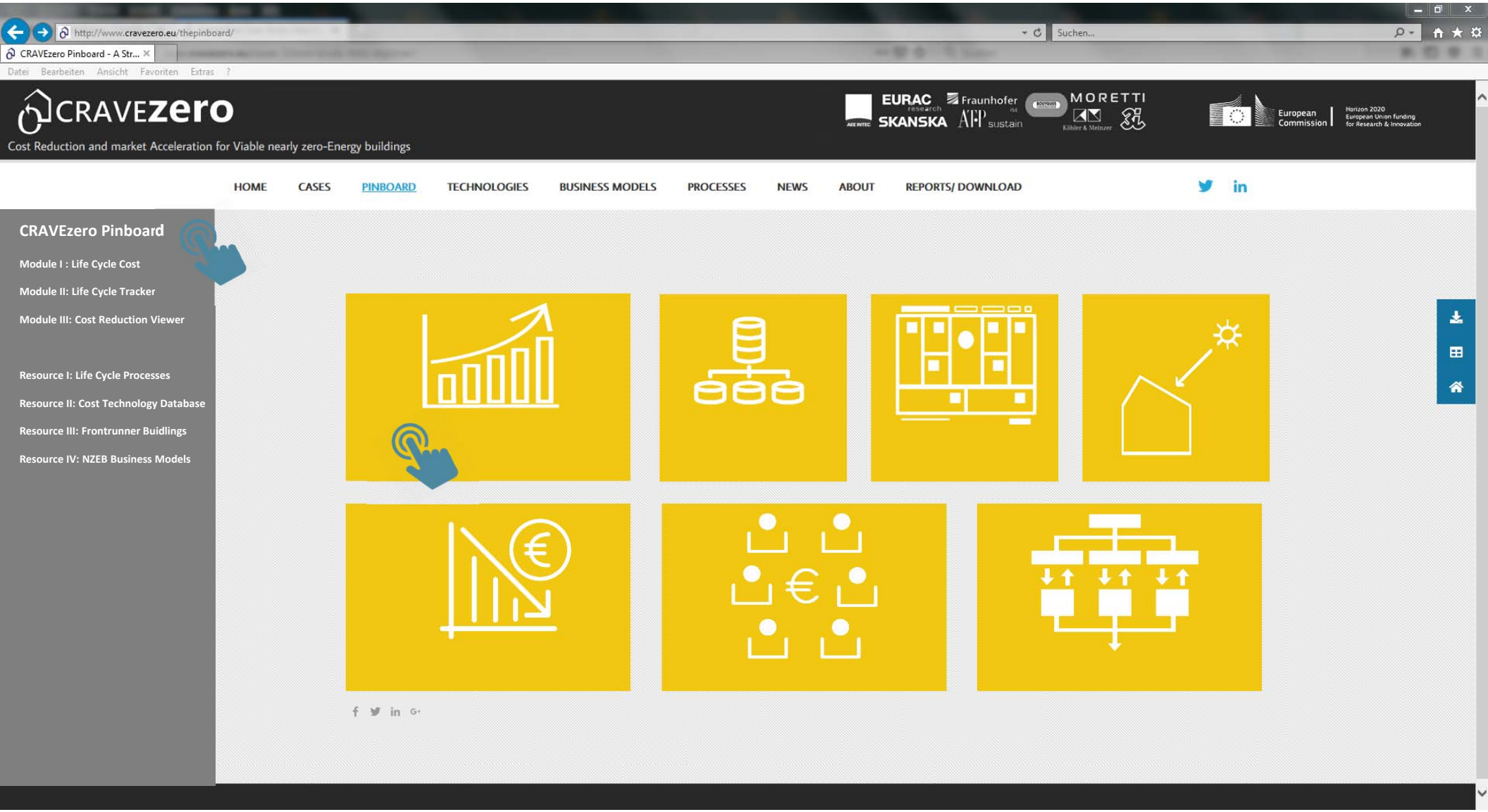
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CRAVEzero Pinboard
Module I : Life Cycle Cost
Module II: Life Cycle Tracker
Module III: Cost Reduction Viewer
Resource I: Life Cycle Processes
Resource II: Cost Technology Database
Resource III: Frontrunner Buidlings
Resource IV: NZEB Business Models

First Results:

Case Study Benchmarks Now Online

http://www.cravezero.eu/cases/case-study-data-explorer

http://www.cravezero.eu/thepinboard/

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EURAC research SKANSKA Fraunhofer ISI AFP sustain MORETTI Köhler & Meinzer

European Commission | Horizon 2020 European Union funding for Research & Innovation

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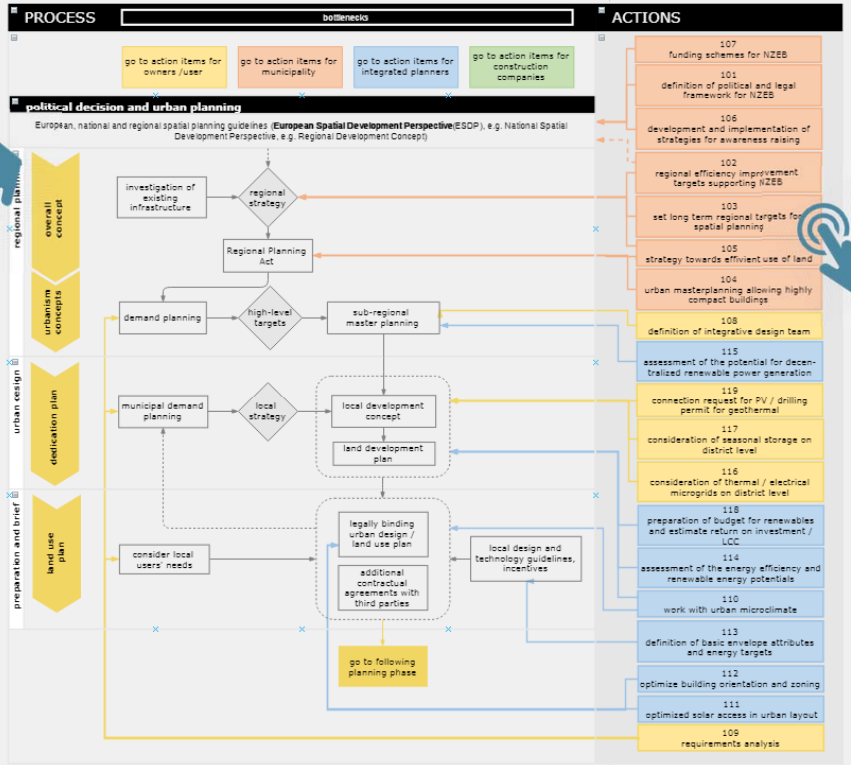


ACTION: Optimize Building Orientation and Zoning

LIFE CYCLE PHASE: URBAN

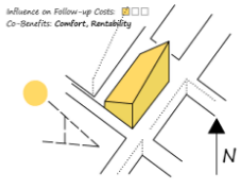
1 DESCRIPTION OF THE ACTION

The orientation of a building and the orientation of the windows significantly determine the heat gain and losses during the heating season, but also cooling demand during summer. East and west oriented windows receive 60%, north windows 40% of the usable solar radiation of a south-facing window. Due to the low morning and evening sun during summer, the east and west facing windows have greater overheating problems than south windows.

The ability to maximize heat gains by orienting, zoning, and increasing the window area on the south side is often overestimated. Depending on the shape of the building and the proportion of the window area, the heat gain ranges from 4 to 8 kWh / m²GFA and year. Only with passive houses with an annual heating requirement of up to 15 kWh / (m²TFA a) do these heat gains play a relevant role. For passive houses, a maximum deviation from the south of 10 ° should be maintained. For low-energy houses, the south-facing façade can deviate up to 30 °.

The zoning of living and recreation rooms should be oriented to the south, so that they can benefit from direct sunlight even in winter. On the north side, adjoining rooms, stairs and the entrance area should be arranged, the temperature level of which can be kept lower in winter.

2 EXAMPLES (CASE STUDY A)



3 CO-BENEFITS

Comfort

4 CONFLICT OF AIM WITH OTHER ACTIONS

5 INFLUENCES ON OTHER ACTIONS

1.7, 1.14

6 POTENTIALS

With decisions on a quarter or urban masterplanning a high potential of energy savings arise from definition of possible orientation and zoning.

7 RISKS

- Might somehow limit the owners freedom of functional use of the building
- There is a need for knowledge on how to use passive solar gains effectively (without causing active cooling measures) and reduce the overall final energy demand

8 STANDARDS AND REGULATIONS

Some local building guidelines define building orientation or at least roof orientation.

Passive-house standard gives very good instructions to use passive solar gains.

9 MAIN DRIVER

Planners

10 INVOLVED STAKEHOLDERS

Stakeholder D

11 METHODOLOGY/ TECHNOLOGY/ BUSINESS MODEL

Energy certification tools or PHPP for calculation of benefits.

12 SPECIFICATIONS (QUALITY / QUANTITY GOAL)

High: Fixed detailed zoning concept with living rooms max. deviating 30° from south
Medium: Basic zoning concept
Low: No orientation and zoning concept of building area

REFERENCES USED

Haas J. et al: Handbuch für Energieberater, 1994, PHI Darmstadt - different sources at https://passiv.de/, accessed at 20th June 2018

Thank you!

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