

# INDU-ZERO

## New European Bauhaus

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15-09-2022



**Smart  
Renovation  
Factory**  
by INDU-ZERO

**Interreg**  
North Sea Region  
**INDU-ZERO**

European Regional Development Fund



EUROPEAN UNION

# Green Deal Europa

## *Renovation wave*

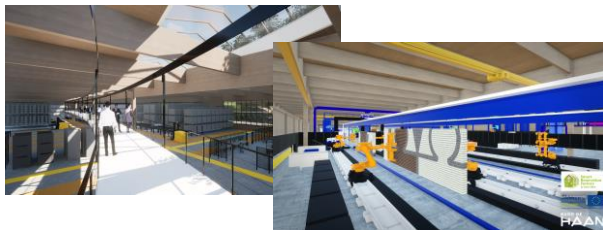
- 2030 – 55% CO<sub>2</sub> reduction
- 2050 – CO<sub>2</sub> neutral

Building responsible:

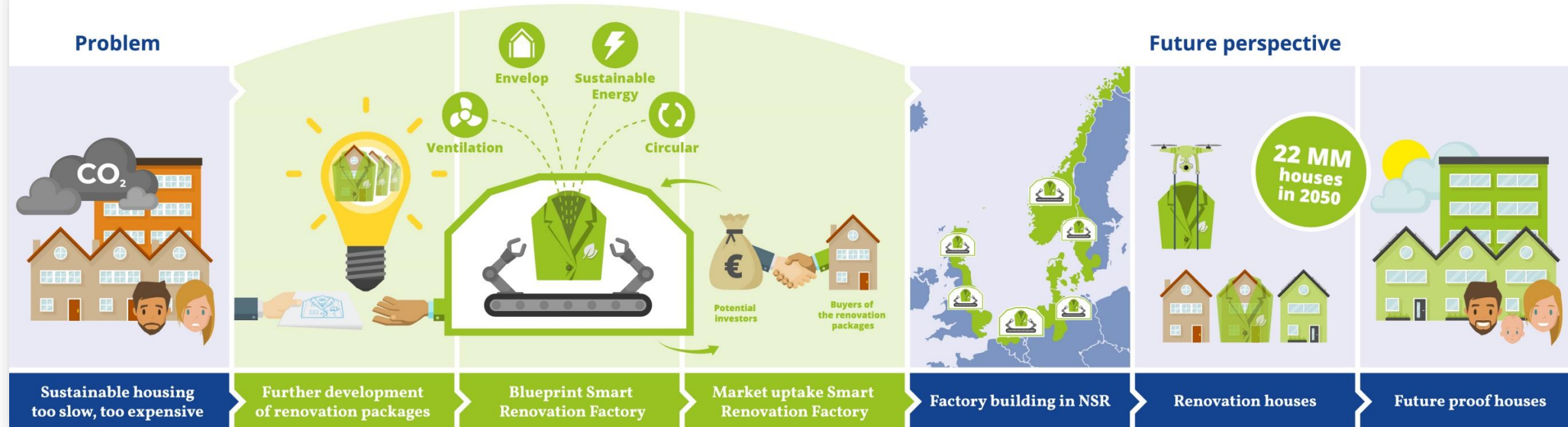
- 40% energy consumption
  - 36% greenhouse gas emissions
- 2030 – 35 million buildings renovated
  - 2050 – 152 million buildings renovated
- **Need for an industrial approach at lower costs!**



# The project



## THE SOLUTION WITH INDU-ZERO



[Interreg INDU-ZERO project - YouTube](#)

# INDU-ZERO in a nutshell

- **Blueprint for a high-tech building factory**
- **50%** of the current price for a Net Zero renovation
- **15.000** renovation packages/year per factory



# Partners and the advisoryboard



# Logistics

# Overview of logistical processes

## Intralogistics

### Inbound

- Truck unloading
- Goods separation
- Material transportation to warehouse

### Warehouse

- Warehouse space calculation
- Storage types
- Transport methods

### To stock

- Panel transportation to stock
- Outbound warehouse space calculation
- Truck loading

## Cross-company

### Transportation to the factory

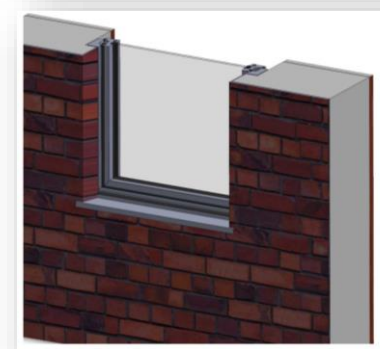
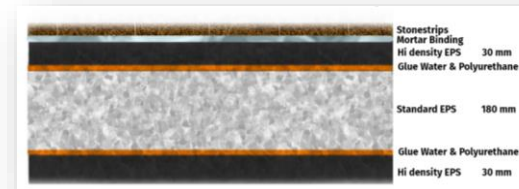
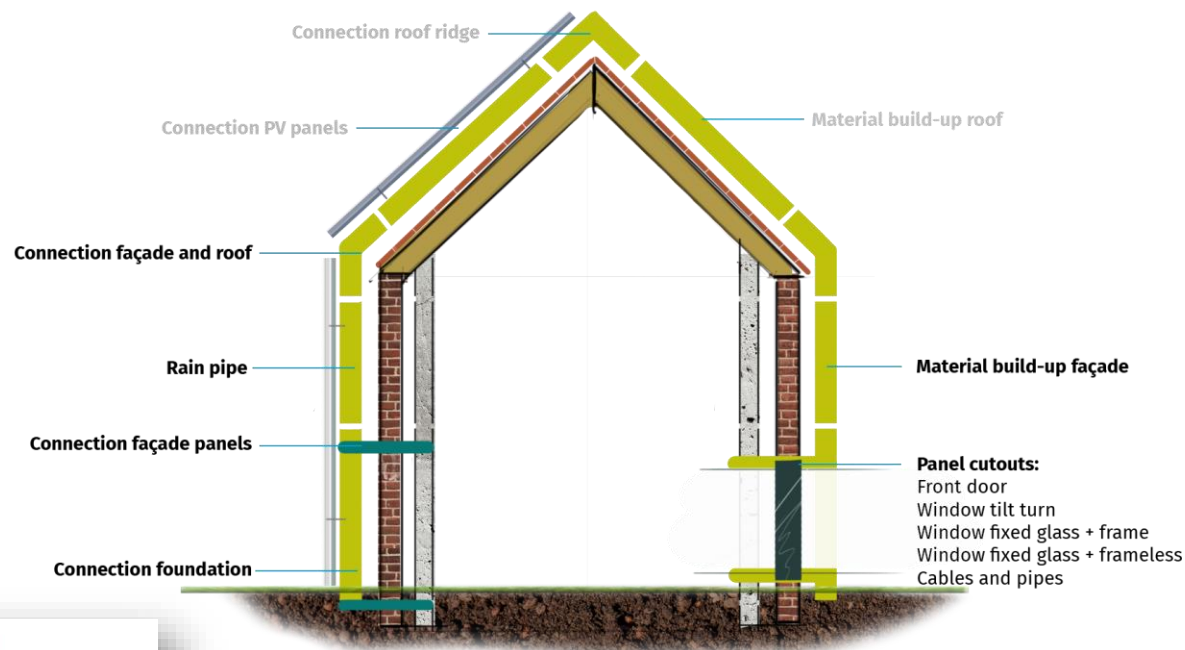
### Transportation to the sites

### Reverse logistics



# Renovation packages

# New products developed



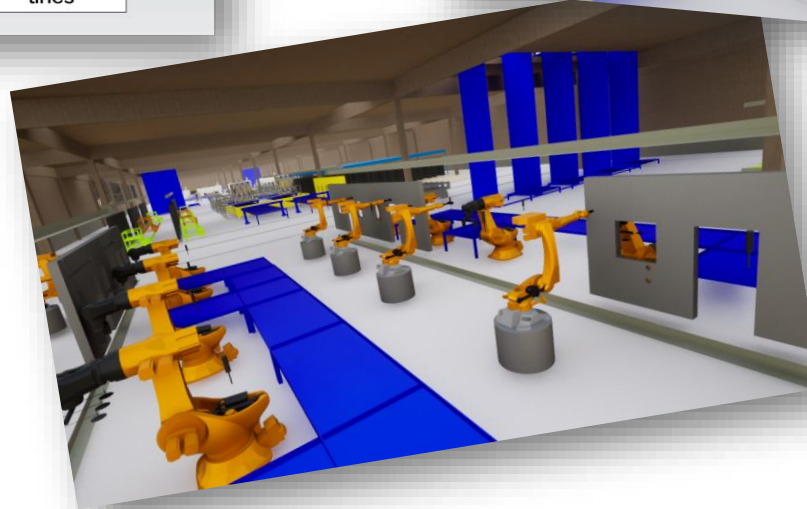
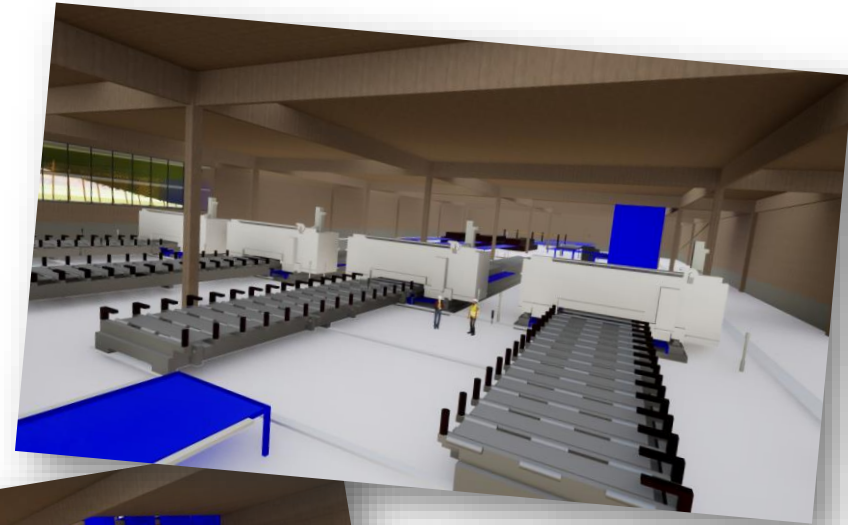
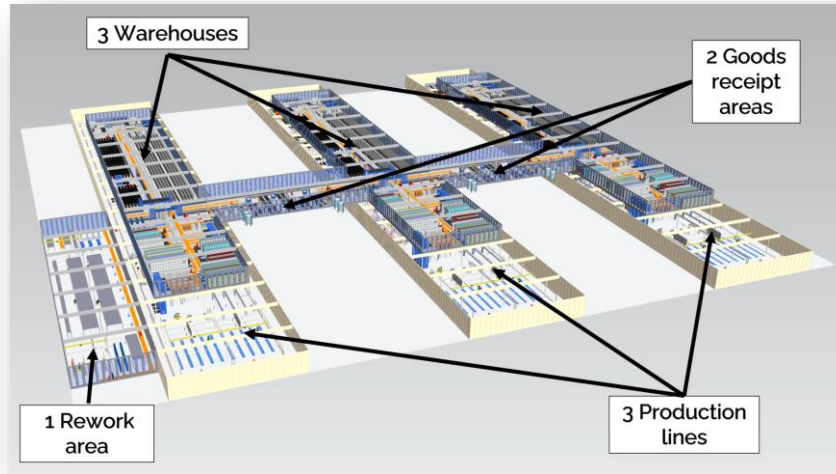
# Impression of the Smart renovation Factory

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North Sea Region  
**INDU-ZERO**  
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# Blueprint INDU-ZERO Smart factory





# INDU-ZERO Smart Factory



- **Factory: 26 hectares**
- **Total 31 hectares**
- **Overall takt time 2 min.**
- **614 elements/day**
- **Inbound & Outbound Logistics**
- **≈ 150 trucks per day**
- **440 workers at the factory**

# INDU-ZERO Video Smart Factory





# On-site mounting

# Mounting on location



- Goal: Total renovation ready within 3 days with 5 workers (terraced house)

→ 1022 employees/year

- Tenants can stay at home



Source pictures renovation Domijn, Rc panels



# Showcase renovation



# Terraced house at Domijn in Enschede / NL

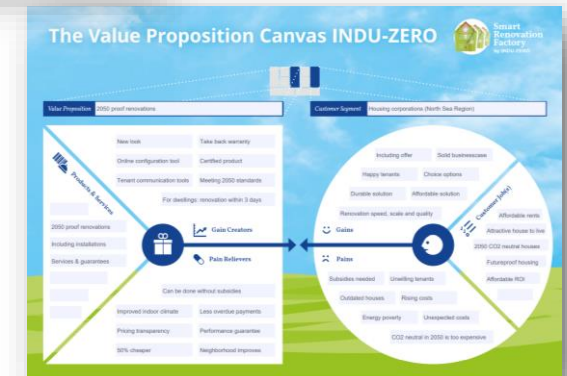
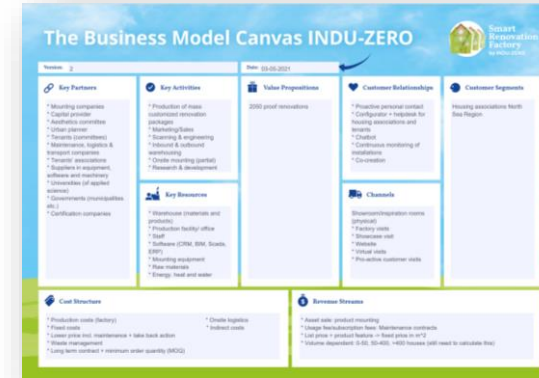
- Net Zero renovations
- 3 different types of installations
- New developments integrated



# Business case

# Business Case of the process

- Business Model Canvas
- Value propositions
- Customer and market research (NL/D)
- Product / Service recommendation
- Break-even-calculation
- Total cost of ownership calculation





# Bidbook



## Bidbook project INDU-ZERO Net Zero renovation

<b>Building type</b>		<ul style="list-style-type: none"> <li>Terraced house rice houses; Corner house - 1965 – 1975 (110 m<sup>2</sup>, size 5.7 m)</li> </ul>
<b>Price</b>		<ul style="list-style-type: none"> <li>€58,000 terraced house; €65,000 corner house excl. VAT</li> </ul> <p>The costs include:</p> <ul style="list-style-type: none"> <li>Design costs, process costs recordings</li> <li>Demolition costs of chimney, removal of old roof tiles, glass and internal parts of windows and doors, removal of central heating boiler</li> <li>Applying the facade and roof panels, including windows and doors</li> <li>Connecting and adjusting all mentioned installations</li> <li>Resident guidance preparation (3 sessions, 1 visit building site)</li> <li>Resident instructions, use installations</li> <li>Permit application preparation</li> <li>Construction and assembly insurance</li> <li>Grant advice</li> <li>Notification Authorities, start renovation</li> </ul>
<b>Panels</b>		<ul style="list-style-type: none"> <li>Sandwich panels for the facade, Rc value of 7 m<sup>2</sup>/K/W</li> <li>Sandwich panels for the roof, Rc value of 8 m<sup>2</sup>/K/W</li> <li>Airtight, airtight (QV 10 value per m<sup>3</sup> = 0.15 litre/s.m<sup>3</sup>)</li> <li>Sill connection / transition</li> <li>Facilities suitable for the conservation law (birds &amp; bats)</li> <li>Comply with the requirements of the Building Decree (fire resistance requirements, etc.)</li> <li>Ready for connections for outdoor fixtures and blinds/screens</li> </ul>
<b>Installations</b>	<b>Central unit</b>	<ul style="list-style-type: none"> <li>3-phase meter box + connection induction hob</li> <li>Air/water heat pump</li> <li>Boiler vessel</li> <li>2 expansion vessels</li> <li>Central ventilation system with heat recovery (WTW)</li> <li>Water-side balancing</li> <li>Infrared radiator bathroom</li> <li>Kitchen hood recirculation</li> </ul>
	<b>Solar panels</b>	<ul style="list-style-type: none"> <li>22 PV panels; 330 WP + inverter; on average about 6,170 kWh/year</li> </ul>
	<b>Monitoring's system</b>	<ul style="list-style-type: none"> <li>Monitoring's system</li> </ul>
	<b>Glazing and exterior doors</b>	<ul style="list-style-type: none"> <li>Window frames with triple glass</li> <li>Skylight</li> <li>Insulated new doors U-value of up to 0.8 W/m<sup>2</sup>/K</li> <li>0 = Net Zero standard</li> </ul>
<b>Standard</b>		<ul style="list-style-type: none"> <li>10 year performance guarantees</li> </ul>
<b>Guarantee</b>		<ul style="list-style-type: none"> <li>Entire renovation ready within 4 working days</li> </ul>
<b>Building time</b>		<ul style="list-style-type: none"> <li>Tenant stays at home during renovation</li> <li>Resident calendar: planning incl. (clean up) tasks resident</li> </ul>

<b>Project dependent (additional costs)</b>	Product costs	<ul style="list-style-type: none"> <li>Floor insulation ground floor RC 3.5 m<sup>2</sup>/K/W</li> <li>Electric</li> <li>Safety glass according to NEN 3569 (costs in accordance with reference types)</li> <li>Vacuum Glass</li> <li>Sun protection (starting point; sun protection kitchen/living room on the south, sluice facility)</li> <li>Induction Cooker</li> <li>Radiators (slightly larger than existing due to heating)</li> <li>Fan 50 m<sup>3</sup>/h if not yet present</li> <li>Fan 25 m<sup>3</sup>/h if not yet present</li> <li>Additional offer for common ZAVs</li> <li>Replace/move outside tap</li> <li>Replace/move water well</li> <li>New fences garden walls</li> <li>Pipes sewer, fibre optic/cable</li> <li>Pan set</li> <li>Air conditioning</li> <li>Conservation law - exclusion flaps, mitigating measures</li> </ul>
<b>Project dependent (additional costs)</b>	Process costs	<ul style="list-style-type: none"> <li>Full resident guidance</li> <li>Permit application and fees</li> <li>Asbestos removal costs</li> <li>Expense and nuisance allowances for residents; wallpaper curtains carpeting etc.</li> <li>Grants (applications)</li> </ul>
<b>Cheaper alternatives</b>	Product costs	<ul style="list-style-type: none"> <li>2 decentralized ventilation systems (CO2 controlled) with WTW (alternative to central WTW) in addition to the use of existing mechanical ventilation and natural ventilation in bedrooms</li> <li>Mailbox outside</li> </ul>

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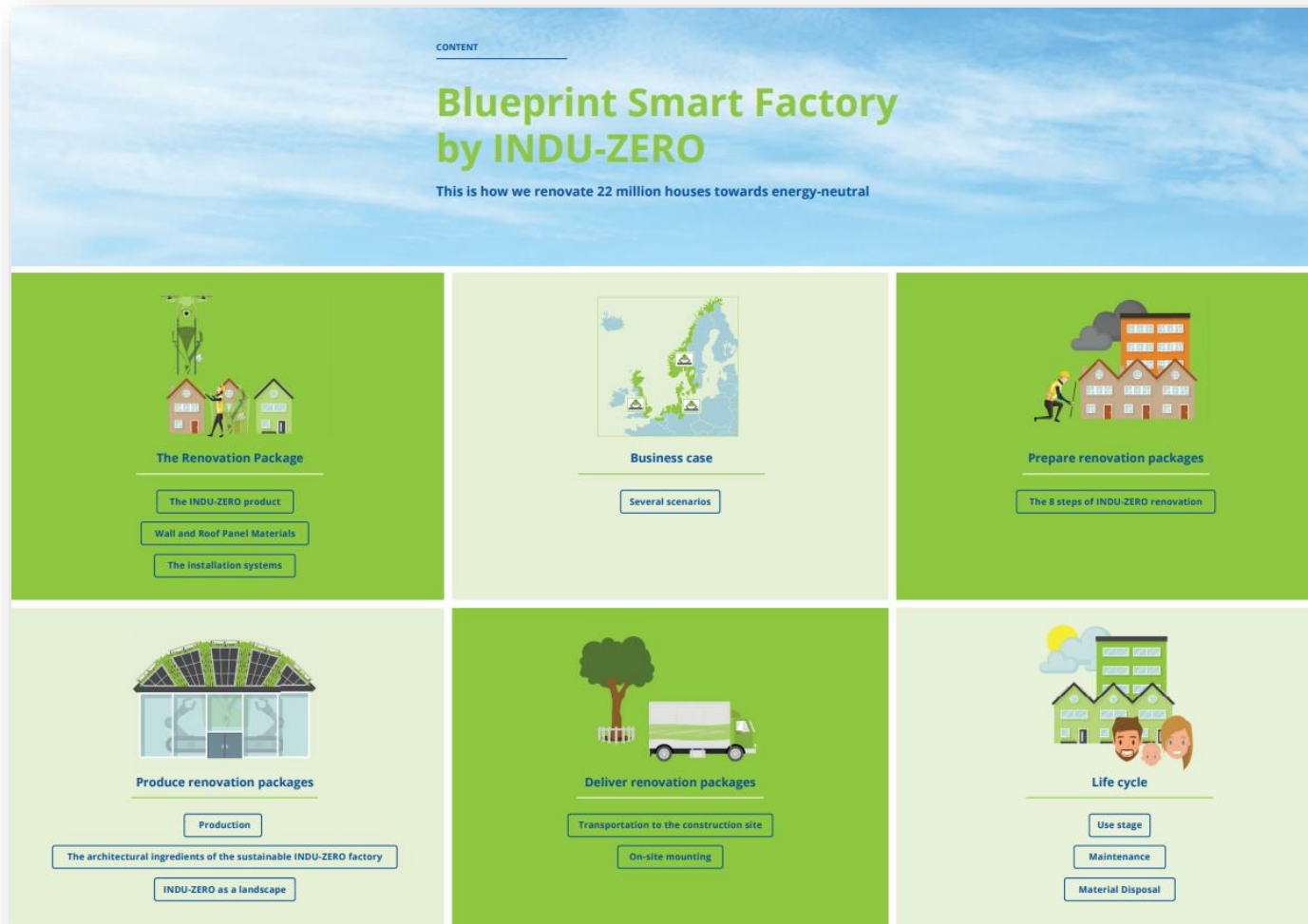


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# Blueprint – Online magazine

# Online magazine

<https://northsearegion.eu/indu-zero/about-the-blueprint/>



# Take home message

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**Industrial Net Zero renovations for half the  
current price!**

➤ <https://northsearegion.eu/indu-zero/>



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# Questions?

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