

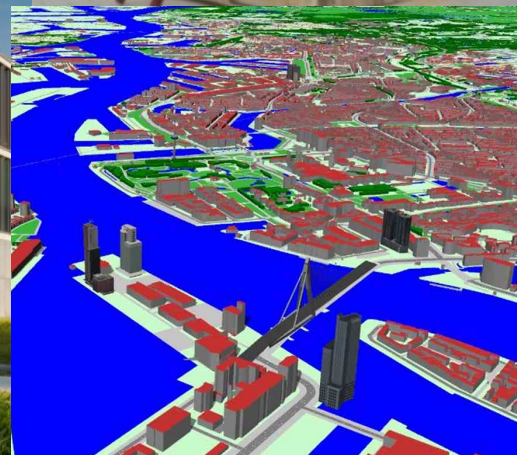
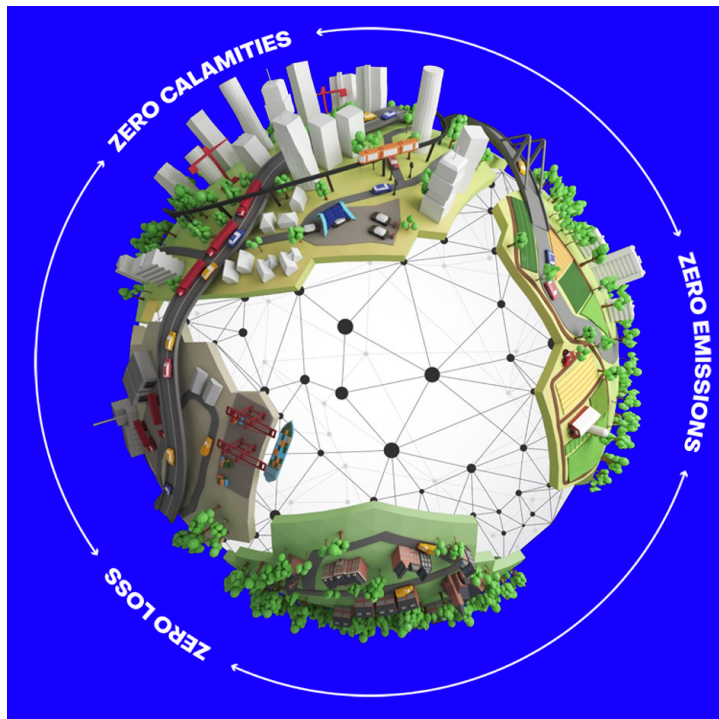
Innovation, Implementation and Industrial Construction in The Netherlands

London Sept 2026
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TNO innovation
for life



A liveable future for all



Our national challenges for the built environment...

Challenging national numbers (~4-8% of EU)

We need to accelerate delivery by a factor 2 – 3:

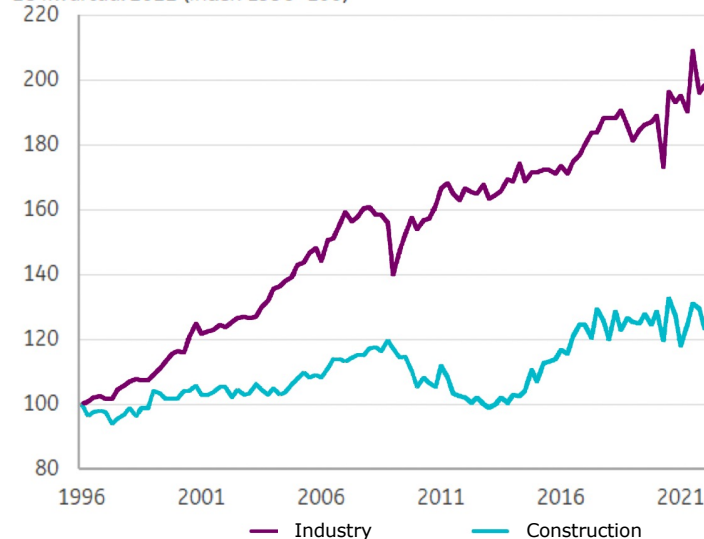
- Realize +100.000 new houses per annum
- Decarbonize 8 million existing houses
- Decarbonize 1 million buildings
- Renovate over 80.000 bridges

With challenging targets:

- Significantly reduce emissions by 2030 (~40% of total CO2 emissions), implement EBPD IV + ...
- A climate resilient built environment
- 50% circular and fully circular by 2050

A significant productivity gap

Arbeidsproductiviteit van de toegevoegde waarde per gewerkt uur, 1996 t/m 2e kwartaal 2022 (index 1996=100)



*Source: ING, CBS

TKI Bouw en Techniek: national consortium for knowledge and innovation in the built environment in the Netherlands

Position in the ecosystem:

System orchestrator connecting policy, asset owners, industry and knowledge institutions to accelerate innovation, adoption and scaling

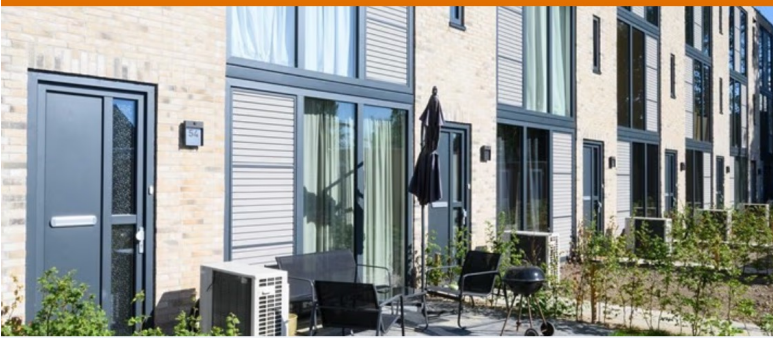
Way of working

Aligning innovation needs from the government and industry, initiating and steering mission-driven national programs and enabling cross-cutting platforms

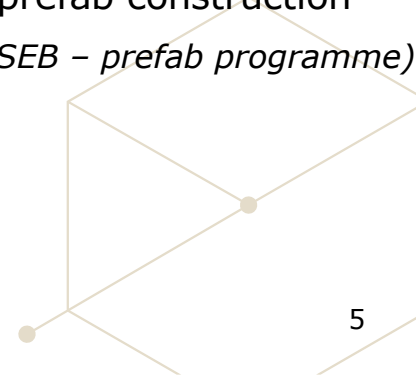


Example: programmes for affordable housing

Programma Innovatie en Opschaling Woningbouw



- > € 100 mln public investment program
- Driving the transition towards:
 - Industrialized housing delivery at scale
 - Fully digital construction and permitting processes
 - Climate- and resource-efficient housing innovation
 - Healthier and more inclusive living environments
- In collaboration with 30 priority urban development areas
- Innovation calls, living labs and acceleration programmes for start-ups
- Supporting and scaling 15 industrialized prefab construction and zero-emission building ecosystems (*SEB – prefab programme*)



Dutch Policy: accelerate housing construction > 100000 dwellings/year

De 26 nationaal grootschalige woningbouwgebieden

Om de woningnood aan te pakken ontwikkelen we versneld 26 nationaal grootschalige woningbouwgebieden – goed voor zo'n 430.000 nieuwe woningen tot en met 2035 – waar het Rijk extra regie voert in regio's met de grootste druk. Deze locaties zijn onderdeel van regionale verstedelijkingsstrategieën en dragen bij aan de jaarlijkse doelstelling van 100.000 nieuwe woningen.



Woningbouwgebieden

- 1 Groningen Suikerzijde
- 2 Groningen Stadshavens
- 3 Eindhoven Internationale Knoop-XL (Knoop XL en Zuidwest-as, incl. Veldhoven - Hart van Brainport)
- 4 Brabantse Stedenrij (CrossMark/t Zoet in Breda, Spoorzone in Den Bosch en Kenniskwartier in Tilburg)
- 5 Rotterdam Oostflank
- 6 Den Haag CID Binckhorst
- 7 Oude Lijn (Rotterdam Binnenstad en M4H, Schiedam Schieveste-Nieuw Mathenesse, Zoetermeer Entree, Rijswijk Stadsas, Leiden Campus en Den Haag Zuidwest)
- 8 Utrecht Groot Merwede & Rijnenburg (Utrecht en Nieuwegein)
- 9 Haven-Stad (Zaanstad Achtersluispolder, Amsterdam)
- 10 MRA West (Haarlemmermeer)
- 11 MRA Oost (Amsterdam Zuidoost, Zeeburg/IJburg, Lelystad Zuiderhage en Almere Stad)
- 12 Nijmegen Kanaalzone
- 13 Nijmegen Stationsgebied
- 14 Zwolle Spoorzone
- 15 Amersfoort Spoor- en A1-zone
- 16 Arnhem Spoorzone-Oost
- 17 Regio Foodvalley (Ede Zuidoost/Kernhem Noord, Veenendaal Centrum/de Klomp en Barneveld Noord/Bloemendaal)
- 18 Alkmaars Kanaal (Alkmaar)
- 19 Apeldoorn Binnenstad, Spoor- en Kanaalzone
- 20 Helmond Centrum+
- 21 Spoorzone Hengelo-Enschede (Enschede en Hengelo)
- 22 Deventer Centrum, Schil en Keizerslanden
- 23 Haarlem Schalkwijk
- 24 Leeuwarden Middelsee-Spoordok
- 25 Maastricht Spoorzone
- 26 Weert Spoorzone

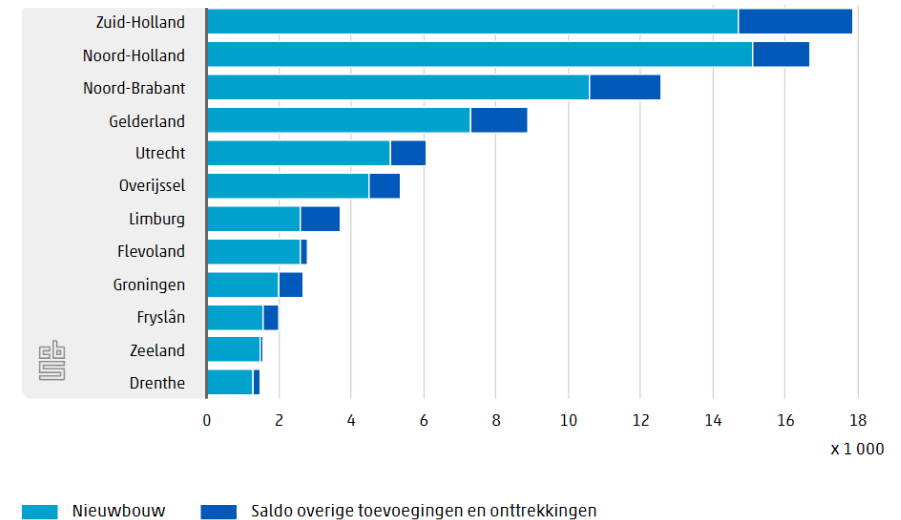
Circular & industrial housing construction NL

(Goals: 100 % circular in 2050, 50 % industrial in 2030)



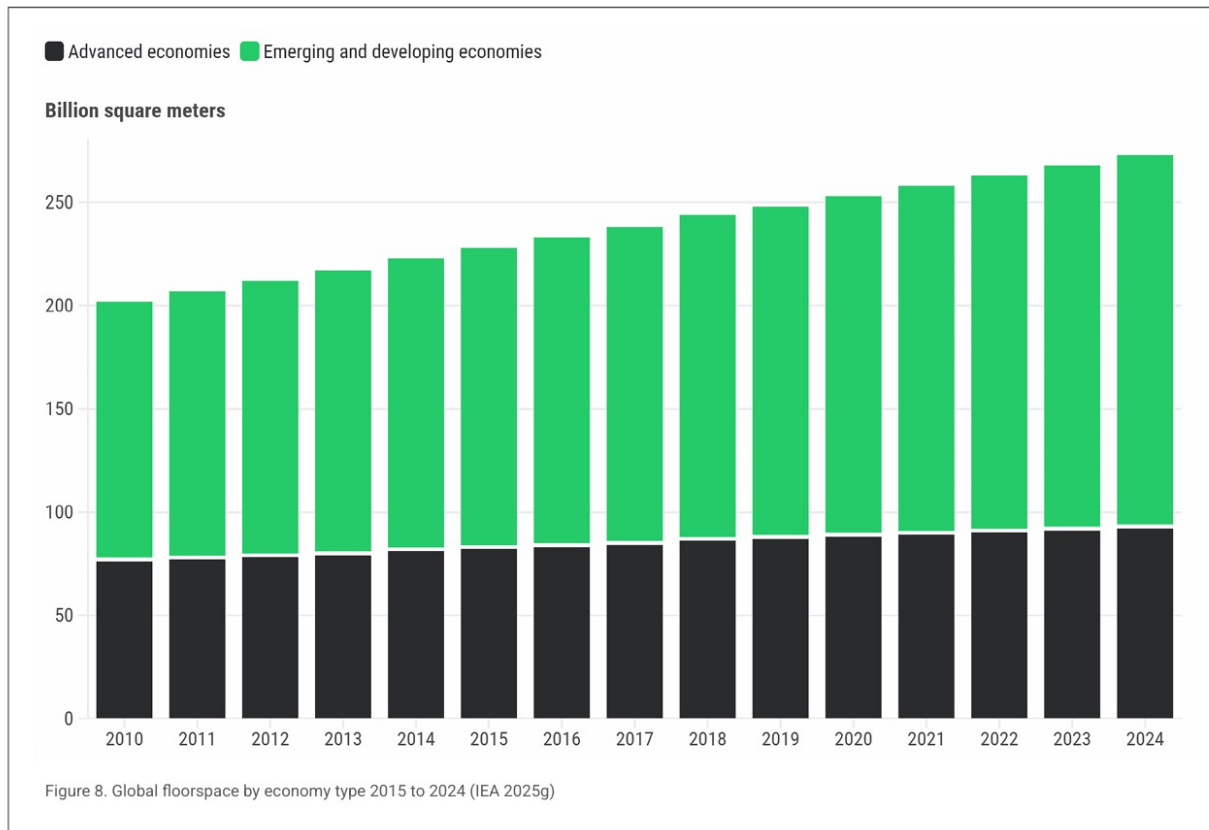
Example: Jaffa (Rotterdam-West). 400 social rentals replaced by 190 new houses

Housing construction per province, 2024



NL, 2024: 70.000 new dwellings
+ 69.000 new built
+ 13.000 transformations/etc.
- 12.000 demolished

Worldwide need for affordable housing



Expected growth up to 2050:

“75 % of the existing buildings in 2050 still to be built”

- ⇒ need for low or negative CO₂ materials
- ⇒ Keep future re-use potential in mind (modular & disassembly)!

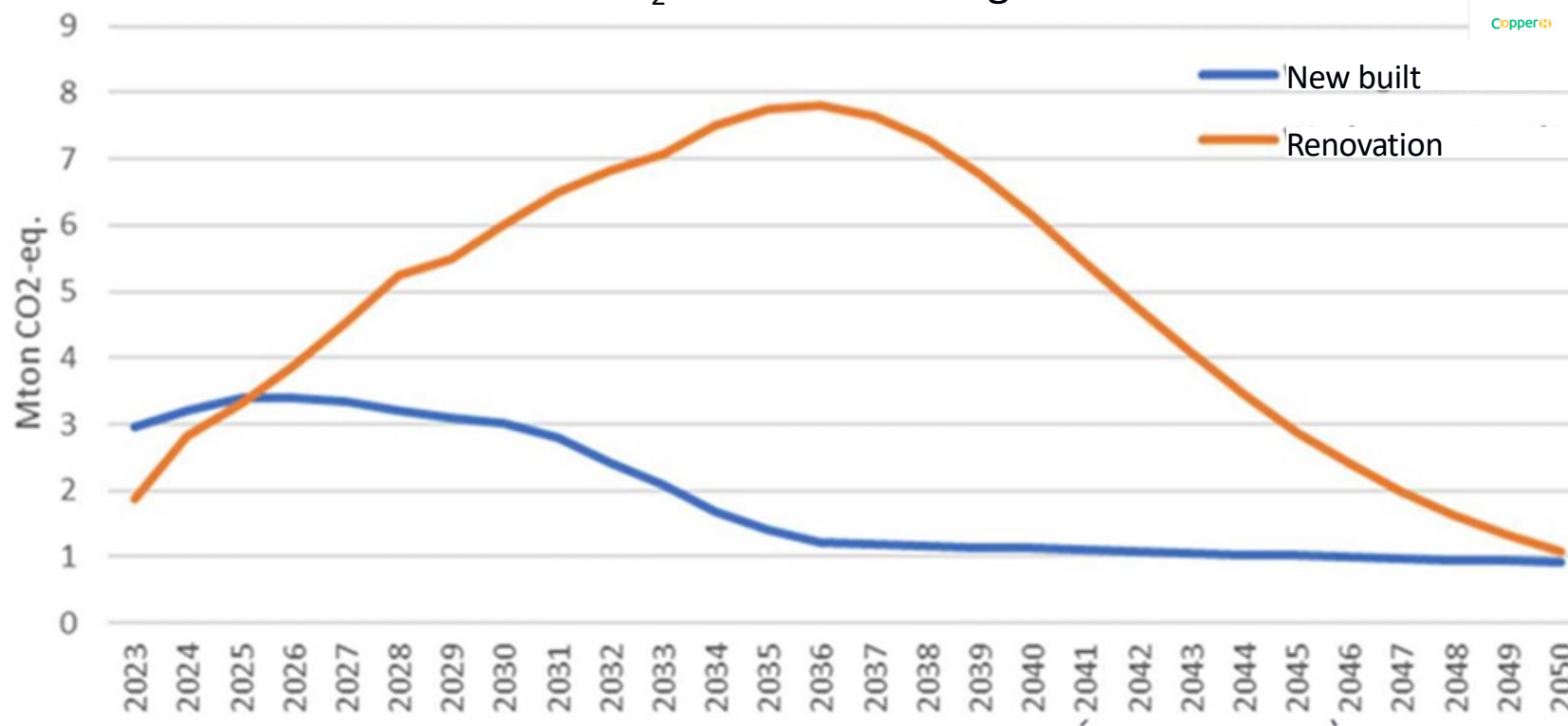
New built & large scale renovation need

European Affordable Housing Plan

Example NL: Renovation material demand will outnumber new built; Circular re-use can cover approx 20 % of materials need

- ⇒ need for high value re-use & regenerative materials (negative CO₂) & modular industrial concepts

NL: Predicted embodied CO₂ emission housing 2023-2050



Nibe et.al. 2023



Housing gap (Europe)



Today we build
1.6 million
new units/year

About
650,000
additional units are
needed per year in the
next 10 years

Delivering the extra
units will cost
€150 bn/year
(public and private
investment)



European Affordable Housing



The 4 pillars of the European Affordable Housing Plan



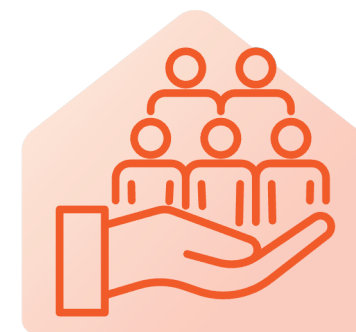
**Boosting
housing supply**



**Mobilising
investment**



**Enabling immediate
support while
driving reforms**



**Protecting the
most affected**



European Affordable Housing



Boosting housing supply



**Strengthening
the productivity
and innovation in
construction**

Industrialization
(off-site, prefab, MMC,...)

**Cutting red tape
to accelerate
housing supply**

Digitalization

**Combining
affordability,
sustainability,
and quality in
housing**

Circularity



European Affordable Housing



9 September 2026: Proposal for Affordable Housing Act to European Parliament

From accompanying recommendation document:

(Brussels, 9.9.2026 C(2026) 6318 final COMMISSION RECOMMENDATION of 9.9.2026 on housing affordability and supply in areas under housing stress)

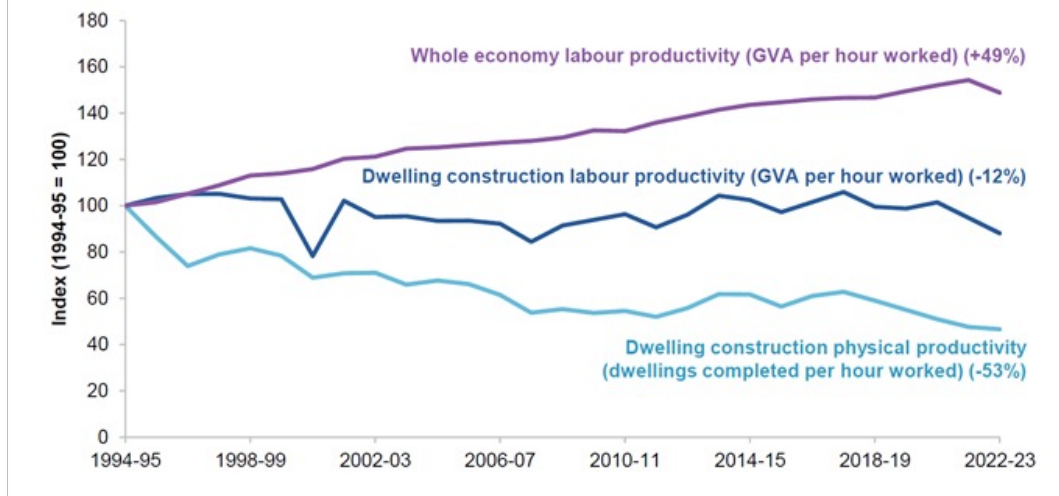
(30) Modern methods of construction, including for renovations, repurposing and extensions, have the potential to reduce costs, construction waste, carbon emissions, construction times and disturbances especially if deployed at scale across the internal market. Such methods are innovative and tend to be more sustainable, for example by employing offsite, modular and prefabricated approaches, and using decarbonised and carbon-storing sustainably sourced biobased materials. They can also promote a whole-life carbon approach to housing construction and improve quality, thus delivering social, economic and environmental benefits.

(34) New funding possibilities for investments in housing supply will be unlocked in the next multi-annual financial framework (2028-2034).



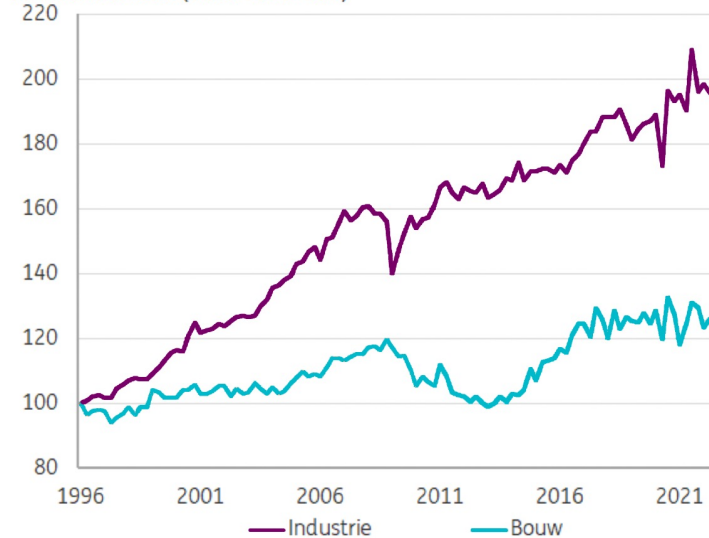
Need for affordable housing & labour productivity

Figure 1 – Dwelling construction productivity in decline



AUS, The Productivity Commission

Arbeidsproductiviteit van de toegevoegde waarde per gewerkt uur, 1996 t/m 2e kwartaal 2022 (index 1996=100)

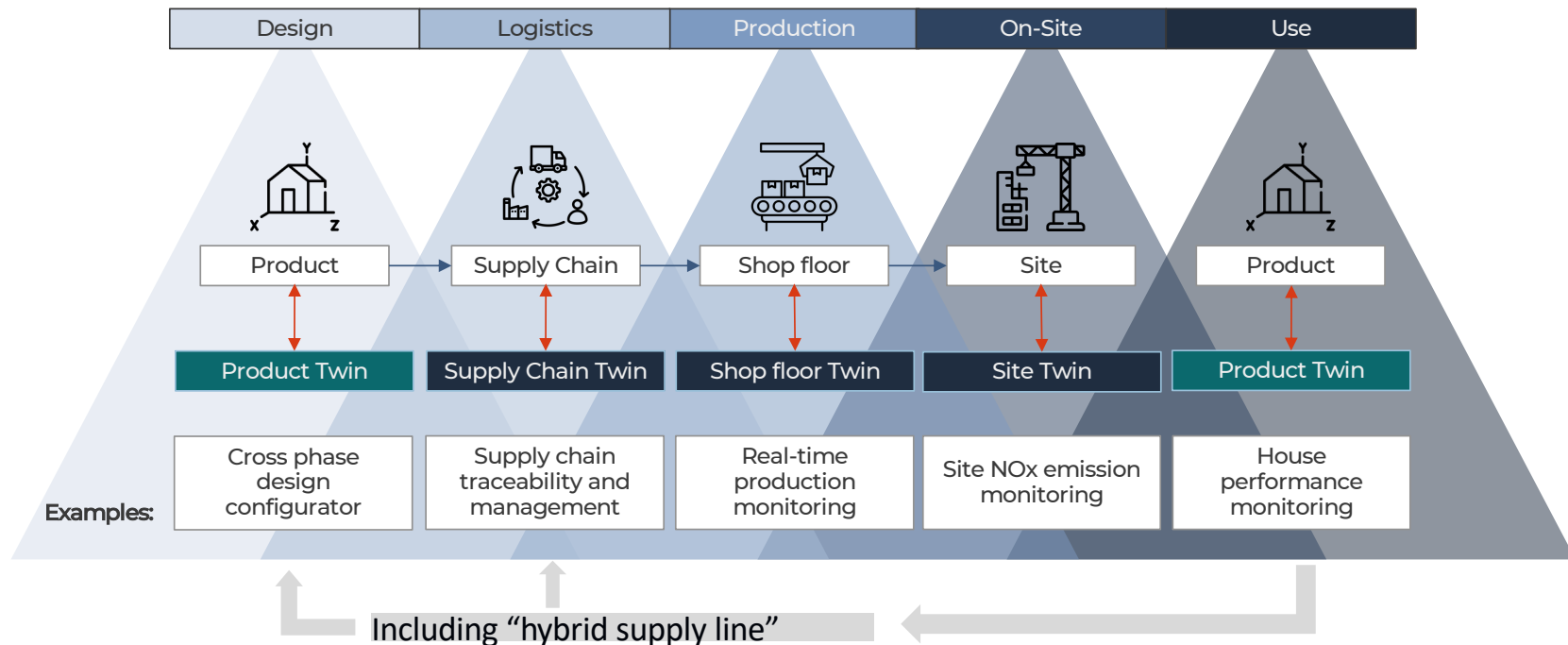


NL, CBS, ING Research, TKI B&T

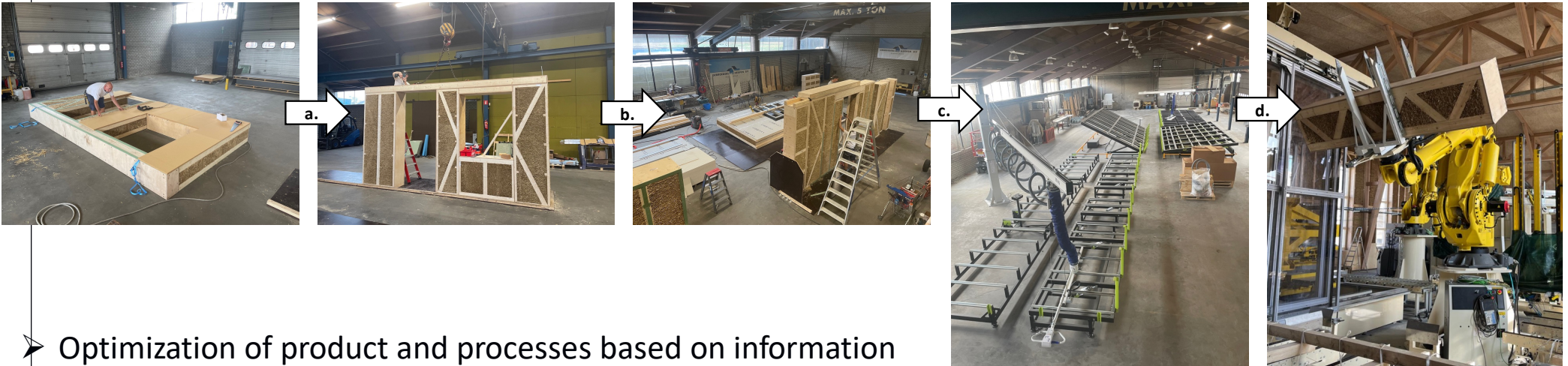
Solution pathway: Move towards more off-site construction (ambitions are growing worldwide; e.g. NL ambition 50 % in 2030; 2025: ~ 20 %), supported by digitalization and use of modular, circular designs

Industrialization / Off-site construction

- Trend housing: standardization and digitalization of **product**, **proces** and **supply chain**
- Coupling with early planning phase & digital permitting process to speed up proces.



Example: biobased façade elements



- Optimization of product and processes based on information and digital technologies
- Data storage of “product” **information in the value chain** and make it available for area development:
 - Circularity, WLC-GWP
 - Energy needs
 - Emissions
 -



**INNOVATION IS THE ACCELERATOR FOR AFFORDABLE
HOUSING (REDUCTION OF COSTS, LABOUR PRODUCTIVITY)**

**COUPLING WITH IMPLEMENTATION PROJECTS IN ORDER TO
REACH SCALE (HIGH TRL)**

**INTERNATIONAL COLLABORATION & KNOWLEDGE SHARING
ESSENTIAL TO INCREASE SPEED**

