

Circular Buildings

Accelerating the circular transformation
of the AEC sector.

Martin Pauli, Director, Global Circular Economy Services Leader

ARUP





Martin Pauli

Director

Arup Global Circular Economy Services Leader

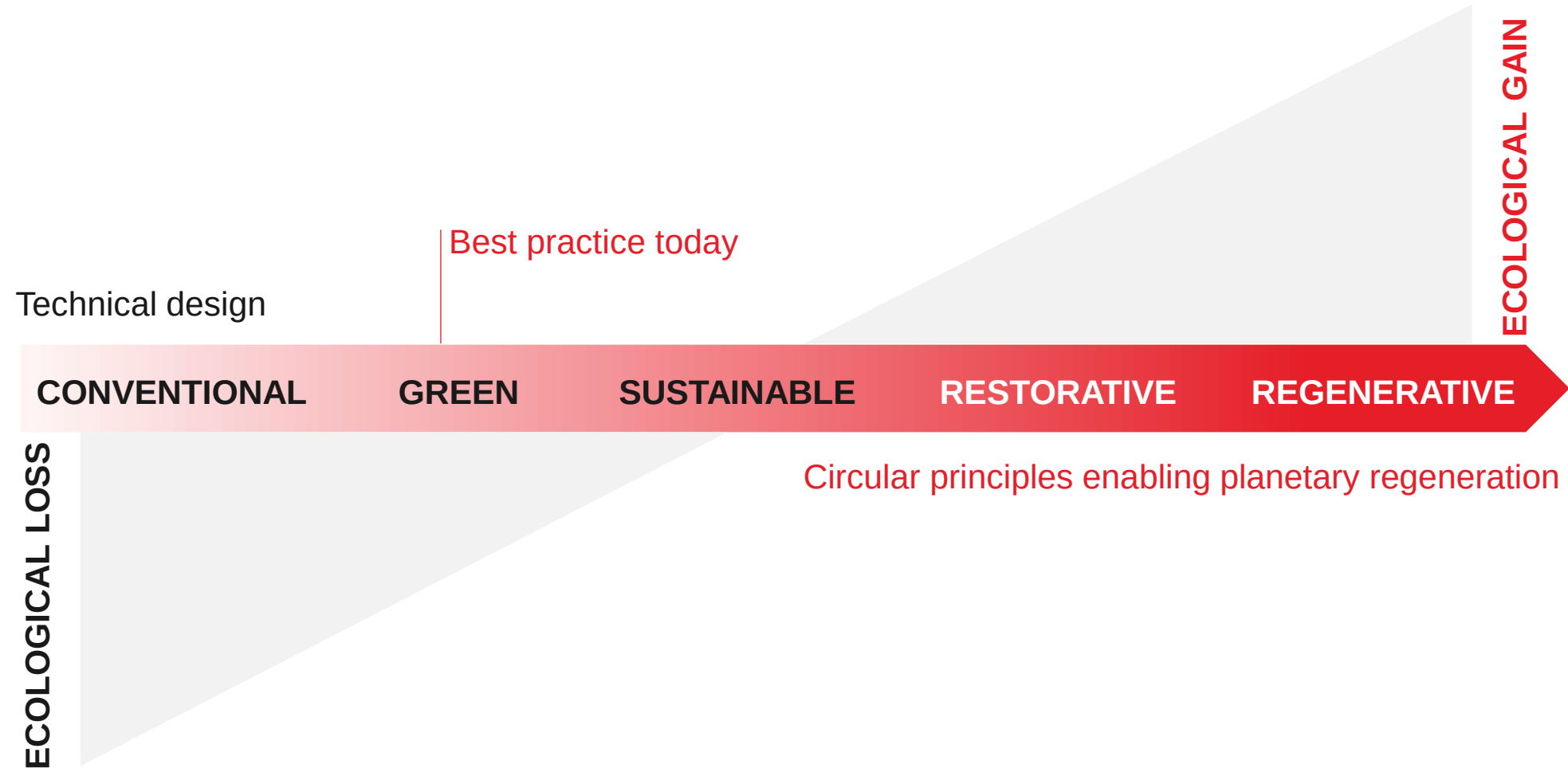
martin.pauli@arup.com

- Architect by training, specialized in **Sustainability Management**
- 10 years **consulting experience** in Construction Sector
- Sector experience – Construction Chemicals, Building System Developers, **AEC Supply Side**
- Advisory **Board Member Circular Construction** DGNB
- Global **Partnership Director** for the Ellen MacArthur Foundation

The built environment is at the heart of achieving climate goals, the biodiversity agenda and decarbonized and resource productive supply chains in Europe and beyond.

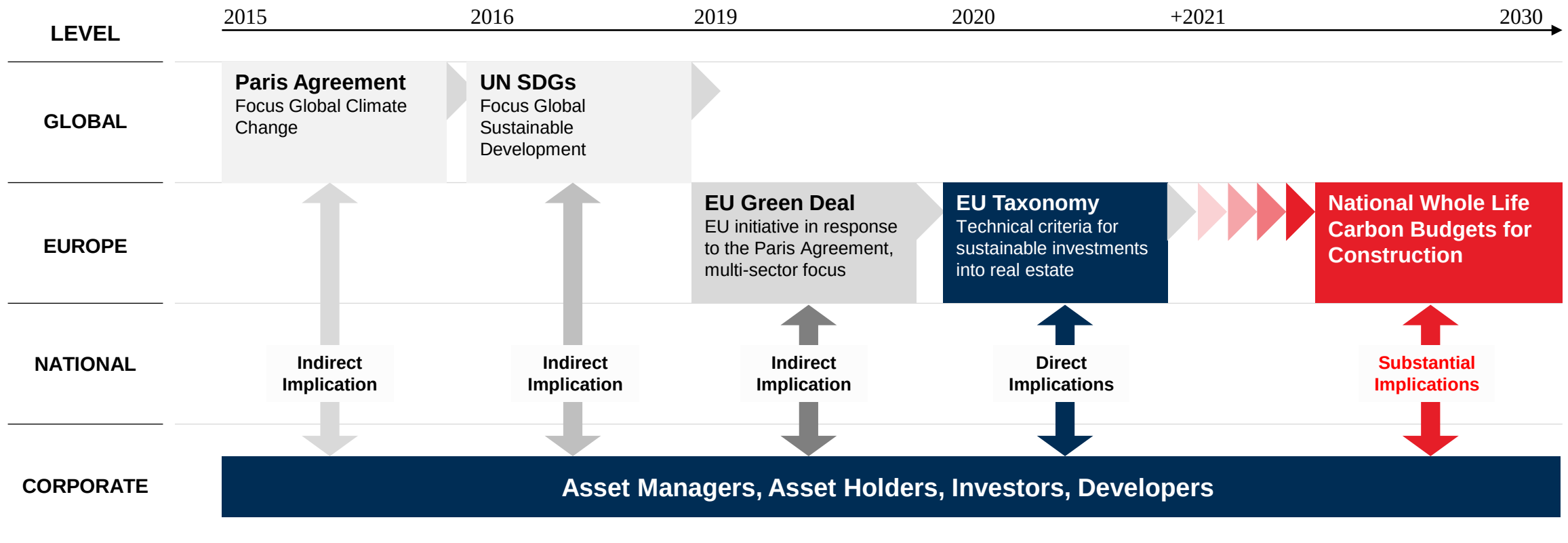
We need to rethink best practice

We need deliver a productive, adaptive and regenerative built environment that make sustainable use of natural resources



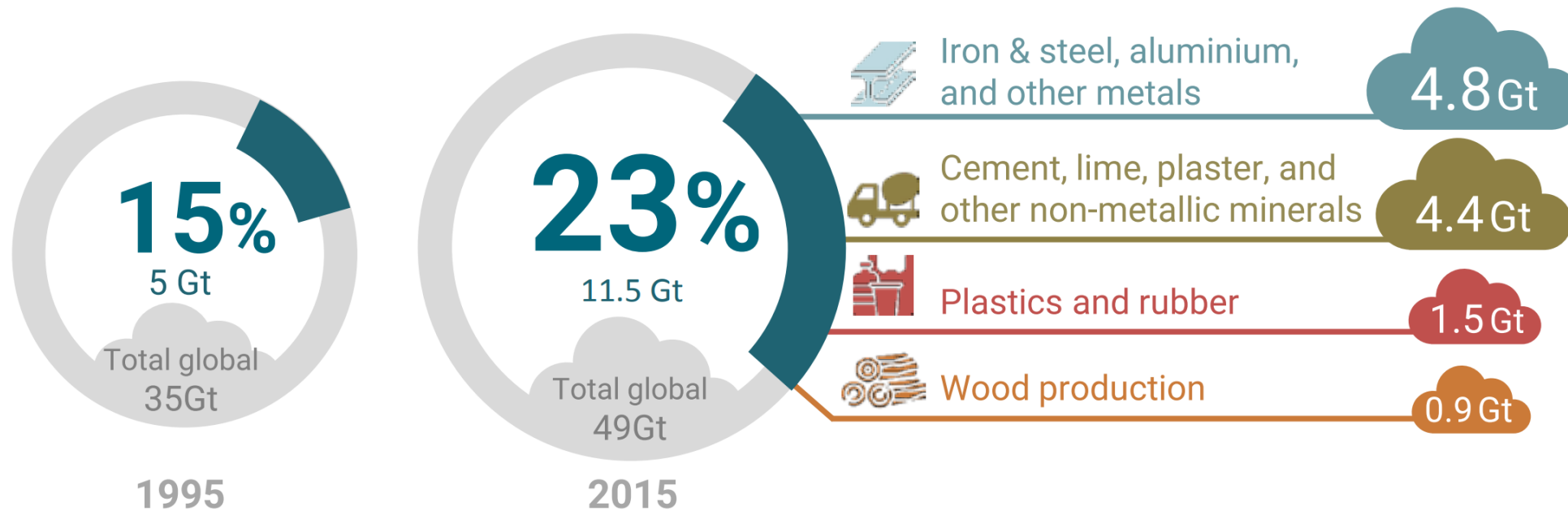
Policy makers react to that

We must accelerate speed as we are half-way through towards 2030

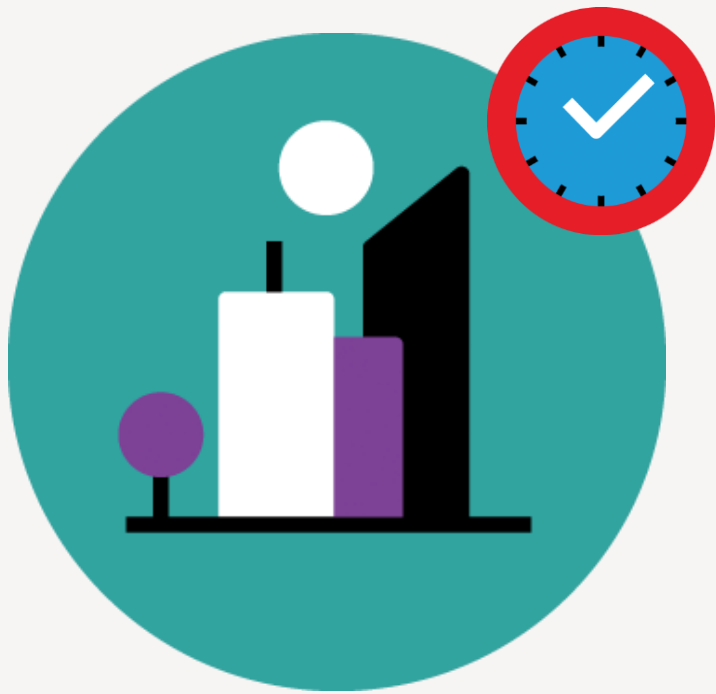


Global Material Emissions

We must accelerate speed as we are half-way through towards 2030



Can you imagine....



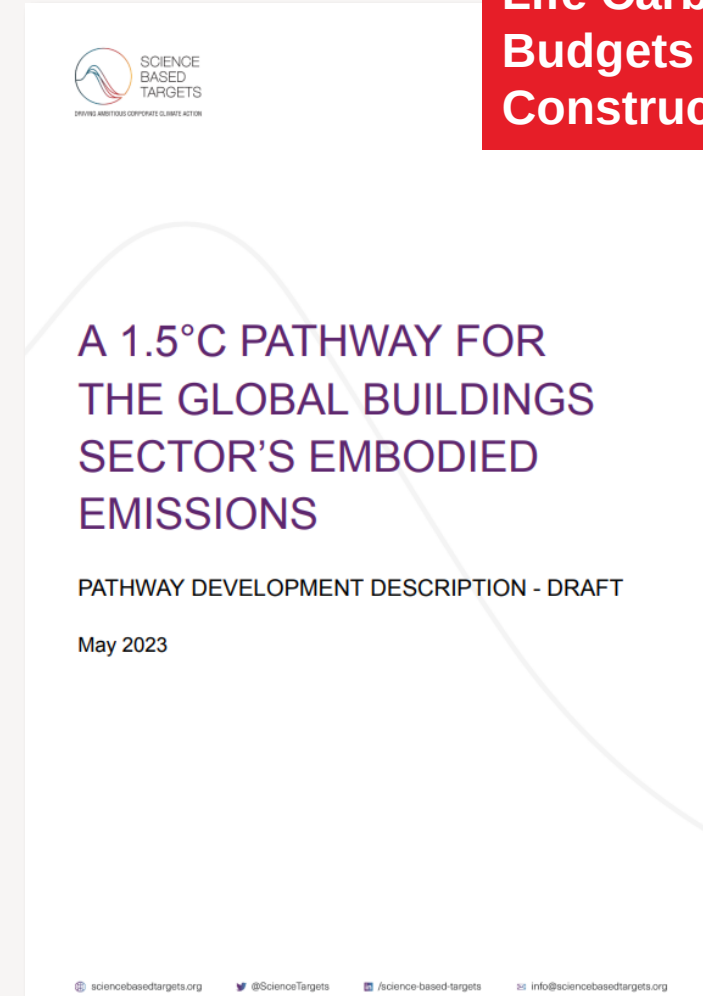
Some of the „greenest buildings“ will have released **70% of CO₂-Emissions** after their **first hour** of operation!

Policy tightens, first countries move

Draft, May 2023 for consultation

1. Science-based upfront embodied emission (Modules A) pathway for buildings globally
2. More and more countries adopting sector budgets;
 - ✓ Denmark (launched 2023)
 - ✓ France (launched 2023)
 - ✓ Finland (launched 2023)
3. Germany expected in 2027 – GEG to include mandatory WLCA

National Whole
Life Carbon
Budgets for
Construction



Policy tightens, first countries move

Whole Life Carbon (up-front and operational)

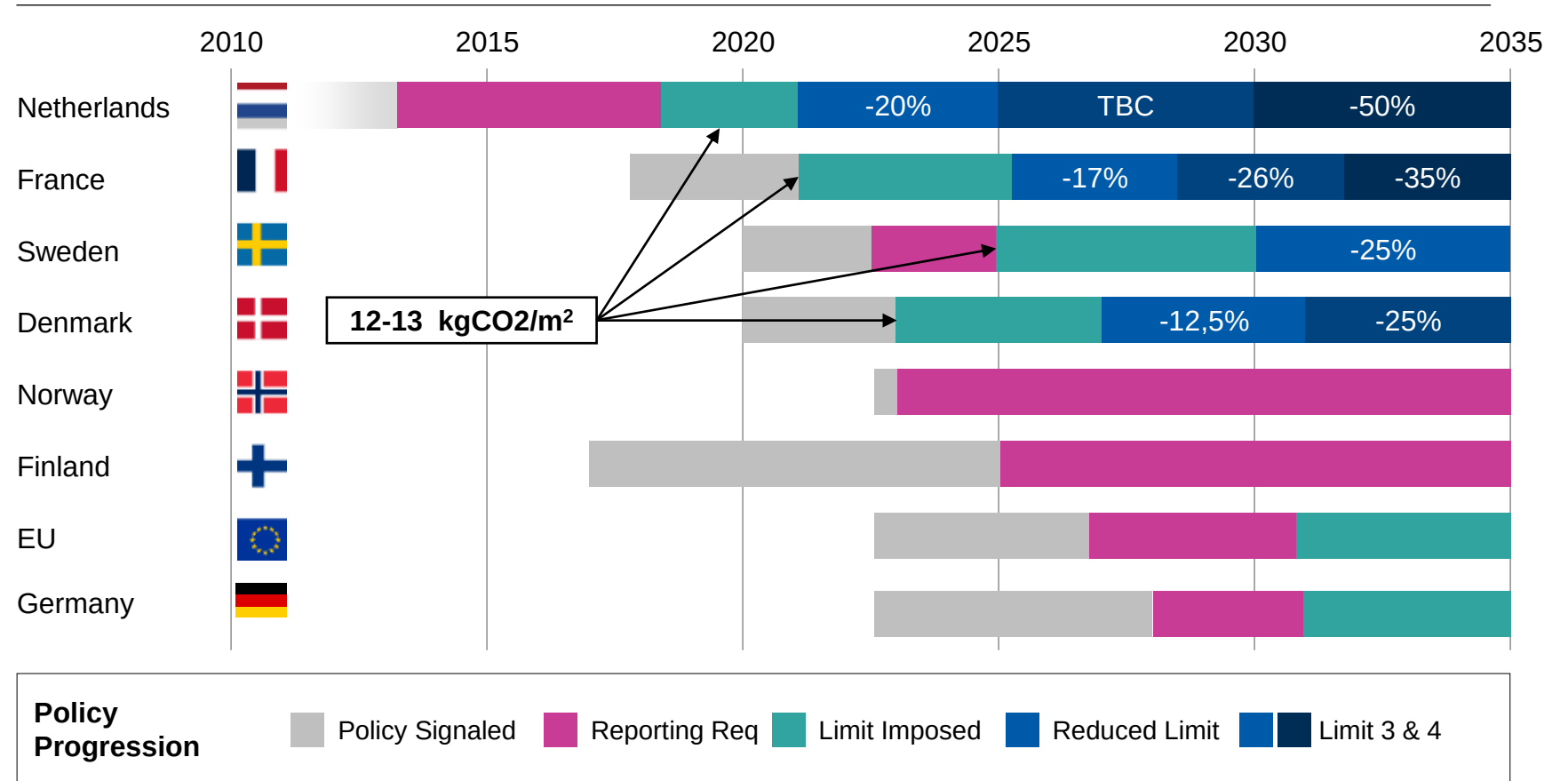
Summary of current and future whole-life-carbon requirements

12-13

WLC benchmarks (bottom-up) established in Europe – Targets to be reduced in selected countries over next years

20-24kg

In Germany for Buildings that receive new construction funding (KFN) the above thresholds have been imposed



Ambitious targets until 2050

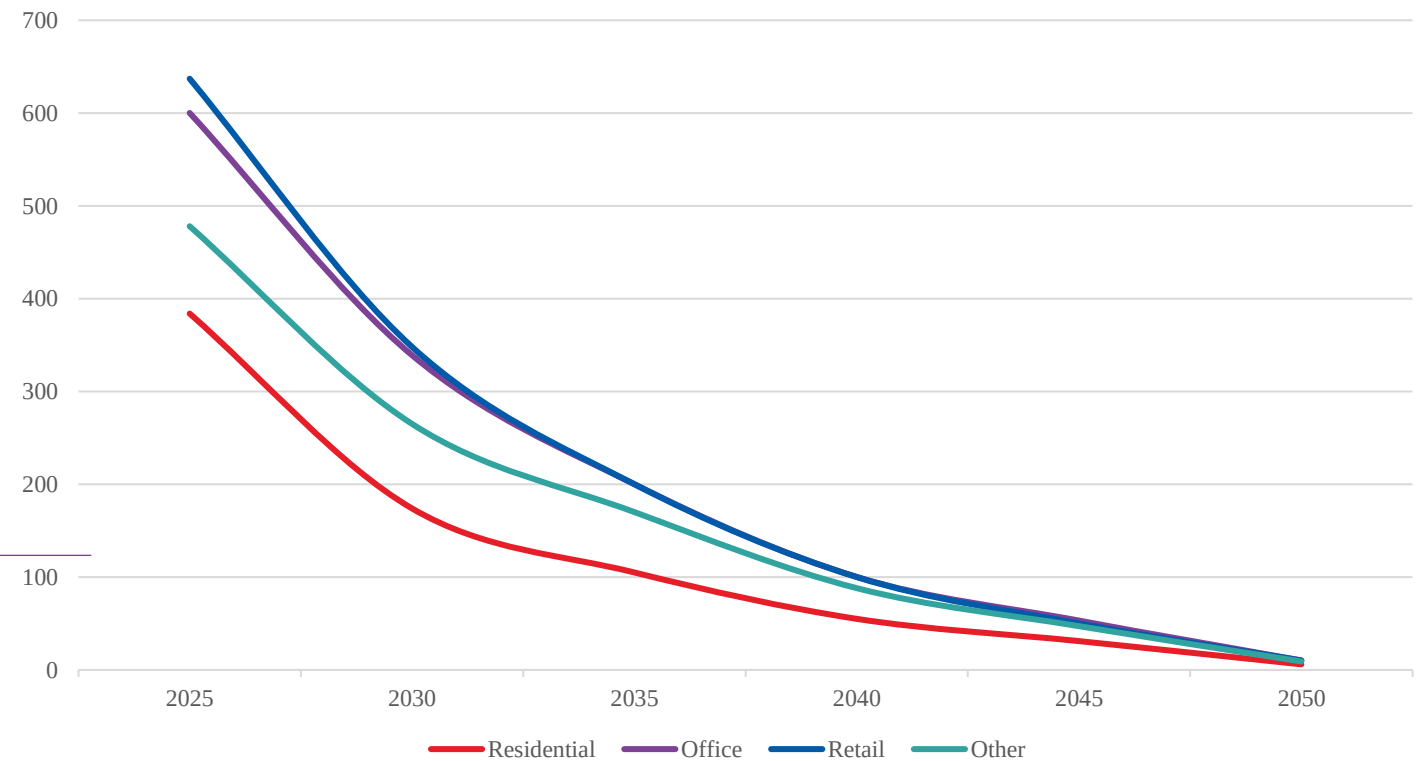
Typology emission reduction pathways

- ✓ Reduction of upfront carbon by approx. 50% every 5 years across building typologies
- ✓ More than 95% total reduction across sectors

Office
Building
In 2030
(A1-A5)

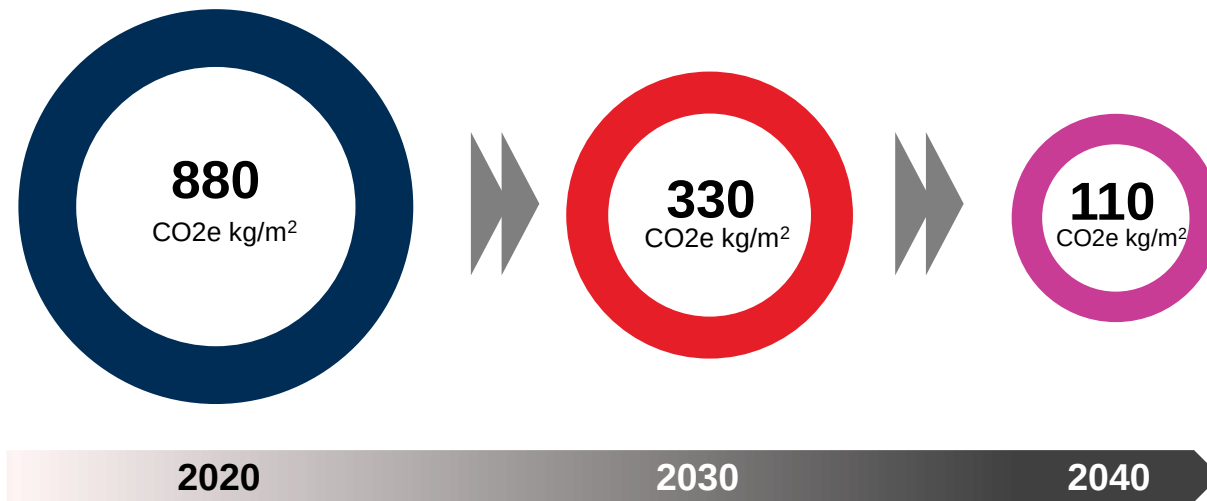


Typology-based Upfront Carbon Intensity 2025 - 2030



Office Building Status Quo

Embodied carbon at practical completion (A1-A5)



Closing the gap between current best practice and 1.5° consistency implies 3 options.



Closing the gap – 3 options

Modules A1-A5 are in the focus

Options		Use Less Materials	Substitute Materials	Circulate Materials
Targets	2050	30% less materials	100% based on renewables	100% reused or refurbished
	2040	20% less materials	60%	60%
	2030	10% less materials	30%	30%
Limitations		- Material efficiency often difficult due to code requirements resulting from fire or acoustics - If less materials could be used, it would be implemented already	- Substitution of materials difficult for foundations, facades and building services - Renewable and low carbon materials often not available at scale	- Supply side is moving fast to procure materials with recycled content - E.g. façade refurbishments being scaled up across geographies

Trade Implications

Global Material Flows

- Export and Import of Recycled Materials
 - Waste as a Resource
-

Trade Policies and Agreements

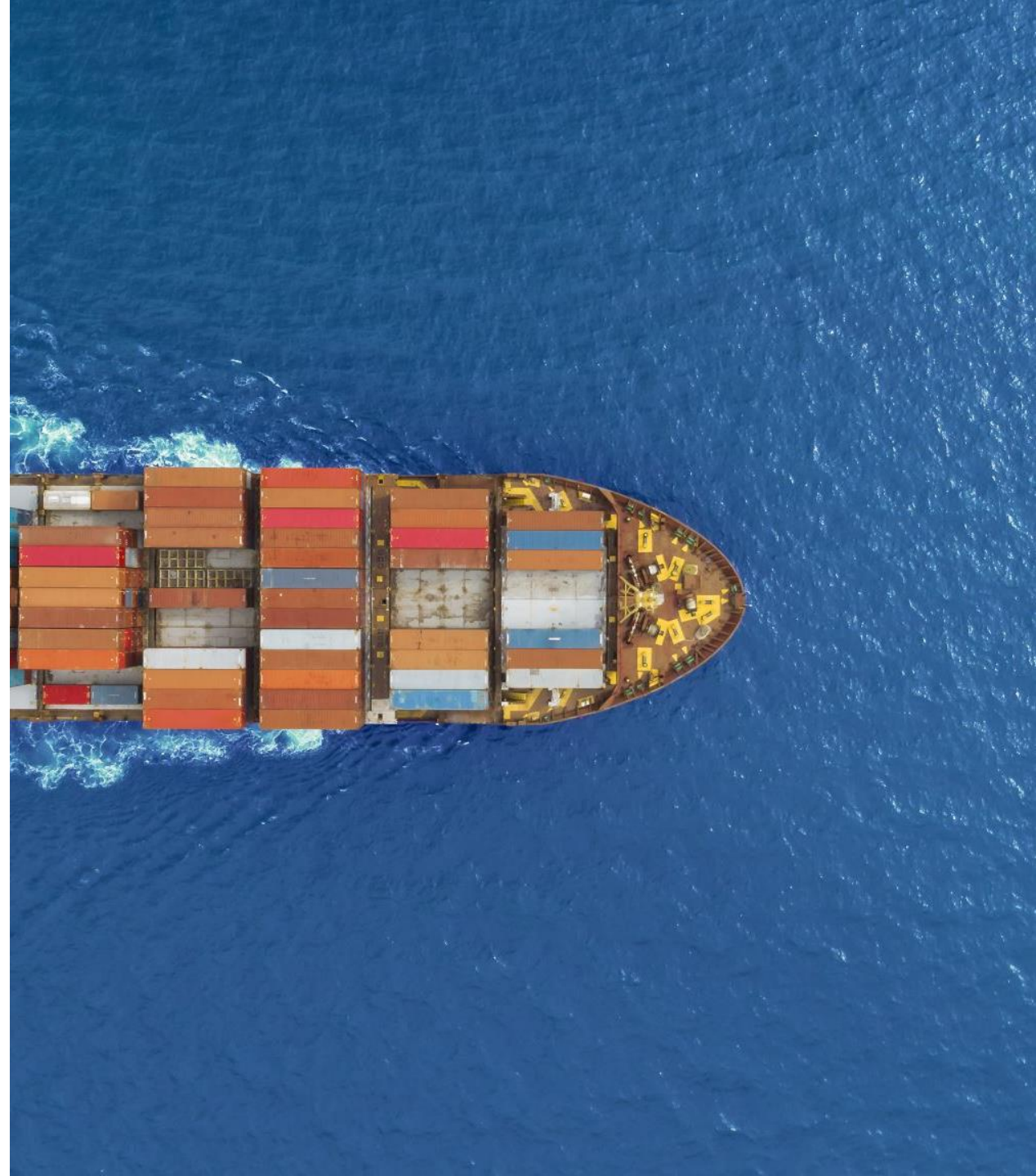
- Tariffs and Trade Barriers
 - Subsidies and Incentives
-

Standards and Regulations

- International Standards for Recycled Materials
 - Regulatory Compliance
-

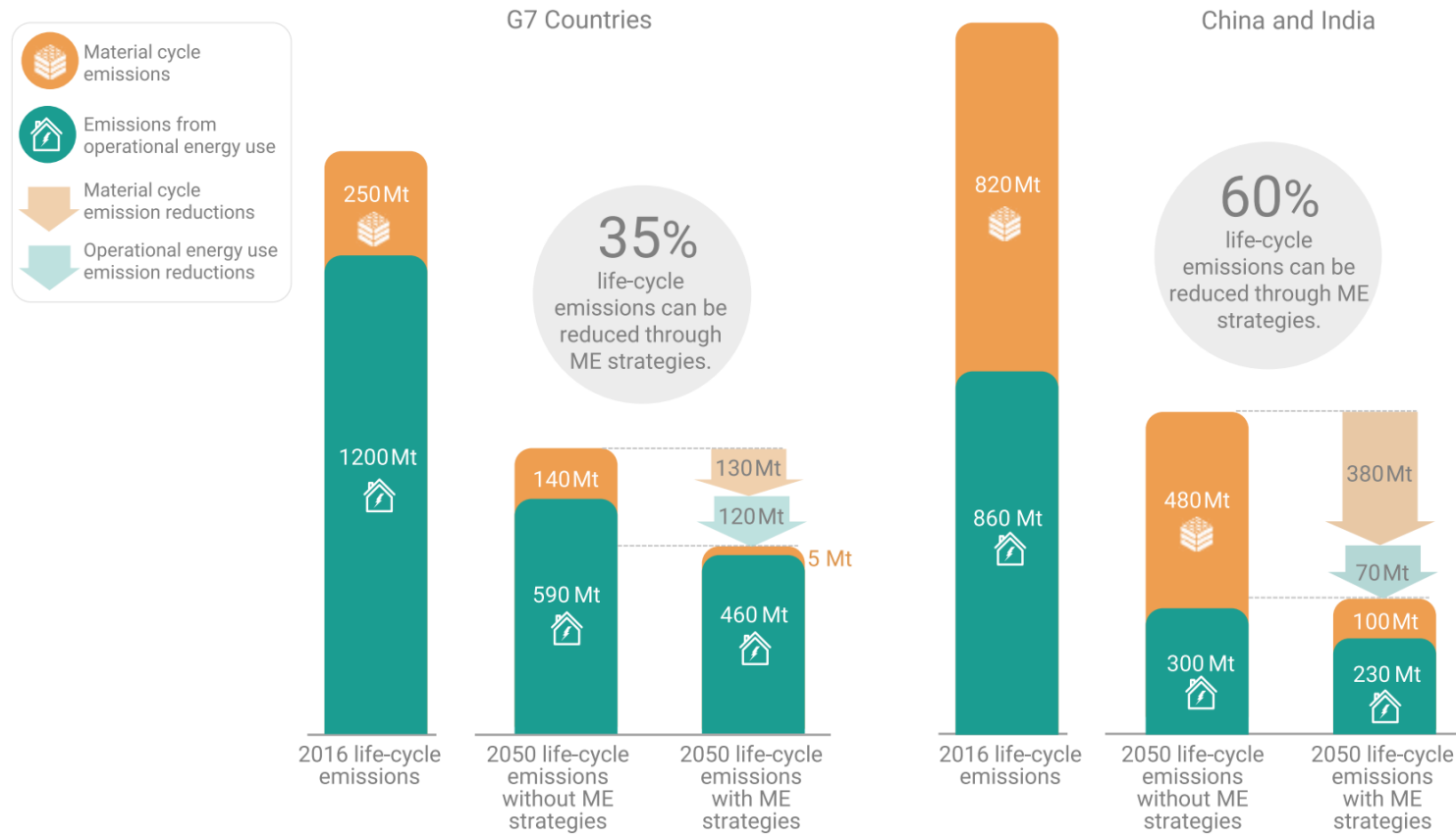
Logistical Considerations

- Efficient Transportation Networks
- Supply Chain Traceability



Significant Global Impact

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