ANNEX 72 EBC

IEA EBC Annex 72:
Assessing life cycle related environmental impacts caused by buildings

Environmental benchmarks for buildings

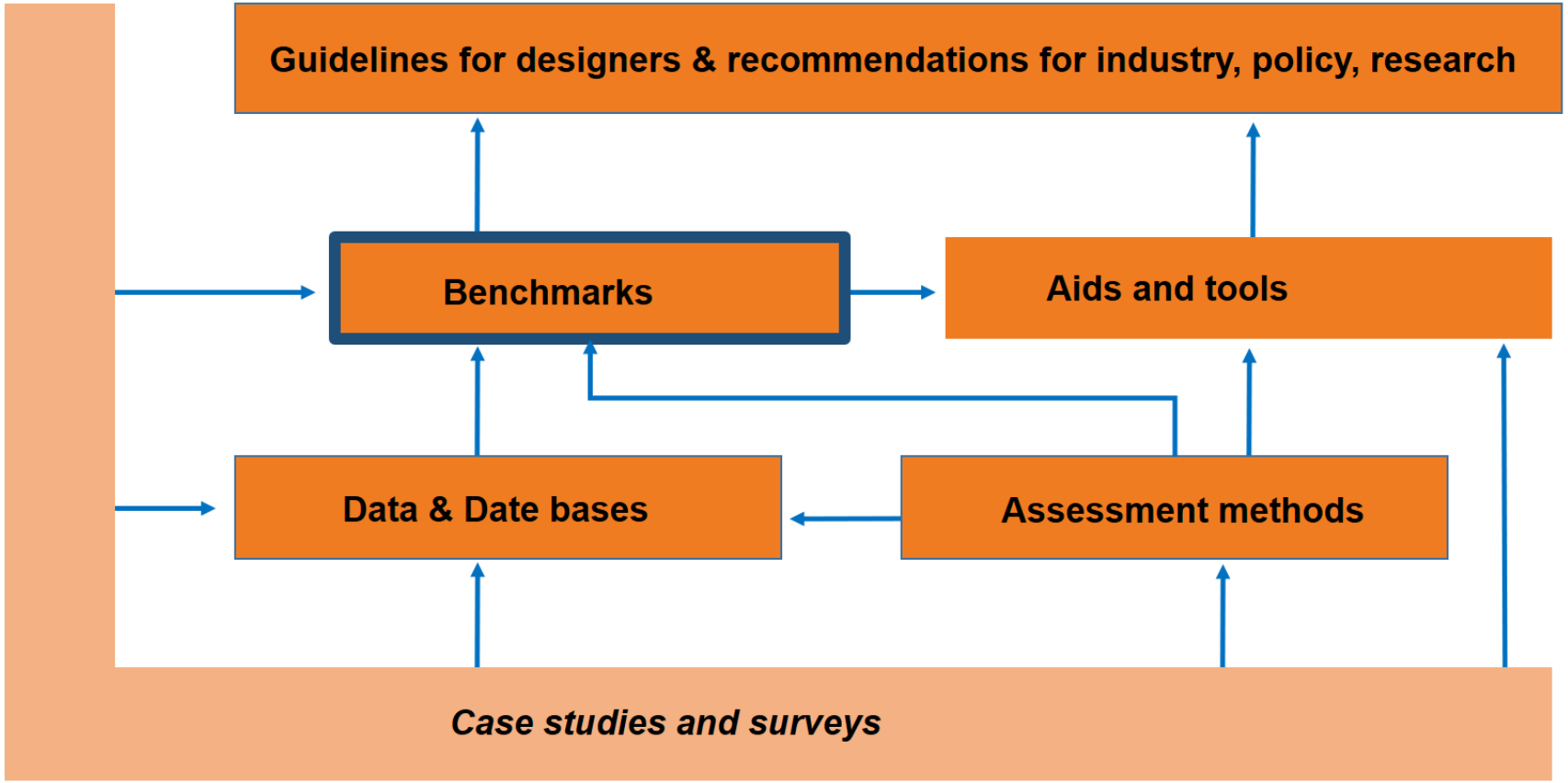
Freja Nygaard Rasmussen, Aalborg University, Denmark
Maria Balouktsi, Karlsruhe Institute of Technology, Germany

Subtask 1 Leader: Thomas Lützkendorf, Karlsruhe Institute of Technology, Germany
Subtask 3 Leader: Harpa Birgisdottir, Aalborg University, Denmark

Final event:
SBE ’22, Berlin, Germany, 21 September 2022

Context

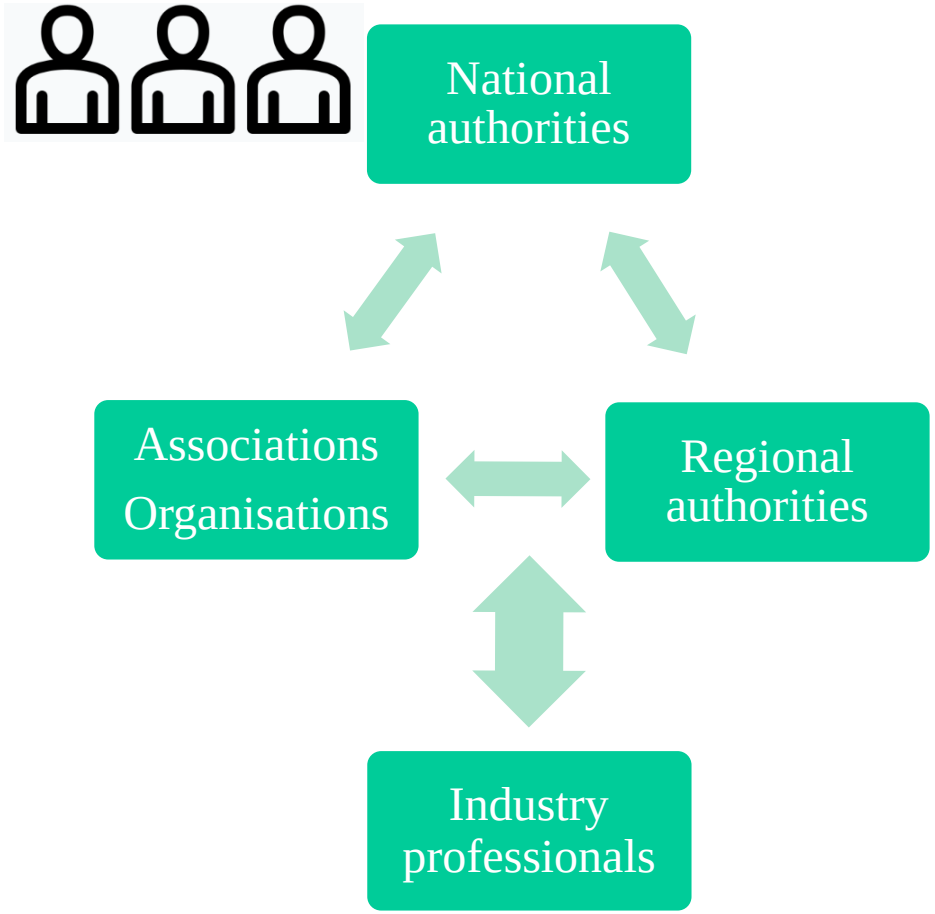
The position of ST1 and ST3 „Benchmarks“ and the interrelations to other ST’s and results



Benchmarks and limit values

Target groups for application, needs and recent developments

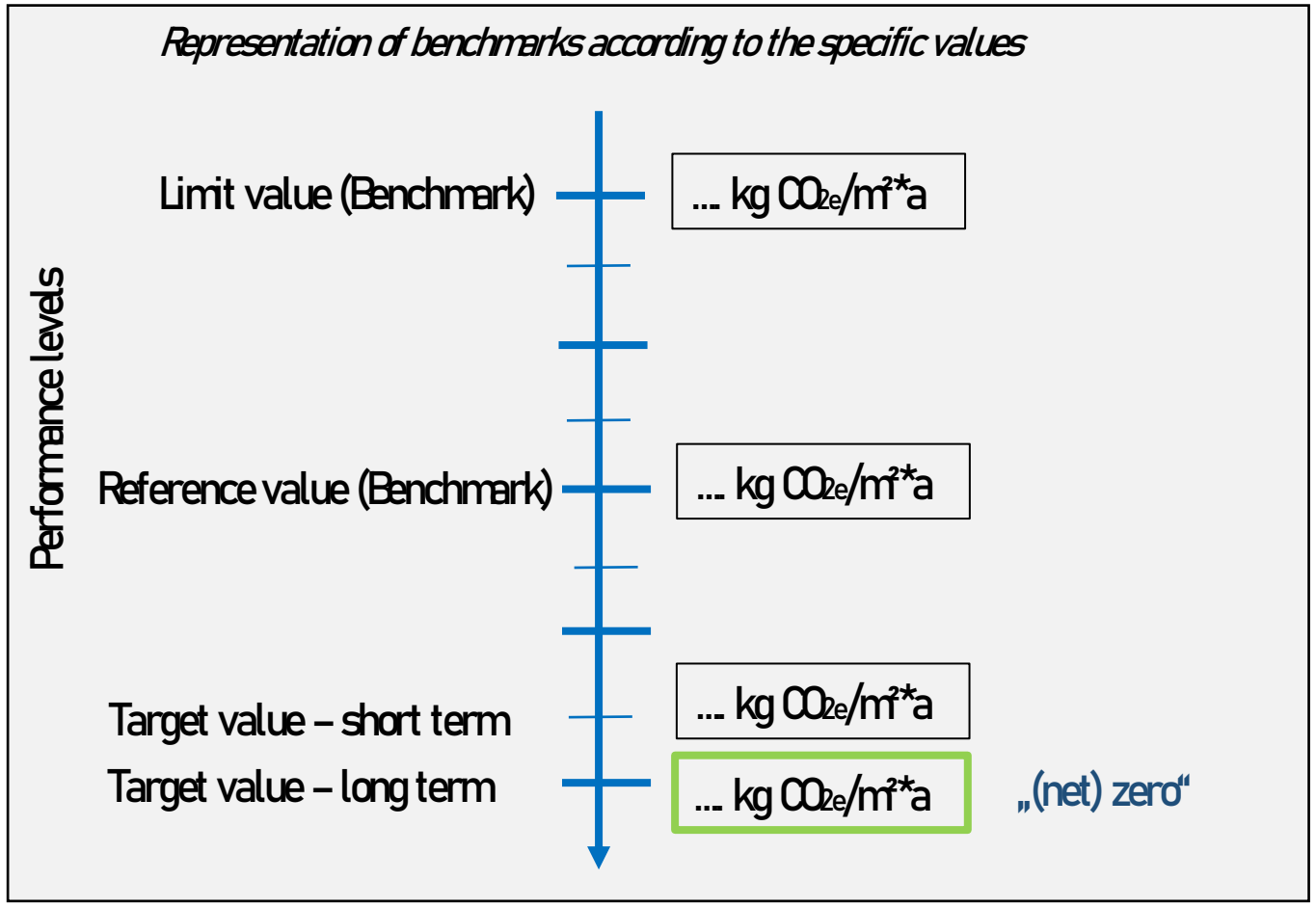
- Target setting in client's brief
- Orientation in design process
- Funding programmes
- Legal requirements



Encouraging
Guiding
Procuring
Requiring

System of benchmarks and target values

Definitions and job sharing



- **Limit value**: the upper or lower acceptable performance level on a performance scale
- **Reference value**: performance level that represents state of the art or best practice. A reference value is subject to temporal changes
- **Target value**: performance level that represents an objective that goes beyond the reference value. Target values can follow a top-down or bottom-up approach. A subdivision into short-term, medium-term and long-term target values is recommended.

Existing Benchmarks (kg CO_2e/m^2*y)

based on a survey for residential buildings: (a) whole life carbon (b) embodied carbon

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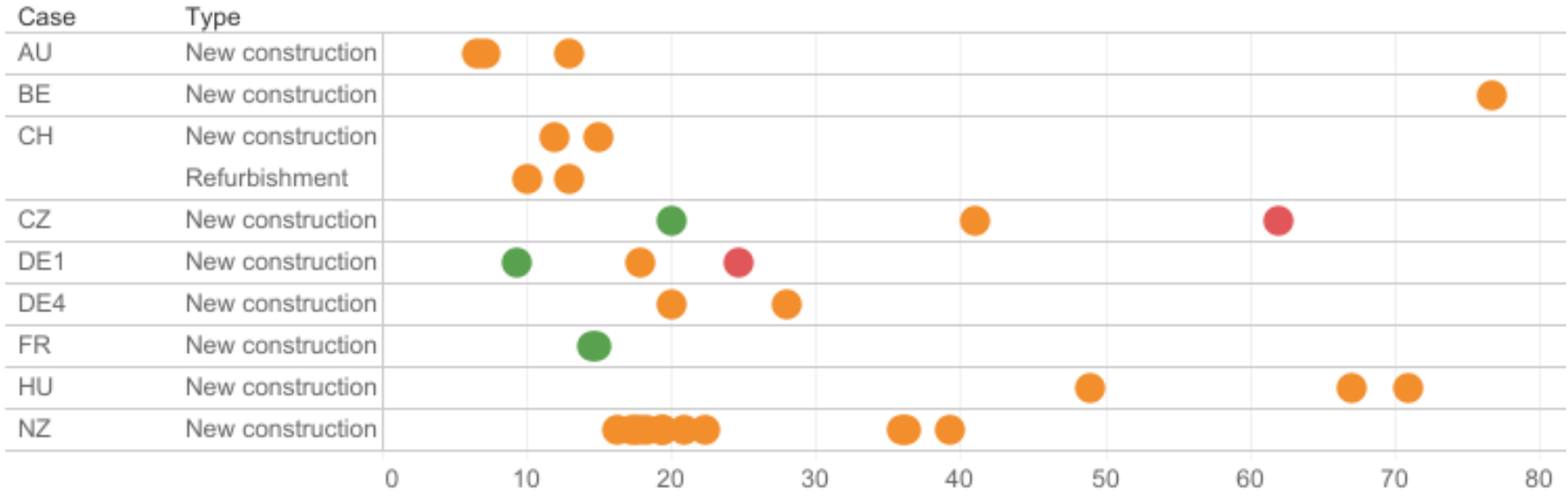
a)

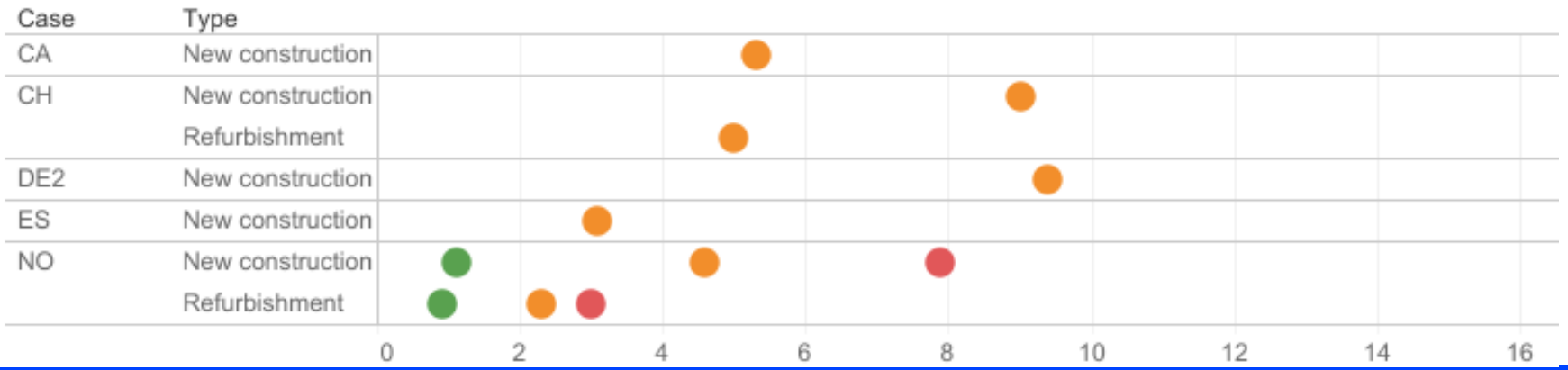


Limit value

Reference value

Target value

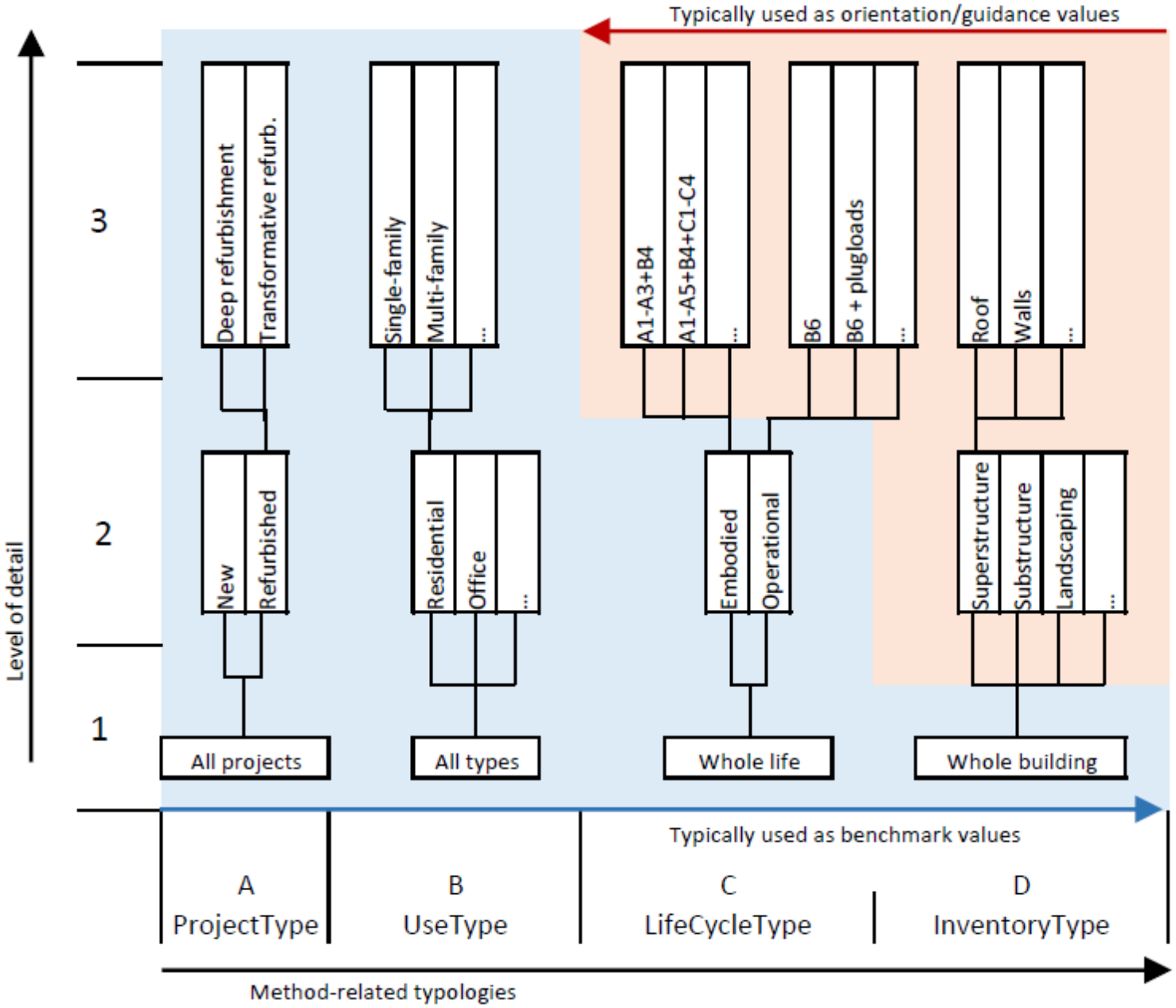
b)



Granularity

Sub-division of benchmarks

- Benchmark values typically for use in regulation or certification
- Orientation/guide values typically for use in the building design process



The “net zero” benchmark

A special type of target

Bottom-up vs top-down target values

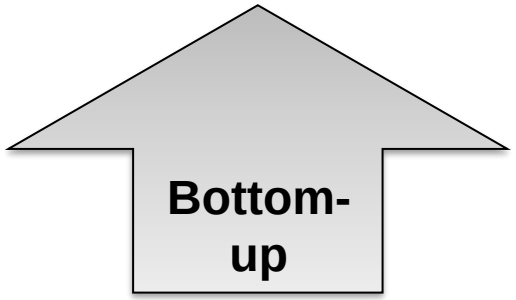
Need to integrate science-based target to be in line with 1.5 °C pathway?

- Political targets
- Science-based targets (budgets) (e.g. GHG emissions neutrality or **net zero** emissions approach)

To what life cycle stages does it apply?

What offset/ balancing options are allowed?

Nearly zero level as intermediate solution?



- Existing technical or economic optimum/ feasibility
- Statistical analyses
- Reference buildings

What type of buildings?

What method?

What database?

Typology of bechmarks

Checklist for interpretation (selected aspects only)

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- Indicator / impact category
- Object of assessment / functional equivalent
- Included building components based on a building model
- Included life cycle stages based on a life cycle model
- Reference study period
- Bottom up versus to down approach
- Static versus dynamic approach
- Source of data, appropriateness in relation to time and region
- …

Absolute versus net zero

Options to define and achieve (net) zero GHG emission buildings

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Net Zero emission approaches						Zero emission a.
Net balance (Aa)	**Net balance (Ab)**	**Technical reduction (Ba)**	**Technical reduction (Bb)**	**Technical removal (Ca)**	**Technical removal (Cb)**	**Absolute Zero**
potentially avoided emissions	**allocation**	**indirect**	**direct**	**potentially reversible**	**stable**	
Accounting for the potential benefits caused by exported energy produced on-site	Attributes the pro rata share of GHG emissions caused by on-site energy production to the exported energy	Investment in projects, which lead to potential CO_2/ GHG emission reductions elsewhere such as investments in solar or wind power plants*	Investment in CO_2/GHG emission reduction projects such as CCS equipment in coal power plants*	Investment in projects, which remove CO_2 from the atmosphere, but with potential reversibility, such as biological fixation*	Investment in projects, which remove CO_2 from the atmosphere, such as BECCS or DACCS*	Use of construction materials/operational energy with zero GHG emissions (including supply chain emissions)

*contribution to initial financing and implement., or purchase of corresponding emission certificates

Lützkendorf, T. and Frischknecht, R., 2020. (Net-) zero-emission buildings: a typology of terms and definitions. *Buildings and Cities*, 1(1), pp.662–675. DOI: http://doi.org/10.5334/bc.66

(net-)zero GHG emission buildings

Scope and system boundary

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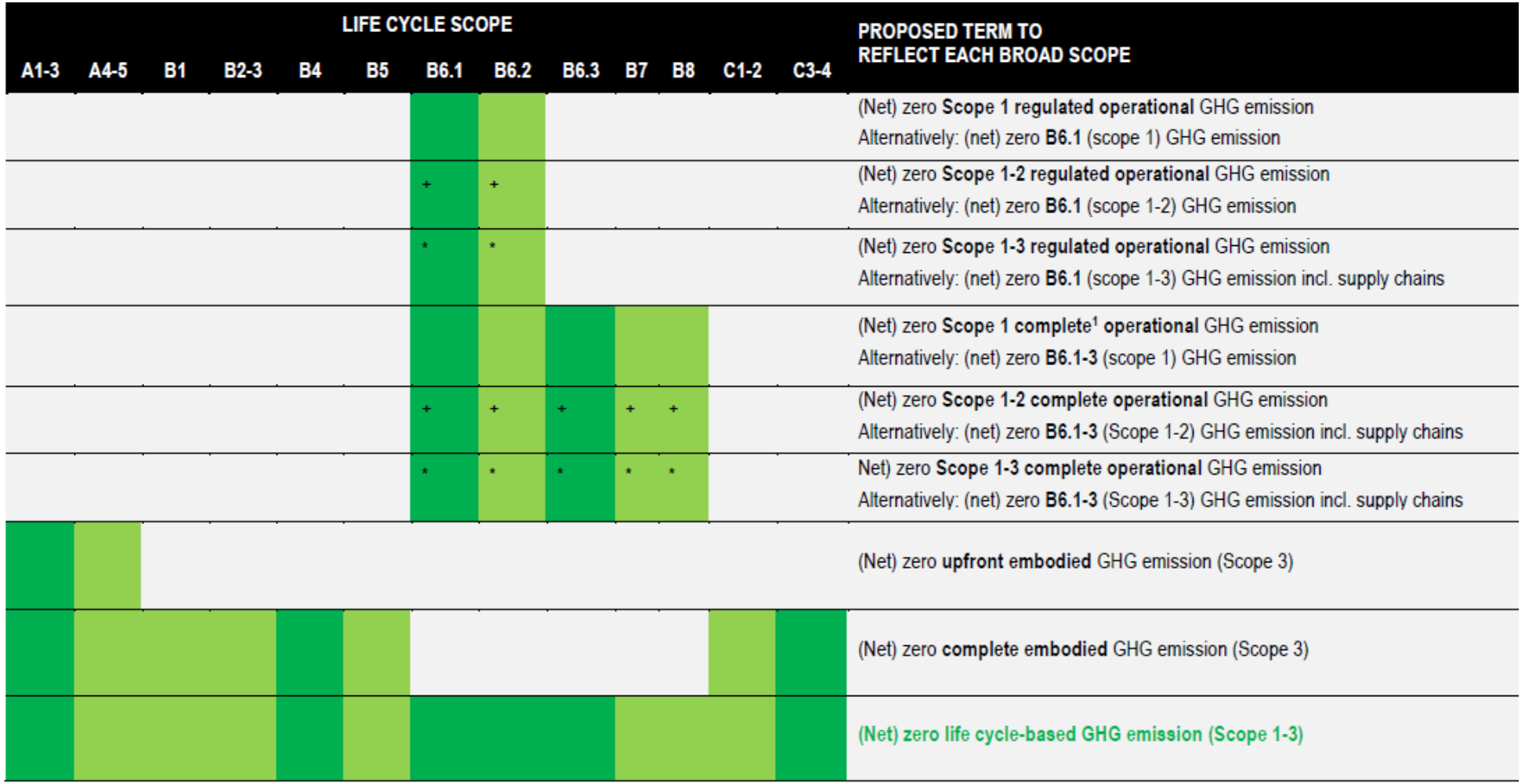

How to reach net zero GHG emission buildings

Supplementation of benchmarks by recommendations on how they can be achieved

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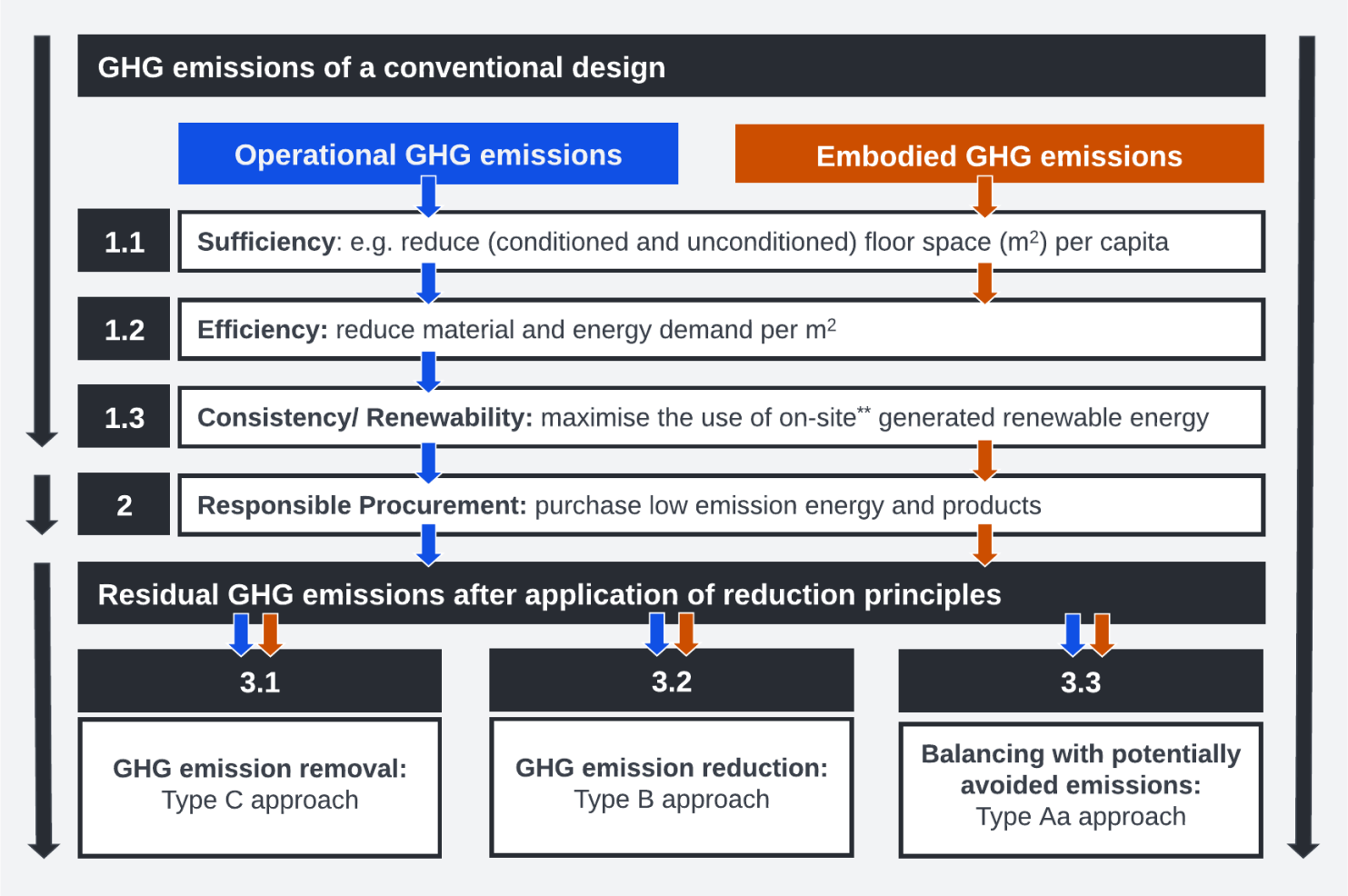

Recommended route to (net) zero GHG emission buildings

How to reach net zero GHG emission buildings

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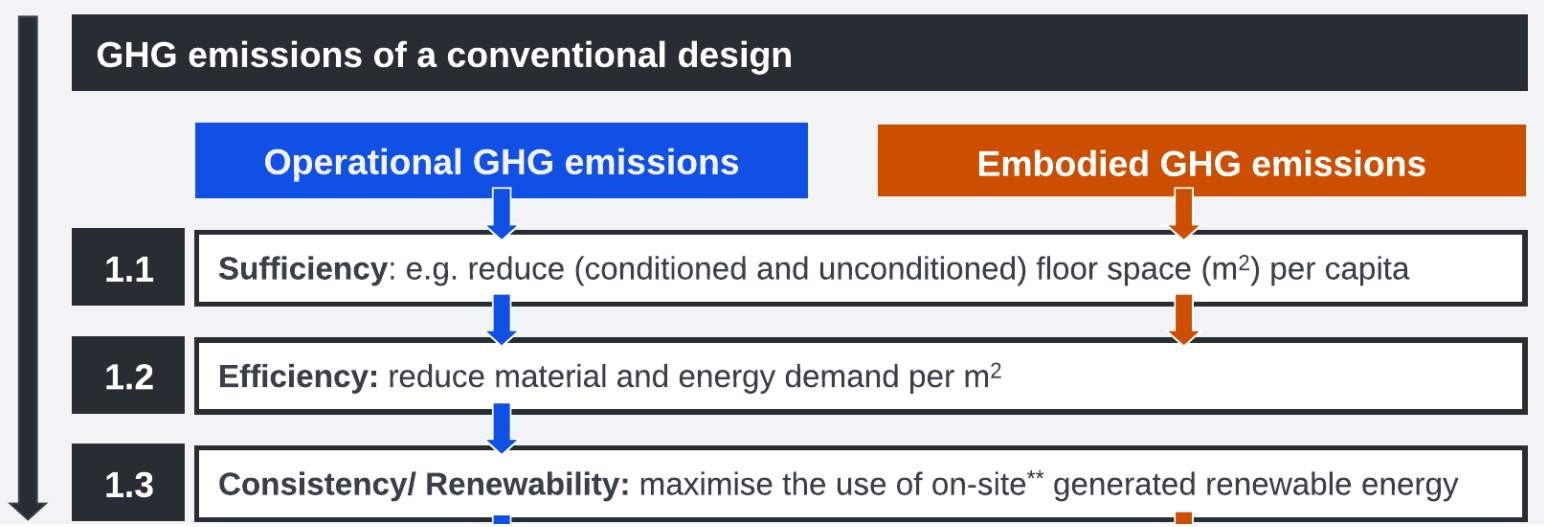
Supplementation of benchmarks by recommendations on how they can be achieved

(1) Reduce via low carbon design strategies



How to reach net zero GHG emission buildings

Supplementation of benchmarks by recommendations on how they can be achieved

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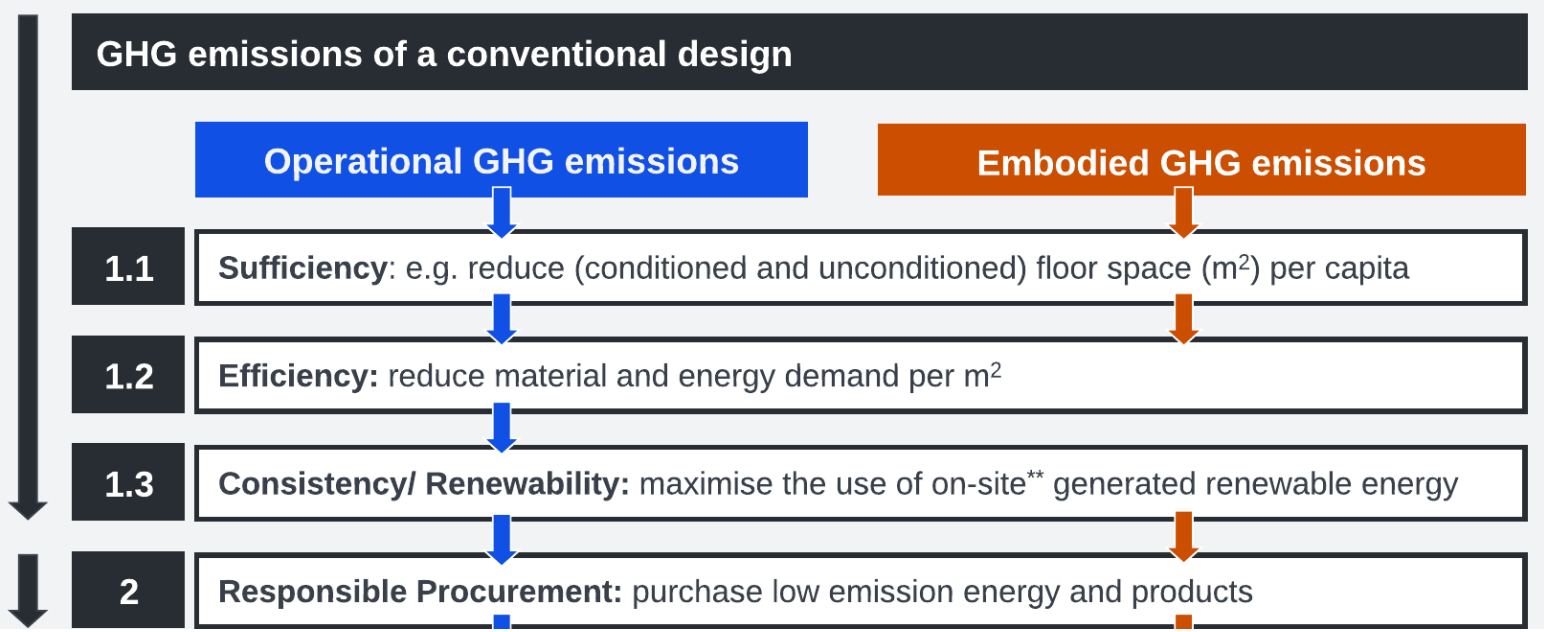
(1) Reduce via low carbon design strategies

(2) Reduce via low carbon purchasing strategies



How to reach net zero GHG emission buildings

Supplementation of benchmarks by recommendations on how they can be achieved

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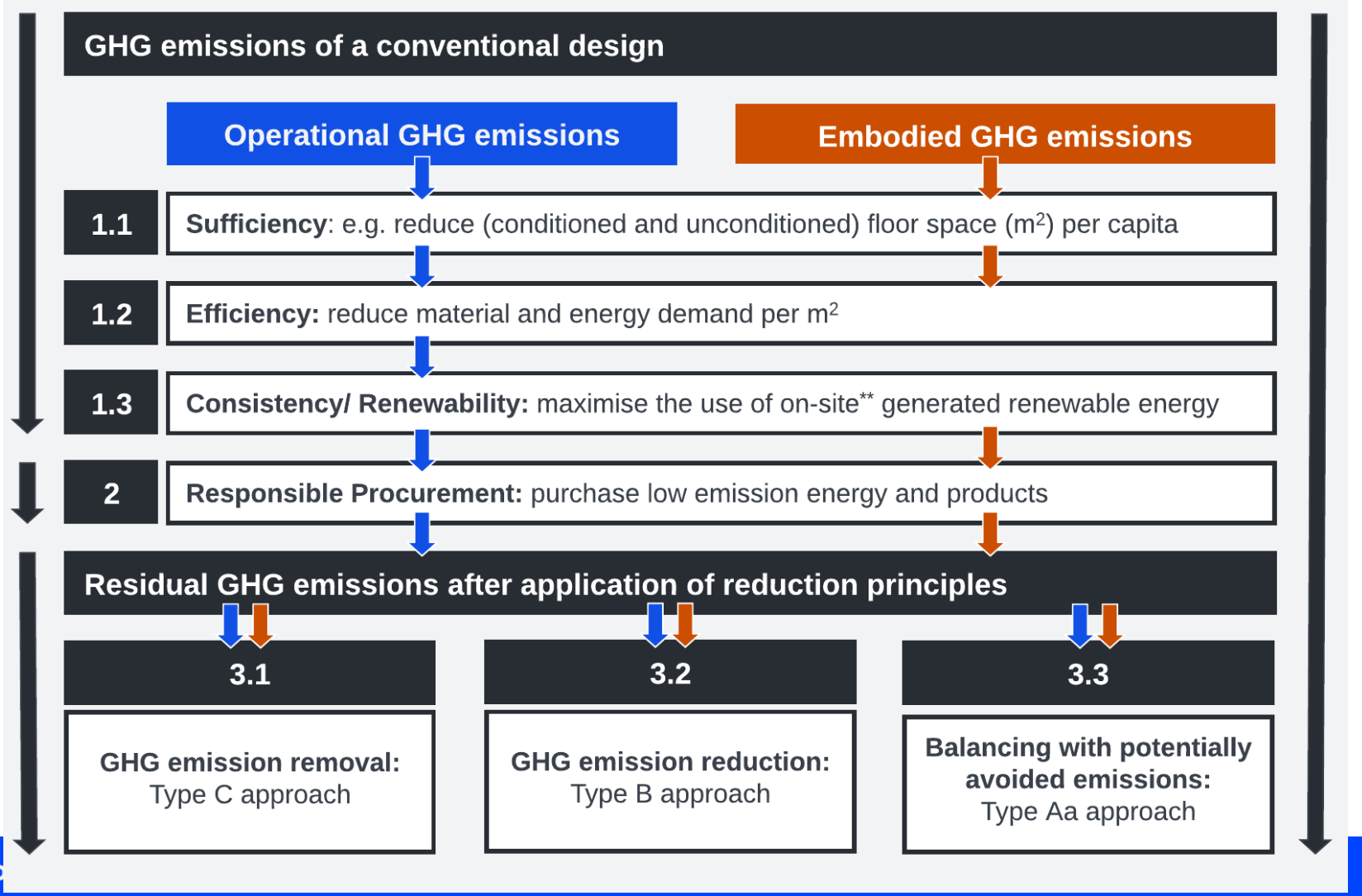
(1) Reduce via low carbon design strategies

(2) Reduce via low carbon purchasing strategies

(3) Offset and/ or balance



Recommended route to (net) zero GHG emission buildings

Conclusions and recommendations

- Benchmarks cannot be defined and applied in isolation; they form an inseparable unit with the respective method and data basis used to derive them.
- It is necessary to complement benchmarks currently based on technical and/or economic feasibility by target values derived from planetary boundaries following a top-down approach
- Paris Agreement and its 1.5° C target calls for life cycle-based “(net) zero GHG emission” buildings including CO_2 removals.
- To improve environmental performance of buildings benchmarks and target values for further impacts are needed, e.g. resource consumption, risk to local environm.
- The benchmarks / target values relating to the life cycle can be sub-divided, into embodied / operational parts (among others), for guide / communication purposes.

Main results

available from spring 2023

Rules and recommendations for the benchmarking and target-setting for the lifecycle-based environmental performance

Target groups

- *Designer*
- *Researcher*
- *Policy maker*
- *Industry*

Application cases

- *Design and decision making*
- *Sustainability assessment*
- *Standardisation*
- *Legislation*
- *Research*