

Critical analysis of environmental benchmarks for buildings

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Content

1. Introduction
2. Literature review existing benchmarks
3. Results critical analysis
4. Conclusions

Content

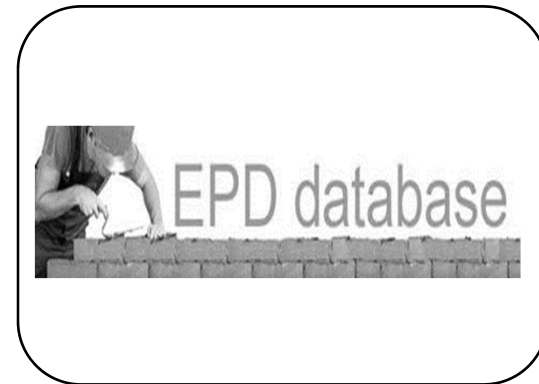
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Life Cycle Assessment in the Belgian building practice

LCA METHOD



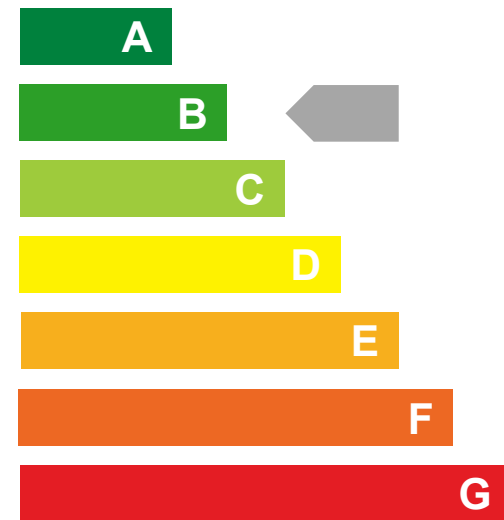
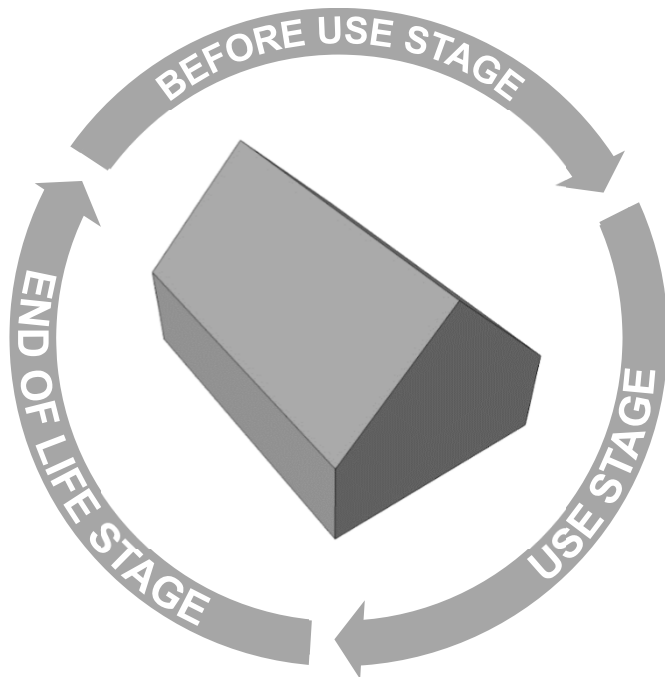
EPD DATABASE



WEB-BASED TOOL

Development of environmental benchmarks for buildings

- **Policy applications:** definition of environmental targets
- **Private / commercial applications:** market positioning



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Evaluation aspects

Definition of benchmark values

- Comparative base
- Benchmark approach
- Benchmark typology
- Sources for benchmark

Benchmark scope

- Life cycle stages
- Environmental indicators

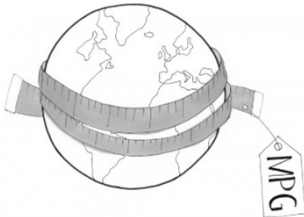
Benchmark applications

- Building types
- New construction versus refurbishments

Benchmark communication

Selected benchmarking systems

Regulations



Labelling systems



SuisseEnergie pour les Communes

Sustainability rating tools

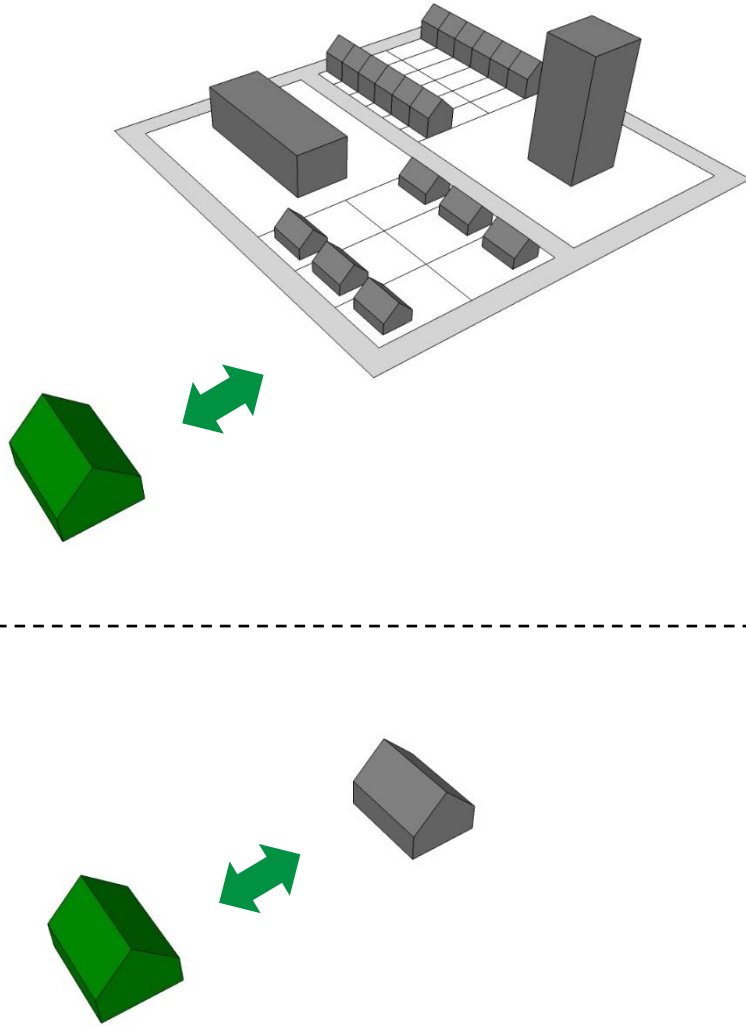


Research studies

Content

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Comparative base



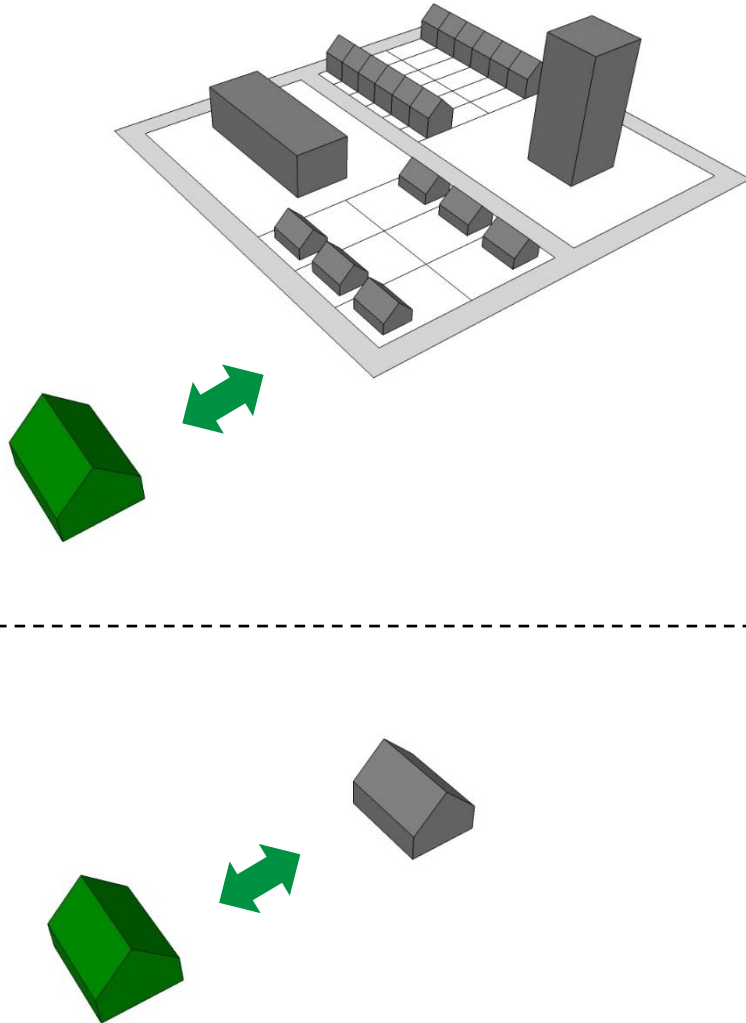
External benchmark

Representative value for a building category within the building stock

Internal benchmark

Comparison to baseline building

Comparative base



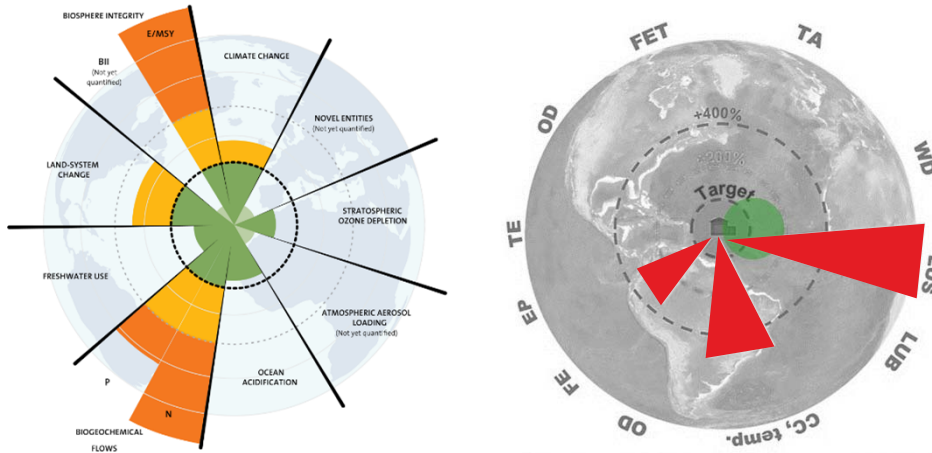
External benchmark

- + Comparison with the building stock
- + Impact of full design

Internal benchmark

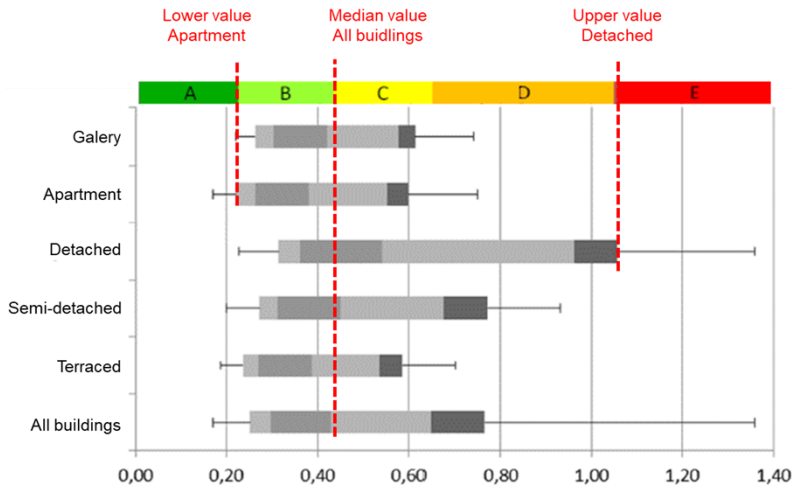
- + No building stock modelling
- Limited to impact of material choices

Benchmark approach



Top-down approach

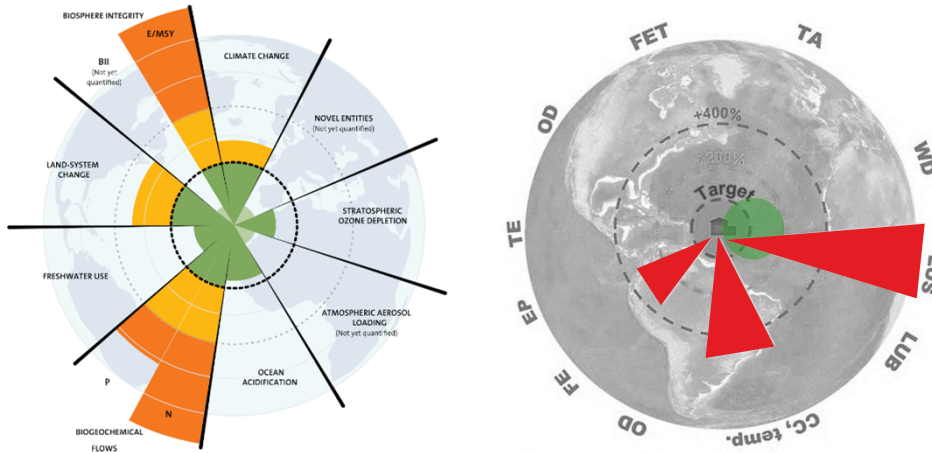
Benchmarks from environmental goals



Bottom-up approach

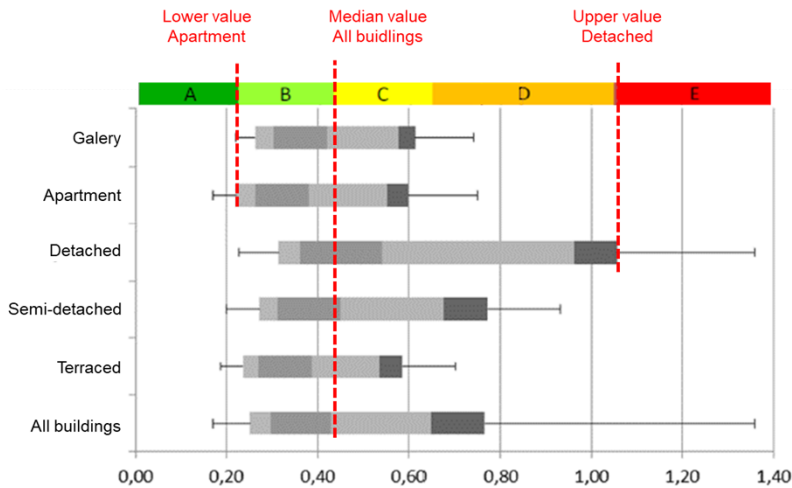
Benchmarks from building stock analysis

Benchmark approach



Top-down approach

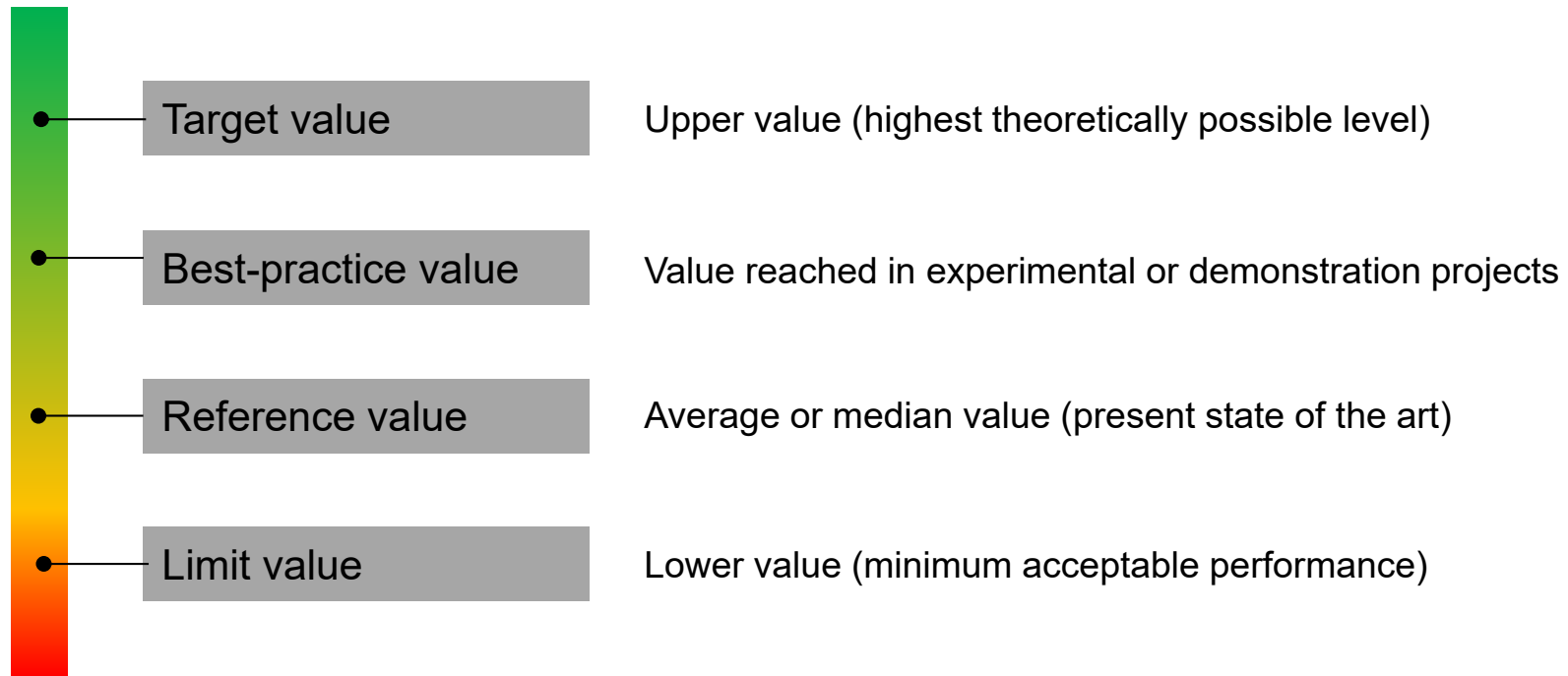
- + Fulfilment with environmental goals
- Availability of targets and allocation procedure



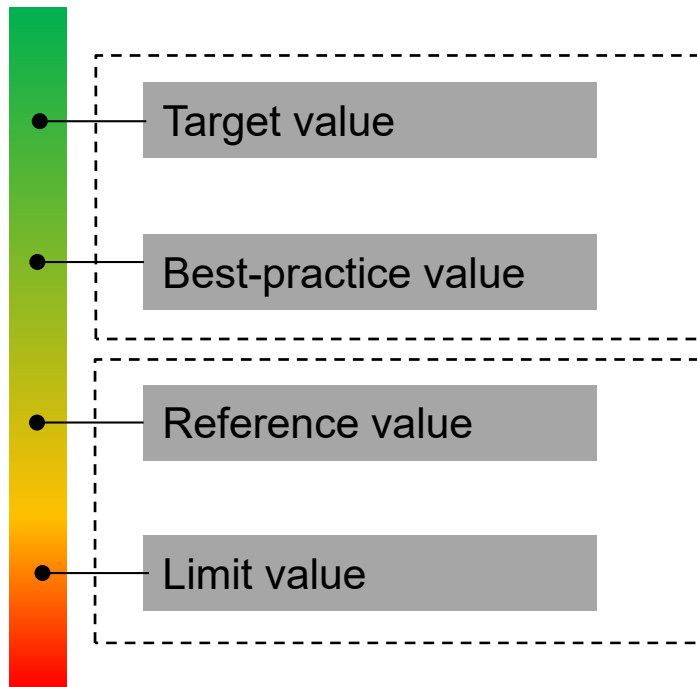
Bottom-up approach

- + Feasible benchmark values
- Availability of data on reference buildings and market variations

Benchmark typology



Benchmark typology



Medium or long term values

- + Steer towards policy targets
- Might not be feasible for all buildings

Short term values

- + Exclude high environmental impacts
- + Address all stakeholders
- Will not lead to major improvements
- Regular update towards more severe values

Benchmark scope – life cycle stages

| Life cycle stages | | Type 1 | Type 2 |
|-------------------|----------------------------|-------------|-----------|
| A 1-3 | Product stage | Light gray | Dark gray |
| A 4-5 | Construction process stage | Light gray | Dark gray |
| B 1-5 | Use stage | Light gray | Dark gray |
| C 1-4 | End-of-life stage | Light gray | Dark gray |
| B6 | Operational energy use | Medium gray | Dark gray |
| B7 | Operational water use | Medium gray | Dark gray |

Embodied impact benchmark

Whole life cycle benchmark

Benchmark scope – life cycle stages

| Life cycle stages | | Type 1 | Type 2 |
|-------------------|----------------------------|--------|--------|
| A 1-3 | Product stage | | |
| A 4-5 | Construction process stage | | |
| B 1-5 | Use stage | | |
| C 1-4 | End-of-life stage | | |
| B6 | Operational energy use | | |
| B7 | Operational water use | | |

— Main benchmark

⋯ Indicative values













Embodied impact benchmark

- Only impact of material use

Whole life cycle benchmark

- + Global impact optimization
- + More design flexibility


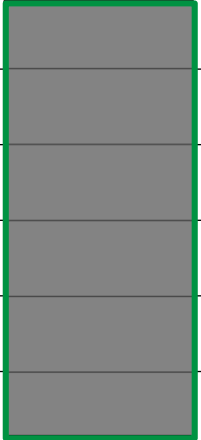


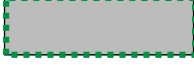


Benchmark scope – environmental indicators



| Impact indicators | Type 1 | Type 2 |
|------------------------------|---|--|
| Global warming |  |  |
| Ozone depletion |  |  |
| Acidification |  |  |
| Eutrophication |  |  |
| Photochemical ozone creation |  |  |
| ...other indicator |  |  |

Individual indicators

Aggregated indicator

Benchmark scope – environmental indicators

| Impact indicators | Type 1 | Type 2 |
|------------------------------|---|--|
| Global warming |  |  |
| Ozone depletion |  | |
| Acidification |  | |
| Eutrophication |  | |
| Photochemical ozone creation |  | |
| ...other indicator |  | |

 Main benchmark
 Sub-benchmarks



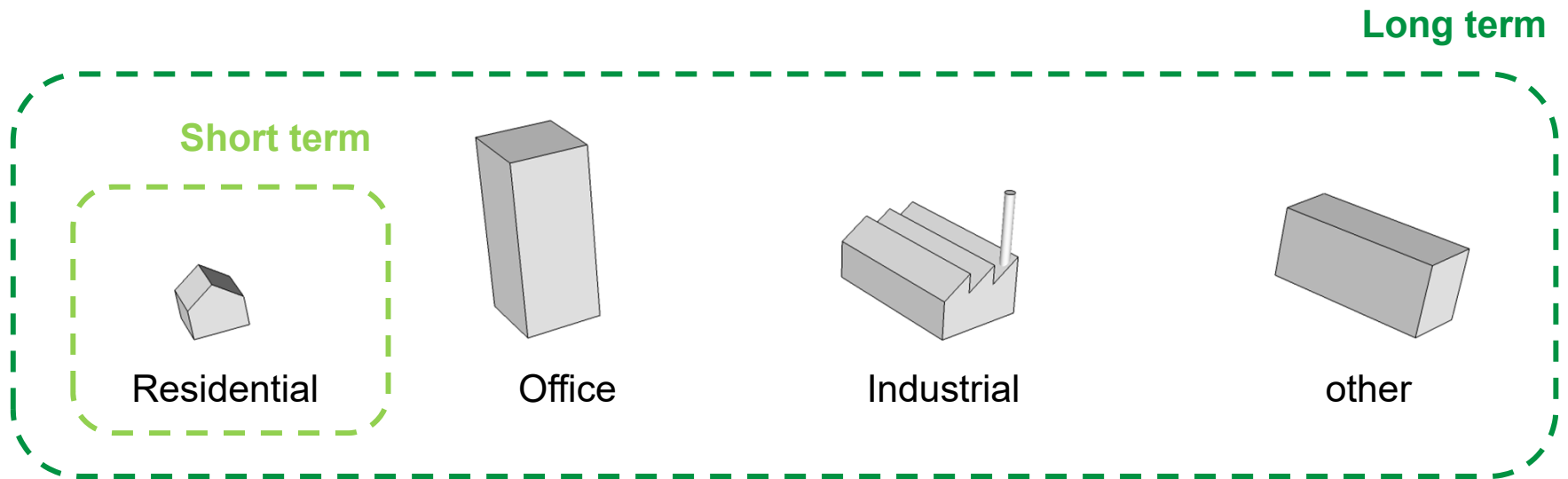
Individual indicators

- + Focus on urgent issues
- Difficult to handle a huge set of indicators

Aggregated indicator

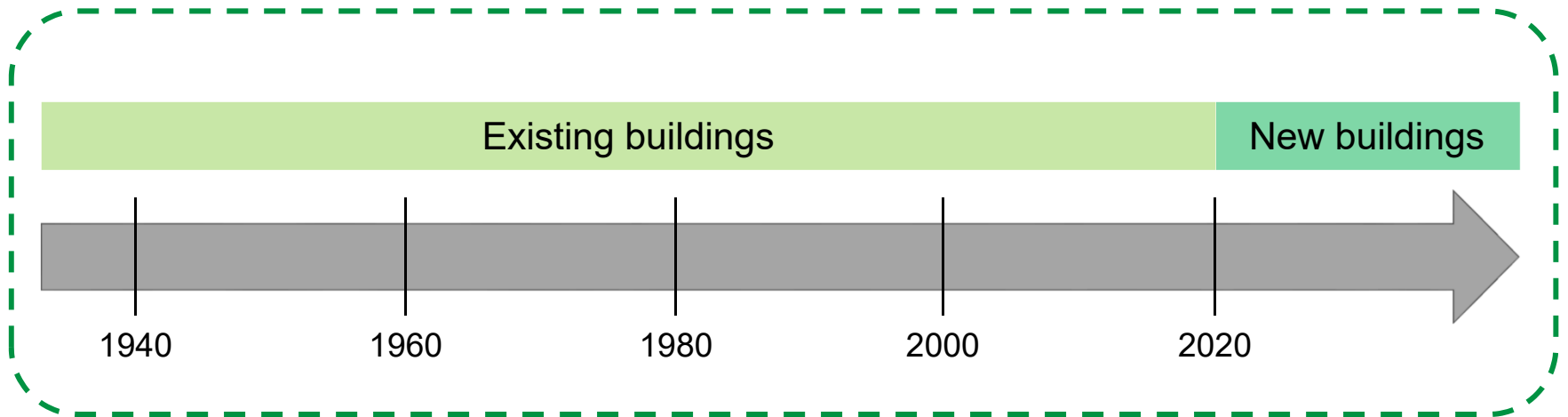
- + Easier to understand and communicate

Benchmark applications – building typologies

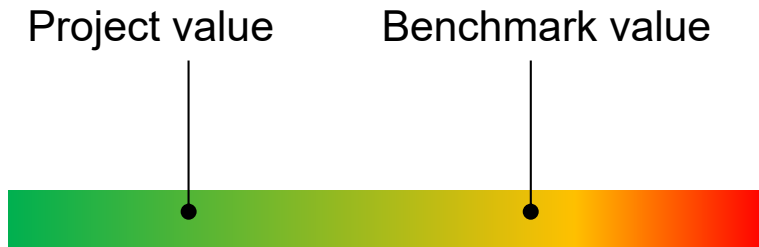


Benchmark applications – new construction and refurbishment

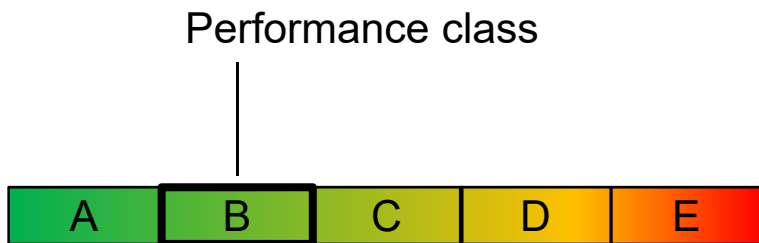
Applicable to the whole building stock



Benchmark communication

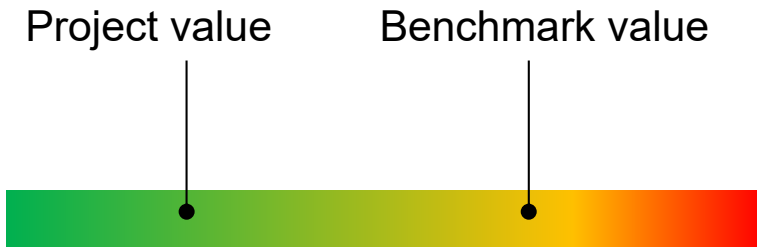


Communication based on benchmark values



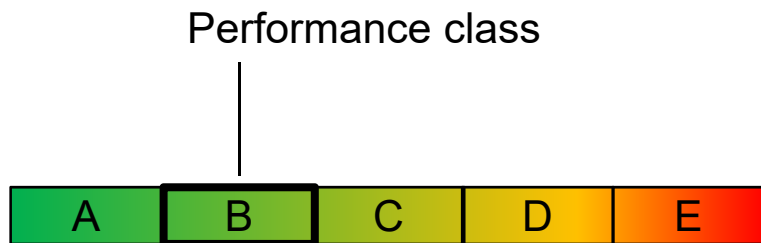
Communication based on performance classes or score

Benchmark communication



Communication based on benchmark values

- + More transparent



Communication based on performance classes or score

- + More user-friendly

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Conclusions and further research

- **Combined top-down and bottom-up** approach
- Different **performance levels** for short term and long term
- **Flexible benchmark scope**: main benchmark and indicative values
- Application to **most widespread building types, new construction and refurbishments**
- **Transparent and user-friendly communication**: benchmark values and performance classes
- **Further research**
 - Extension to research studies
 - Consultation of policy makers and building stakeholders

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