IEA EBC Annex 72:

Assessing life cycle related environmental impacts caused by buildings

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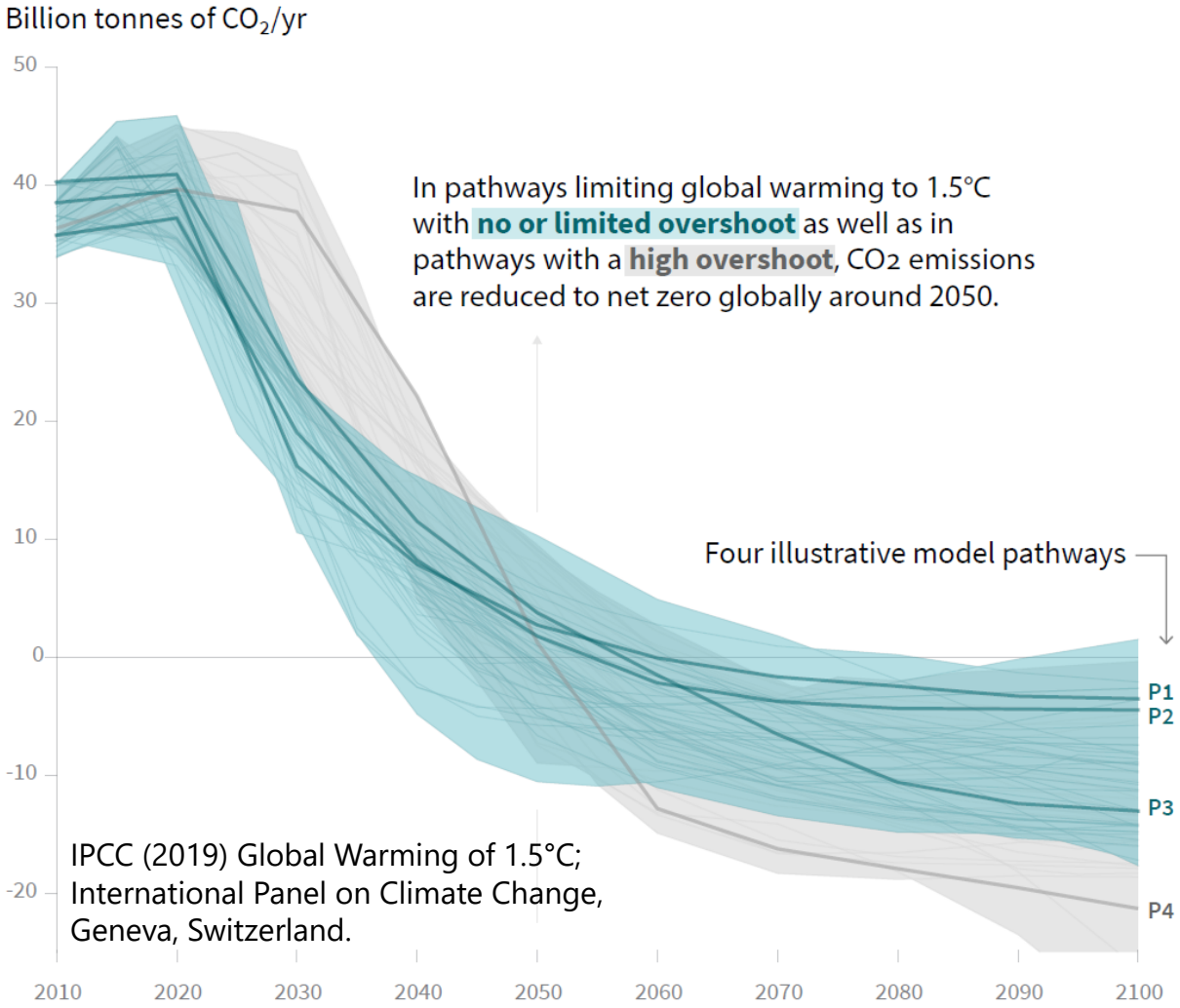
Operating agent, Switzerland

Webseminar:
The Science and Communication of Energy-Efficient Indoor Environments
10 November 2020

Net zero CO_2 emissions by 2050

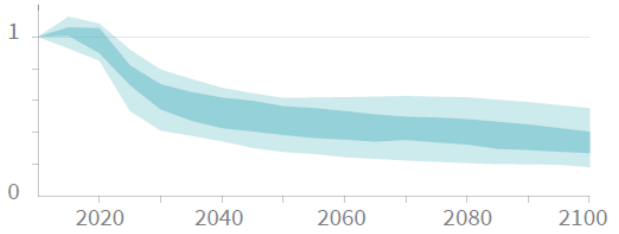
Global total net CO_2 emissions



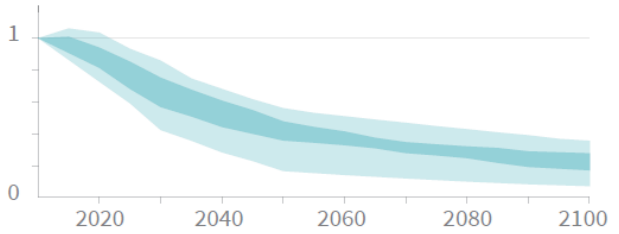
Non-CO_2 emissions relative to 2010

Emissions of non-CO_2 forcers are also reduced or limited in pathways limiting global warming to 1.5°C with **no or limited overshoot**, but they do not reach zero globally.

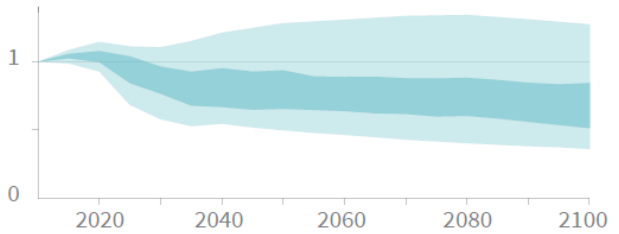
Methane emissions



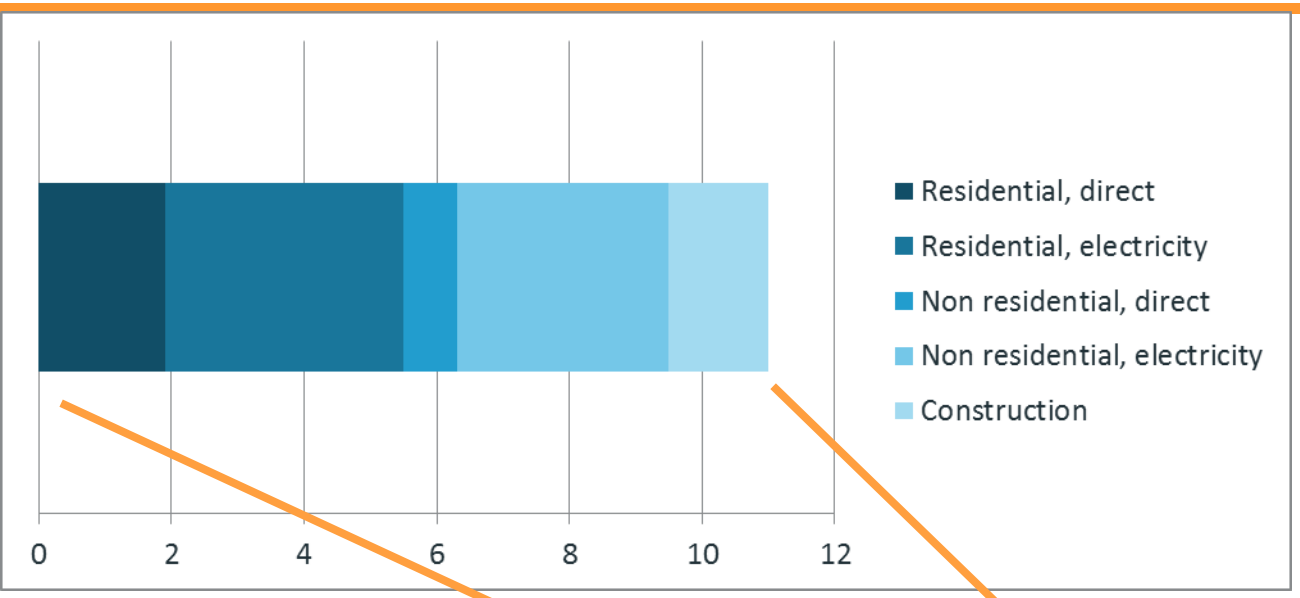
Black carbon emissions



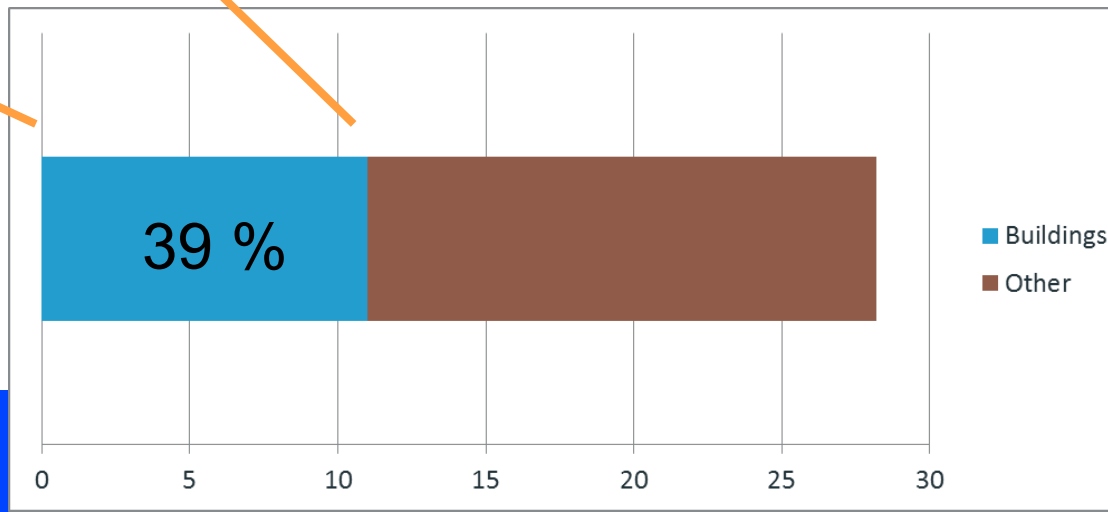
Nitrous oxide emissions



Buildings – an important source of CO_2-Emissions

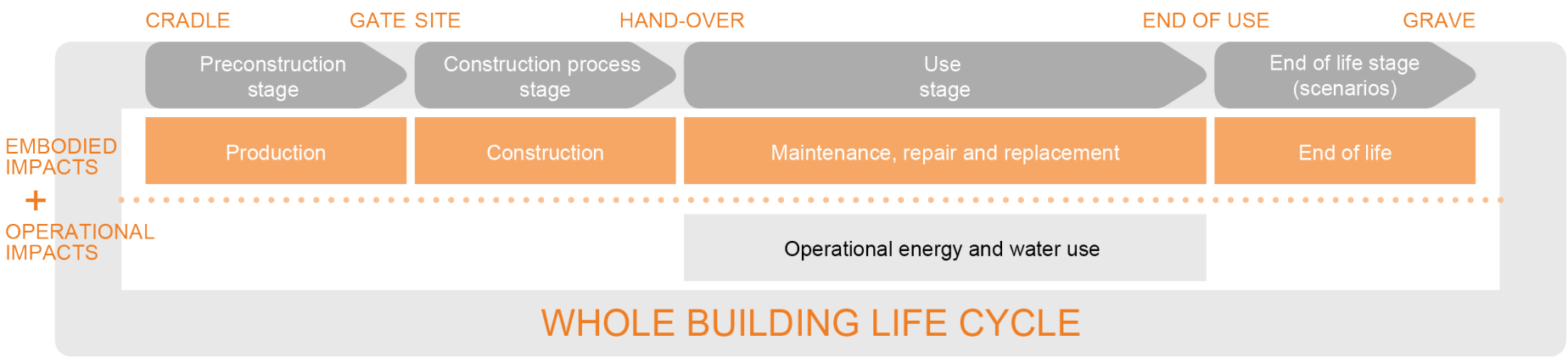


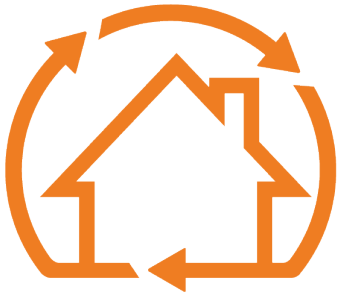
Gt CO_2



UN Environment & IEA (2018): Global Alliance for Buildings and Construction; 2018 Global status report

IEA EBC Annex 72: Full scope environmental assessments of buildings





Net Zero

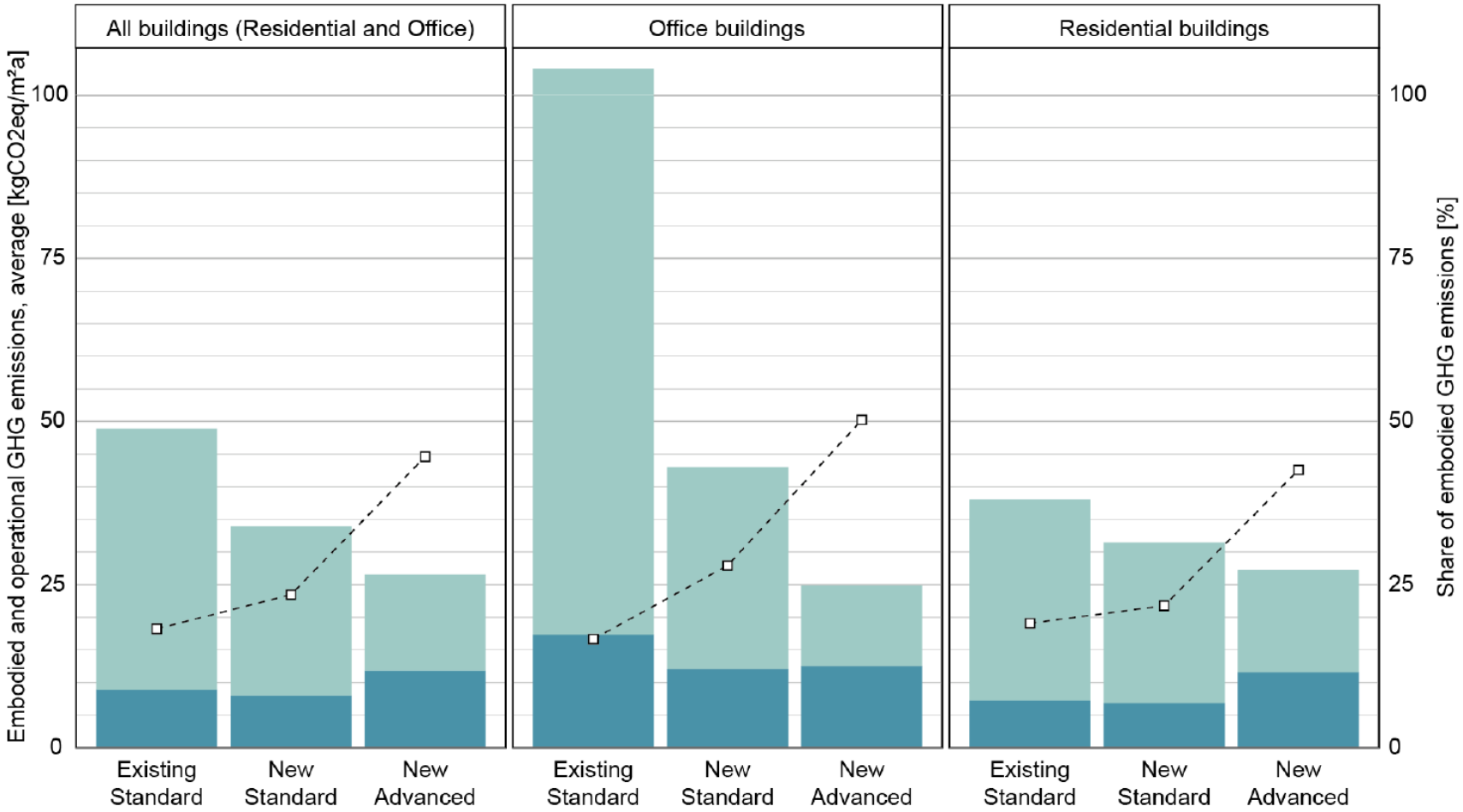
Subtasks

- **Subtask 1**: Harmonised methodology guidelines:
  - developing and extending the methodology guidelines
- **Subtask 2**: Building assessment workflows and tools:
  - description and development of national or regional building assessment tools, in particular embedding of life cycle assessment approach into BIM (Building Information Modelling)
- **Subtask 3**: Case studies:
  - analyzing building case studies using the methodology agreed in Subtask 1
- **Subtask 4**: Building sector LCA databases:
  - development and supply of life cycle assessment databases targeted to the building sector
  - India as a case study: developing buildings sector database
- **Subtask 5**: Dissemination:
  - communication and dissemination of the results

Embodied Greenhouse gas emissions of buildings: a meta analysis

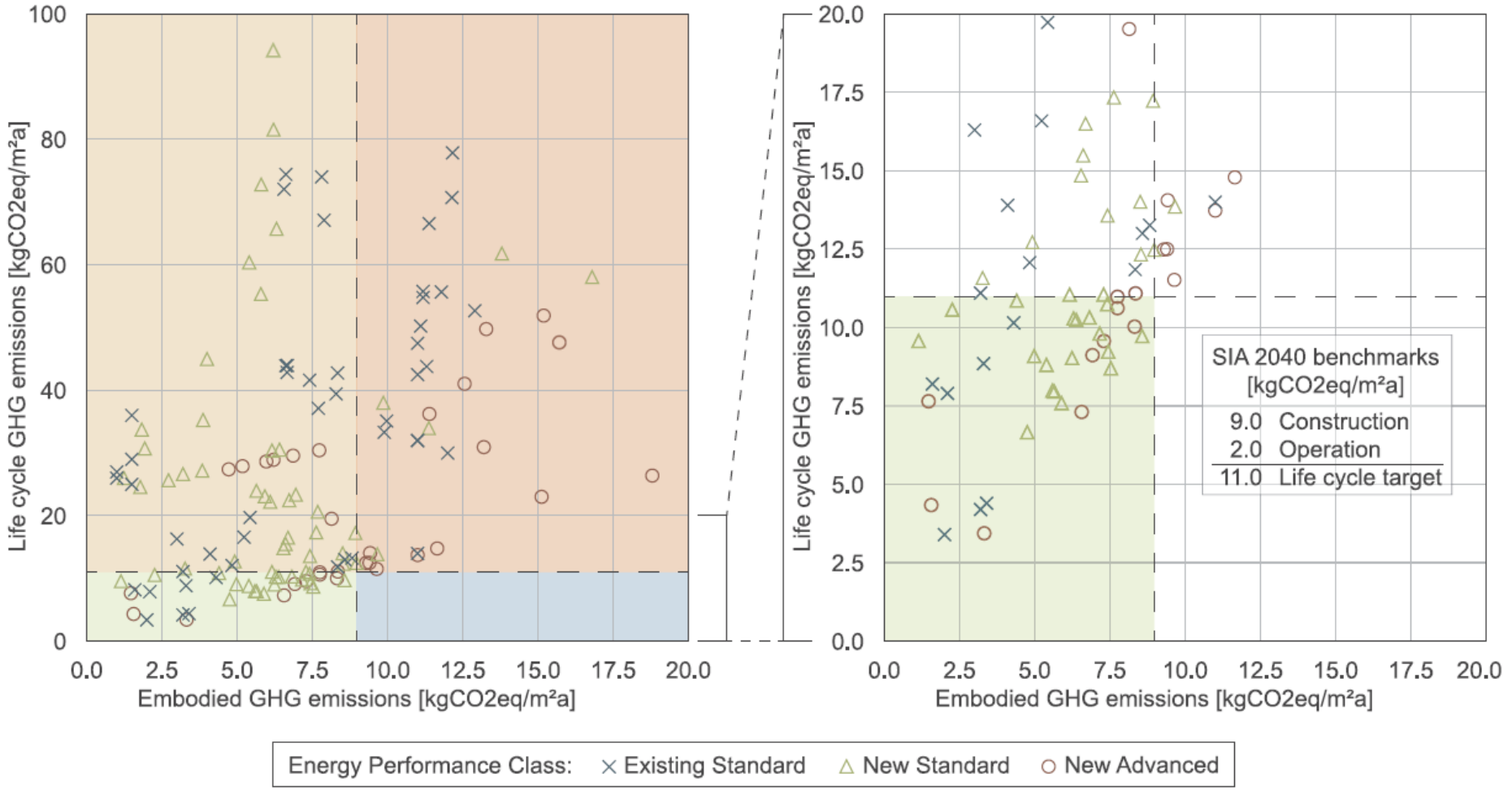
EBC

a) Global trends in embodied and operational, life cycle GHG emissions



Röck M., Saade M. R. M., Balouktsi M., Rasmussen F. N., Birgisdottir H., Frischknecht R., Habert G., Lützkendorf T. and Passer A. (2020) Embodied GHG emissions of buildings – The hidden challenge for effective climate change mitigation. In: Applied Energy, 258 (114107), pp., https://doi.org/10.1016/j.apenergy.2019.114107.

Embodied Greenhouse gas emissions of buildings: a meta analysis



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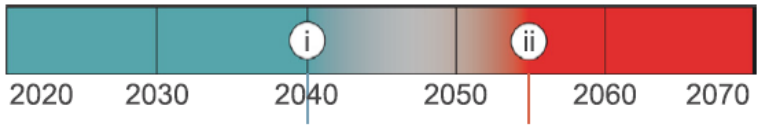
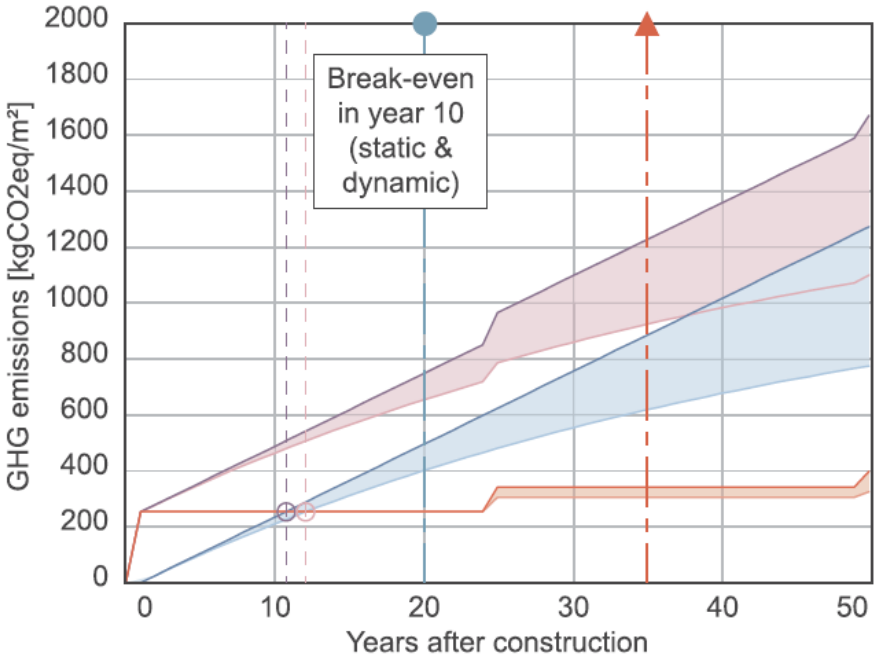
Embodied Greenhouse gas emissions of buildings: a meta analysis

a) Net global GHG emission pathways (acc. IPCC SR 1.5)

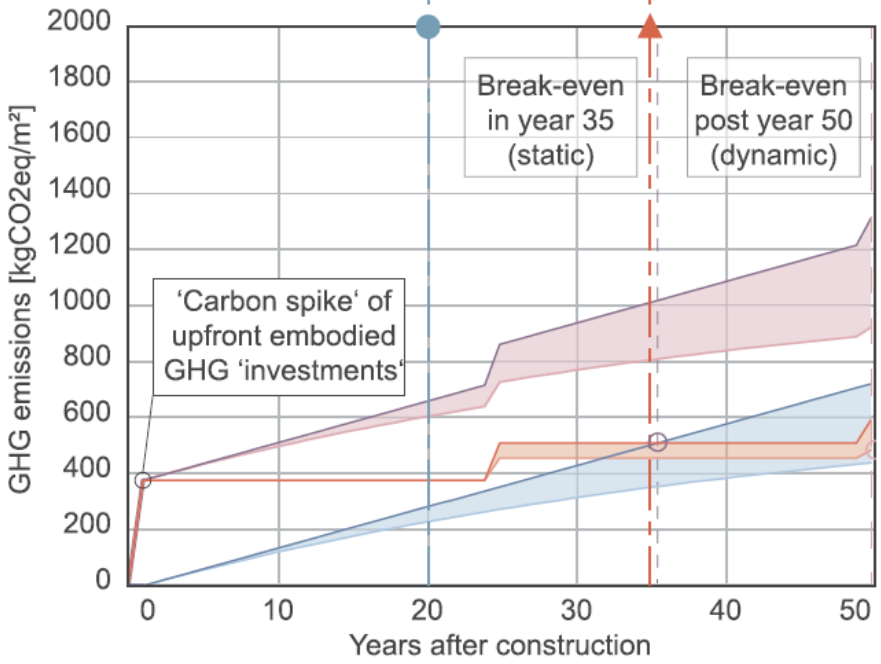
Target: Net zero life cycle GHG emissions, i.e. embodied and operational, by:
i) year 2040 for '1.5°C pathway' ii) year 2055 for 'well below 2°C' scenario



b) Average 'New standard' building



c) Average 'New advanced' building



Embodied GHG | Operational GHG | Life cycle GHG

Technology Collaboration Pro
by iea

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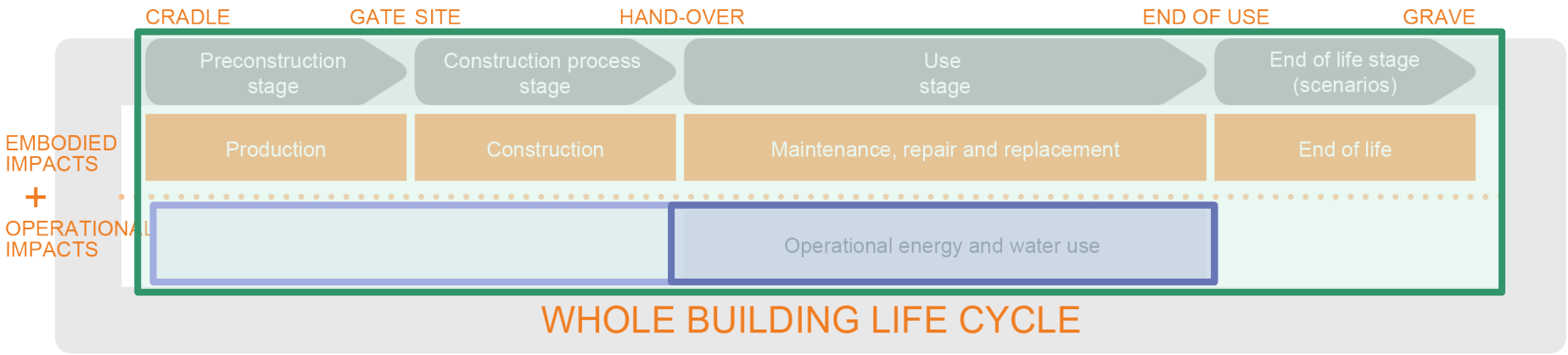
Typology of (net-)zero building approaches

Net Zero emission approaches				Zero emission a.
Net balance	**Net balance**	**Economic compensation**	**Technical Reduction**	**Absolute Zero**
potentially avoided emissions	**allocation**			
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	Purchase of CO_2 certificates covering life-cycle GHG emissions caused by the building	Investment in technical-reduction measures to reduce life-cycle-based GHG emissions caused by the building	Use of construction materials/operational energy with zero GHG emissions (including supply chain emissions)

Level of ambition

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

Typology of (net-)zero building approaches



Level of ambition

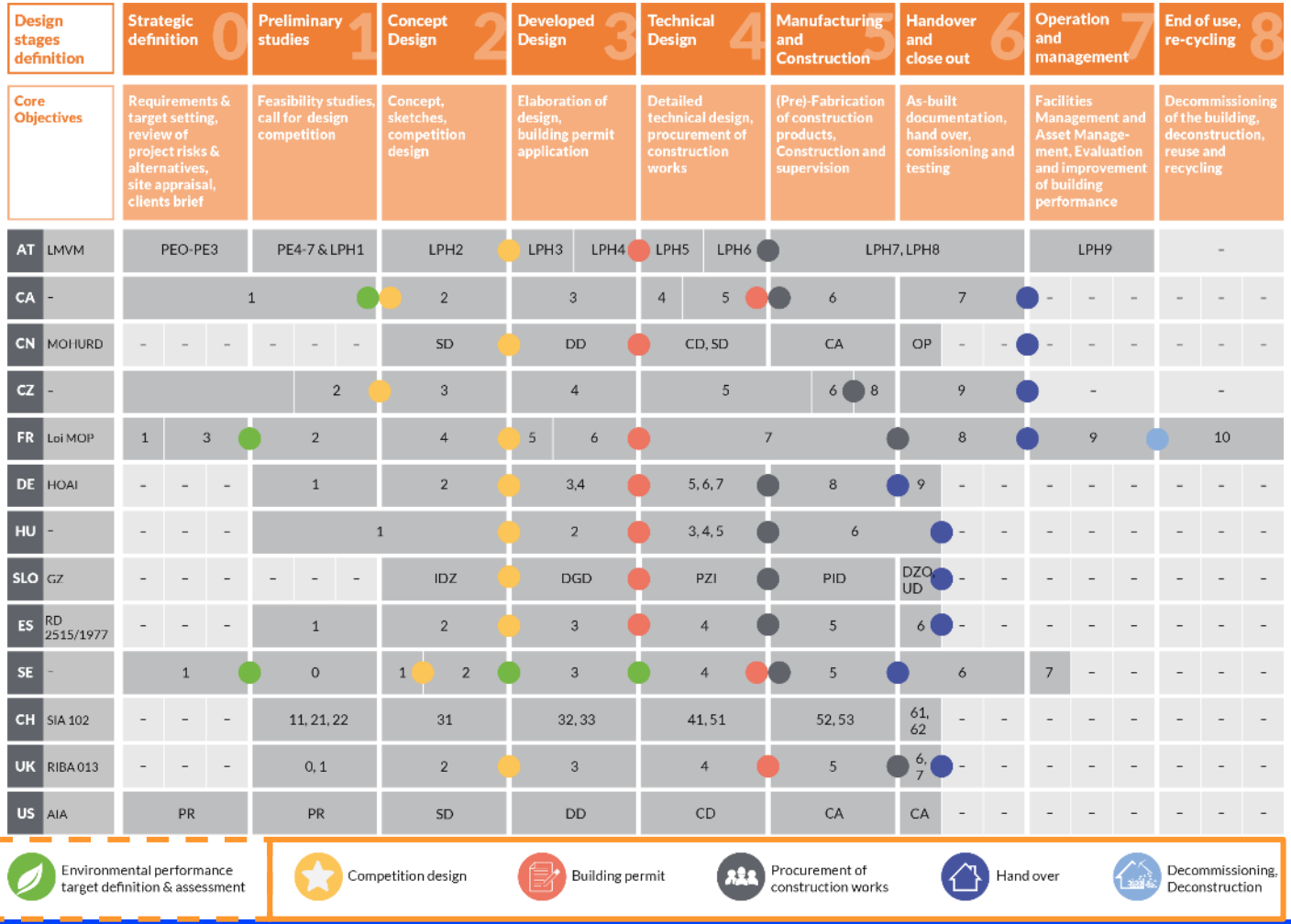
Direct emissions

Direct emissions plus energy supply chains

Full life cycle emissions

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

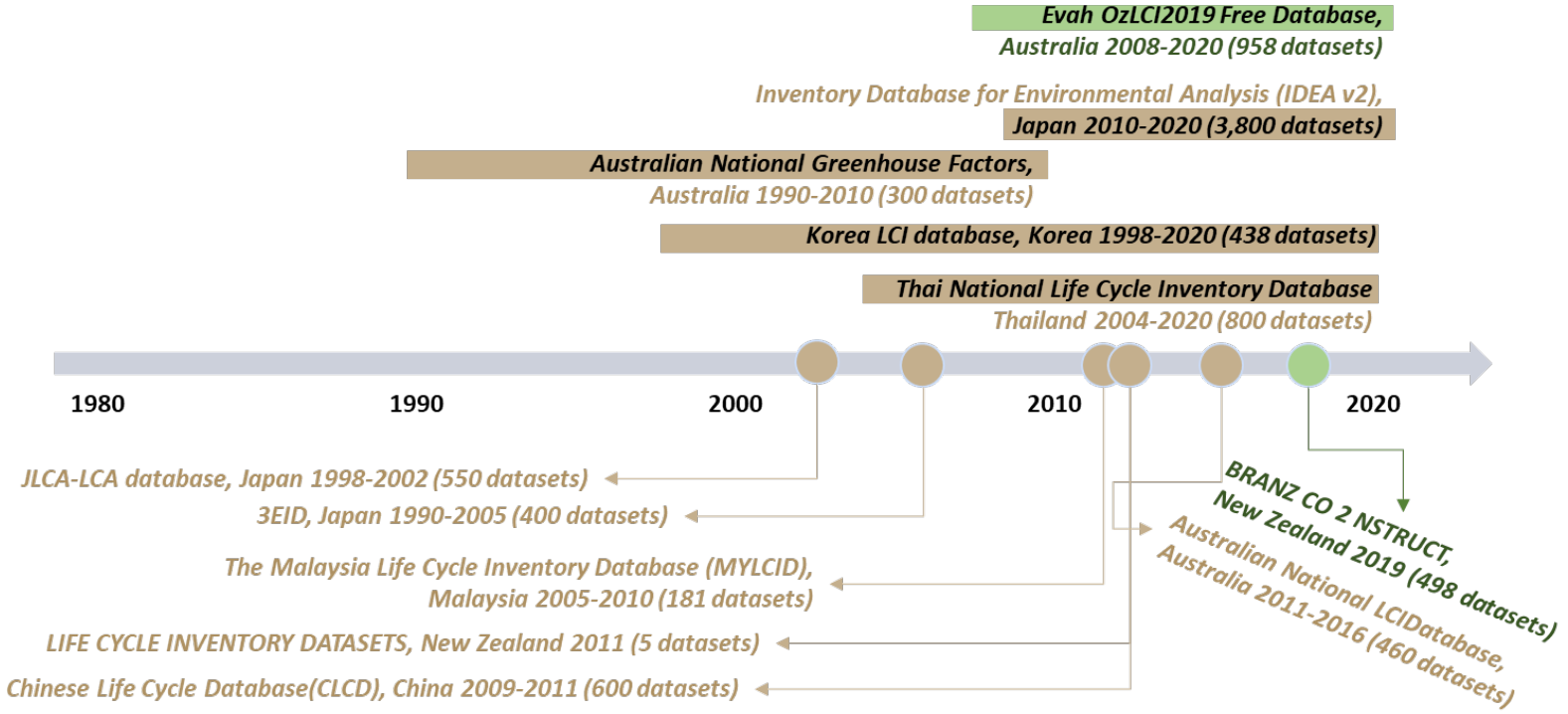
Results: Mapping of national definitions, milestones



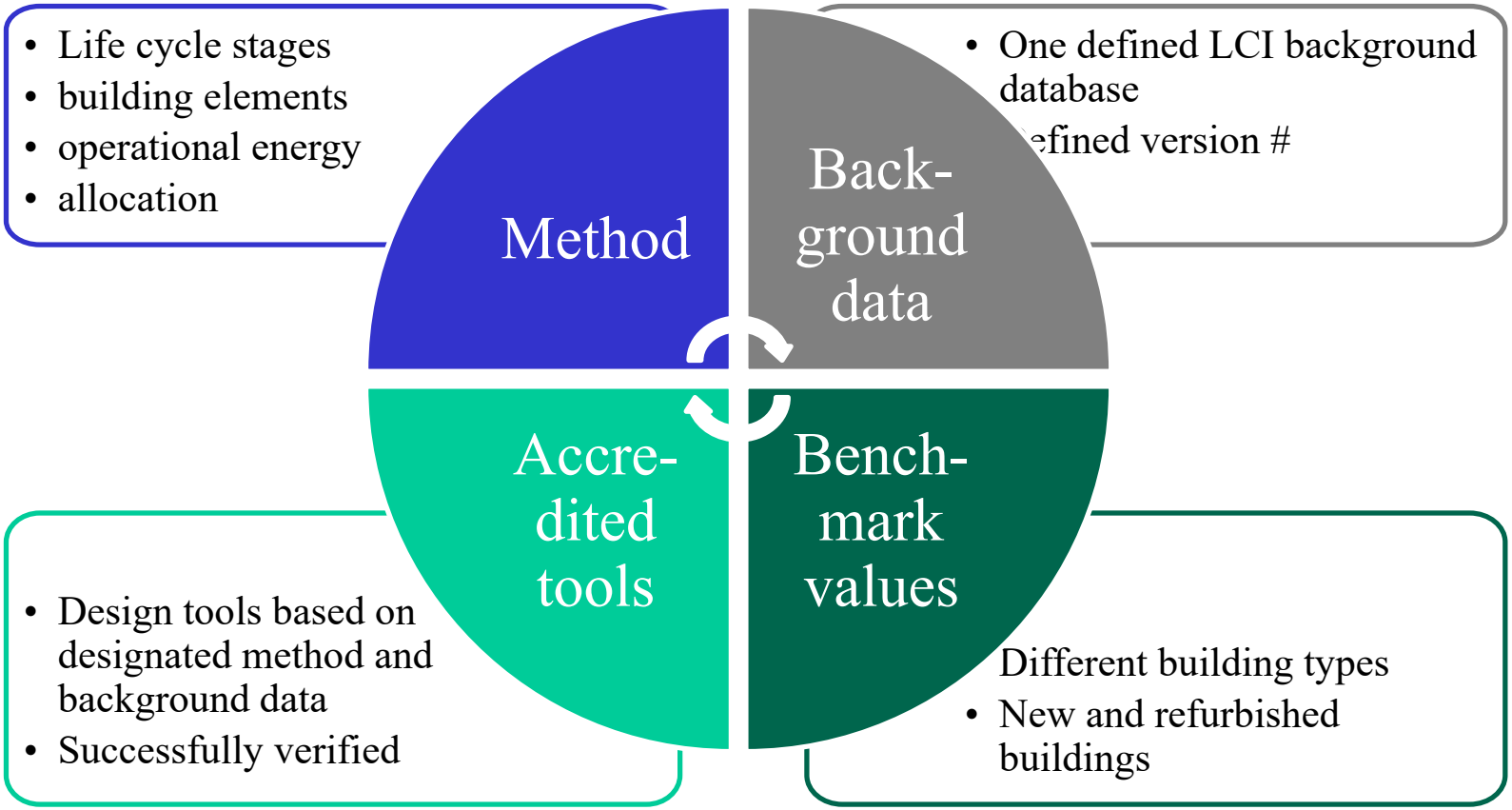
Building LCA databases survey: Asian countries

- ✓ 1 National database is closed. (Taiwan)
- ✓ 11 generic database
- ✓ 0 sector specific databases
- ✓ 2 building LCA database : Evah OzLCI2019 Free Database (Australia), BRANZ CO 2 NSTRUCT (New Zealand)

eFootprint, China



The package for national buildings LCA



Synthesis

- Embodied environmental impacts gain importance and need (more) attention
- Paris Agreement calls for high ambition “net zero emission” buildings
- Guidelines, data and tools are ready for application in many countries:
  time for life cycle based policy measures

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LinkedIn; ResearchGate

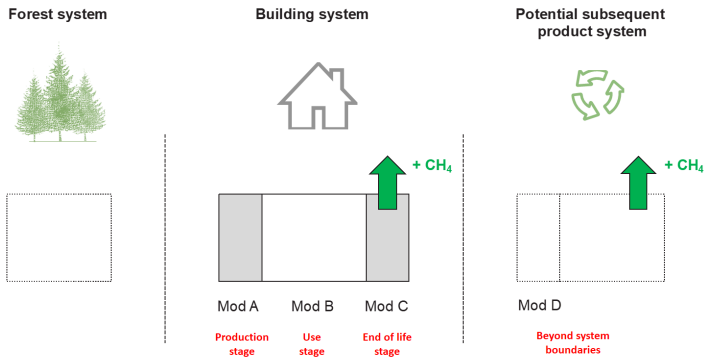
EBC

Annex 72, we do it for you!

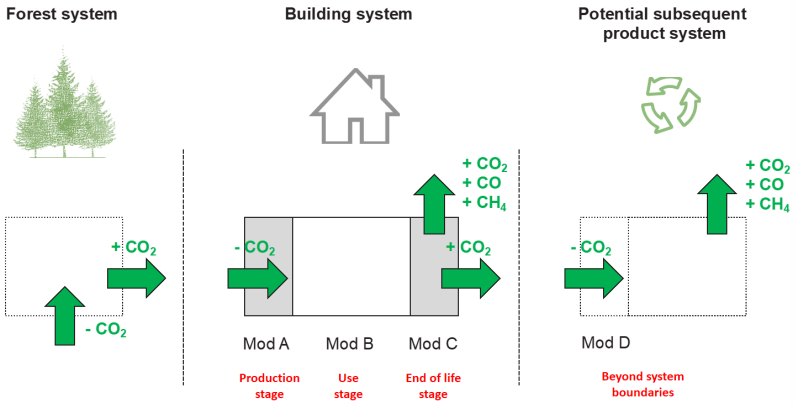
Latest developments in the assessment of GHG emissions of buildings: biogenic carbon

EBC

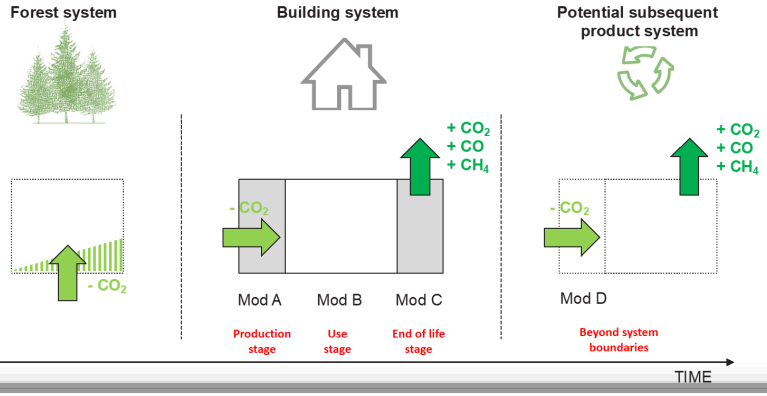
(Option 1)
Assessment of biogenic carbon: the 0/0 approach



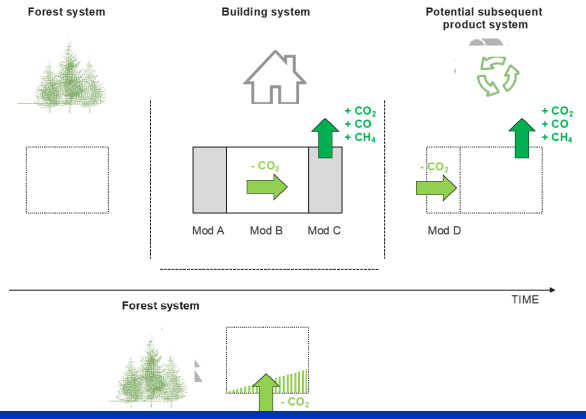
(Option 2)
Assessment of biogenic carbon: the -1/+1 approach



(Option 3a)
Assessment of biogenic carbon – the dynamic approach
tree growth before harvest



(Option 3b) Assessment of biogenic carbon – the dynamic approach tree growth after harvest



Technology Collaboration Programme
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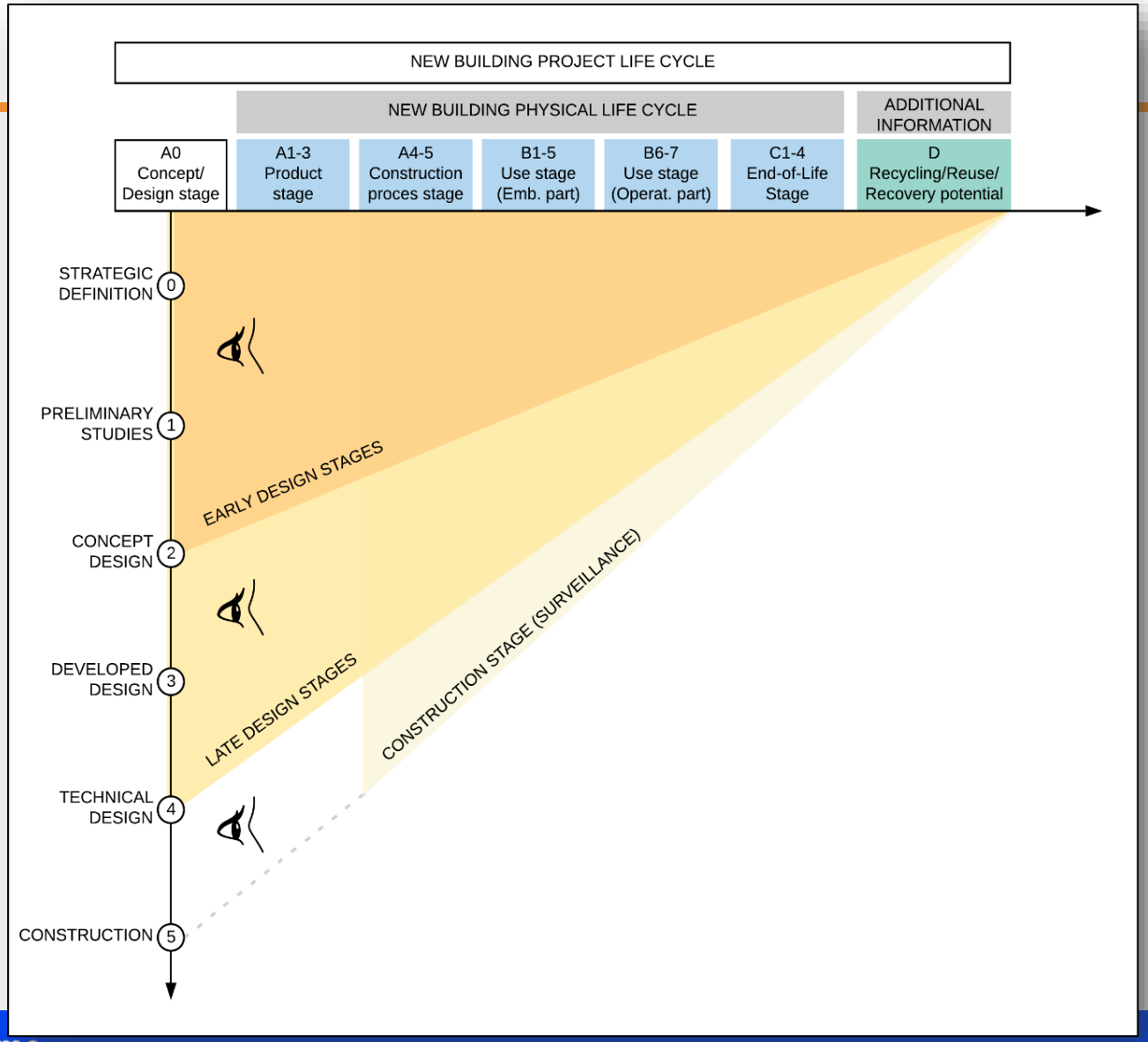
Hoxha, E., Passer, A., Saade, M.R.M., Trigaux, D., Shuttleworth, A., Pittau, F., Allacker, K. and Habert, G., 2020. Biogenic carbon in buildings: a critical overview of LCA methods. *Buildings and Cities*, 1(1), pp.504–524. DOI: http://doi.org/10.5334/bc.46

Design steps

Relationship between the typical project and design steps for a **new building** and the building's physical life cycle



The Graz Declaration

Graz Declaration for Climate Protection in the Built Environment

Outcome of SBE19

Consider signing this declaration!

An intact natural environment is not only vital for humankind but also provides the basis for further social and economic development. For more than 30 years, the international scientific community has provided a strong body of evidence on the increasingly high atmospheric concentrations of man-made greenhouse gases (GHG) and the need to reduce these in order to limit the damages and risks caused by global warming. The UNFCCC has endorsed this and has started international processes for collectively reducing these

https://www.tugraz.at/en/events/sbe19/graz-declaration/graz-declaration/