2024.Sept..24th and 25 th

Recent LCA studies in Japan

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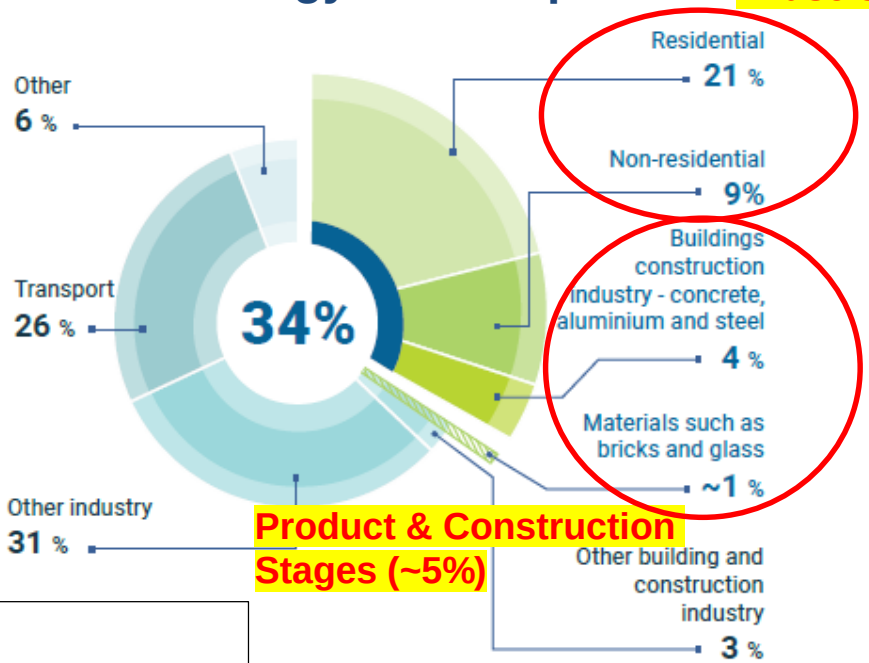
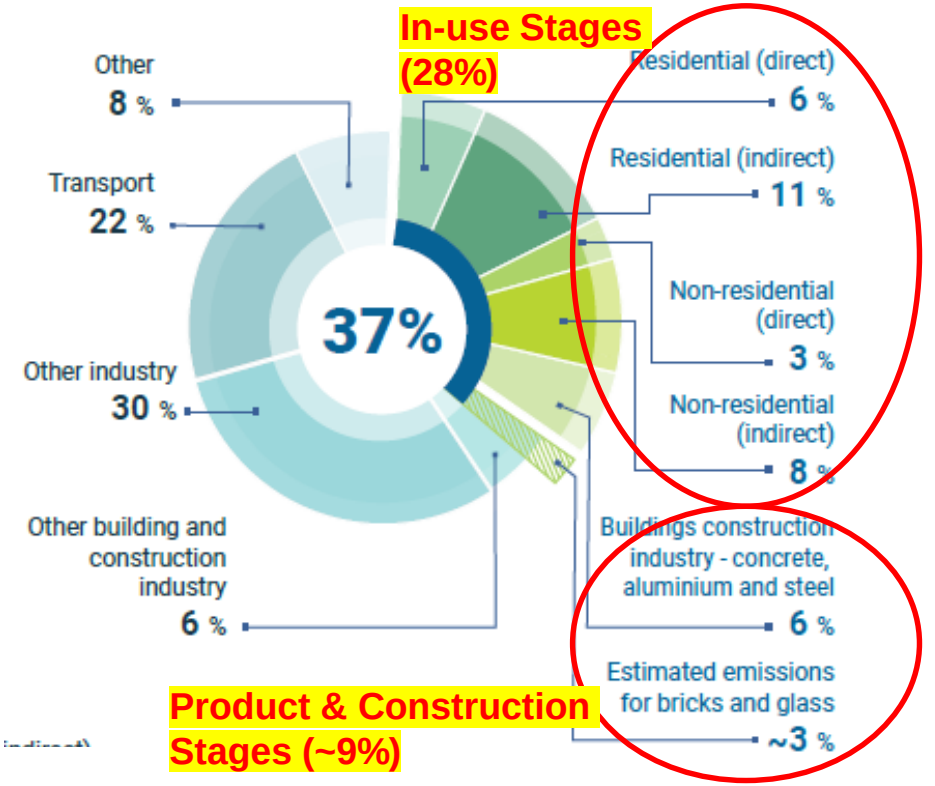
Share of Buildings in Energy Consumptions and Global Emissions (2021)

Fig. 14 Share of buildings in total final energy consumptions

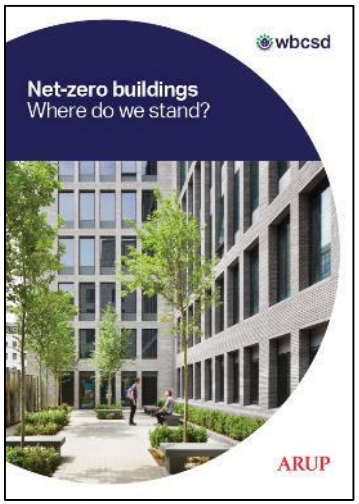


Source：
2022 GLOBAL STATUS REPORT FOR BUILDINGS AND CONSTRUCTION
(Copyright: 2022 United Nations Environment Programme)

Fig. 15 Share of buildings in global energy and process emissions



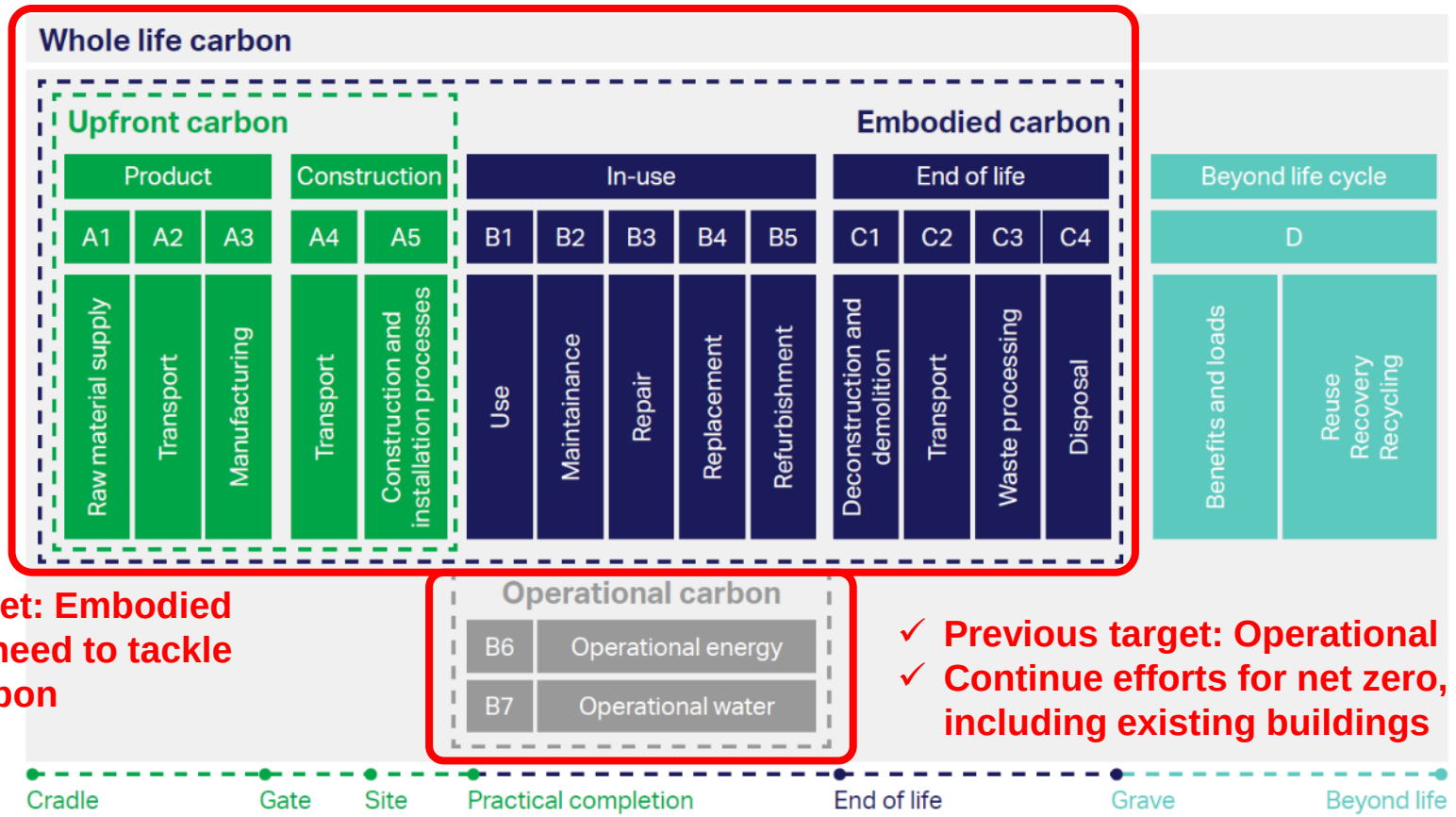
Classification of Whole Life Cycle Stages (Definition by WBCSD)



Source:
Net-zero buildings – Where do we stand? (WBCSD, July 2021) the World Business Council for Sustainable Development

Net-zero buildings: Where do we stand?

Figure 7: Whole life cycle stages, EN15978 (2011)[10]

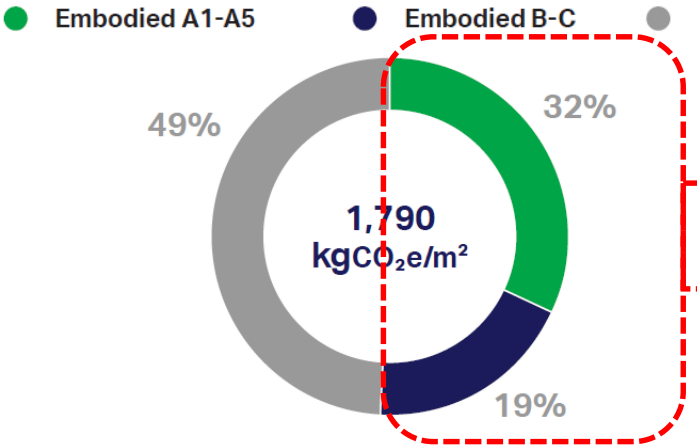


- ✓ **Recent target: Embodied**
- ✓ **Especially need to tackle upfront carbon**

- ✓ **Previous target: Operational**
- ✓ **Continue efforts for net zero, including existing buildings**

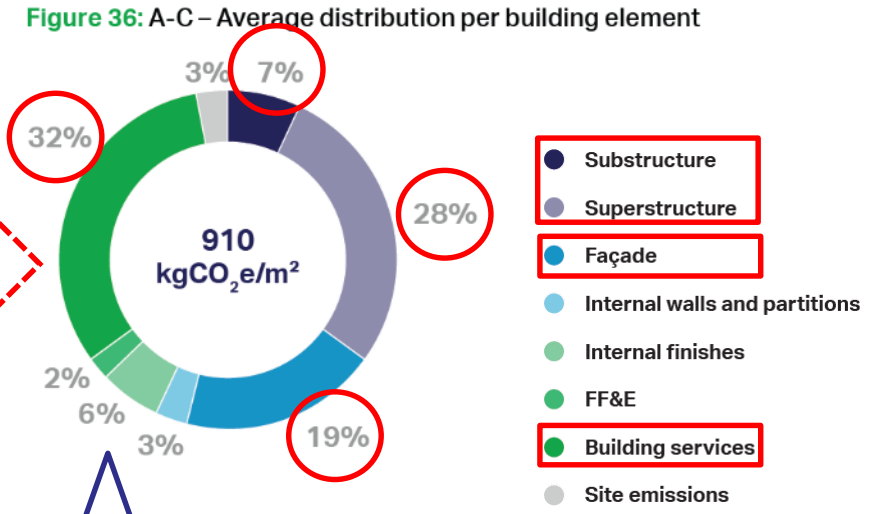
Average Distribution of Embodied Carbons (WBCSD/ARUP 6 Case Studies)

Figure 41: Whole life carbon (A-C) average across all six case studies



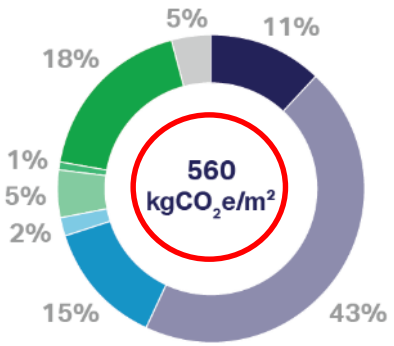
Breakdown of Embodied Carbons

Figure 36: A-C – Average distribution per building element



Product & Construction Stages

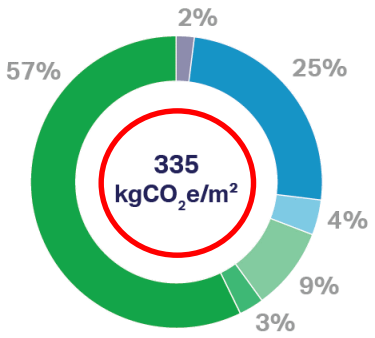
Figure 32: A1-A5 Average Distribution



Structure accounts for 54%

In-Use Stage

Figure 34: B1-B5 – Average distribution

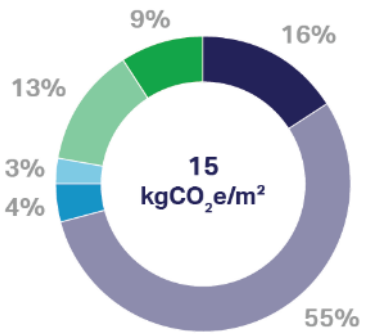


Building Services* 57%, Façade 25%

*equipment replacement, refrigerant leakage, etc.

End of Life Stage

Figure 35: C1-C4 – Average distribution



Structure accounts for 71%

Source: Net-zero buildings – Where do we stand? (WBCSD, July 2021)

Chapter 2: Achieving Sustainable Economic Growth through Addressing Social Issues

~increasing incomes and productivity through entrenchment of wage increases and strategic investment~

3. Responding to social issues through increased investment and social implementation of innovative technologies

(2) GX and energy security

While promoting energy security and decarbonization in an integrated manner, we aim to build a resilient economic structure by strengthening industrial competitiveness and developing growth frontiers through the creation of new demand and markets. To this end, based on the goals of achieving carbon neutrality in 2050 and reducing greenhouse gas emissions by 46% (compared to FY2013) in FY2030, the GX National Strategy will be formulated by the end of FY2024, while promoting GX-related investments of over 150 trillion yen over 10 years through public-private sector cooperation, as well as the Energy The “Energy Basic Plan” and “Global Warming Countermeasures Plan” will be revised by the end of FY2024. Work toward the realization of a circular economy.(omitted).

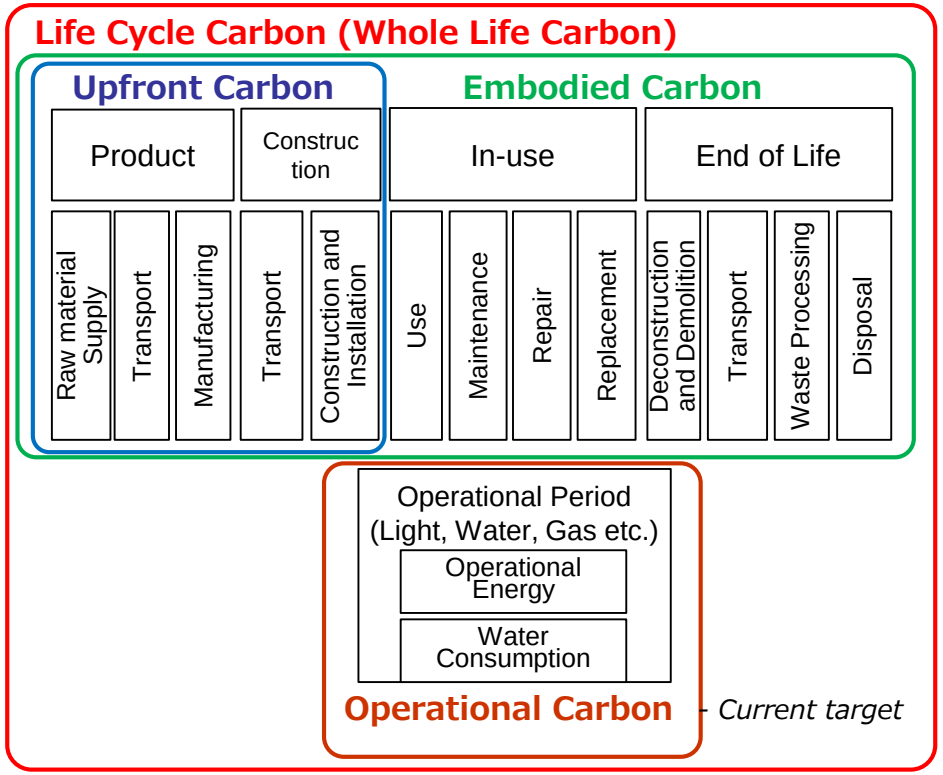
With regard to regions and lifestyles, select 100 or more leading decarbonization regions by FY2025, and revitalize regional economies by horizontally deploying advanced initiatives. Promote “DEKO-KATSU (Decarbonization-Eco Action)" and 3Rs to change people's lifestyles. In addition to infrastructure, including urban development GX, carbon neutral ports, and **buildings*, promote decarbonization** of mobility-related sectors such as fuel cell railcars, zero-emission ships, and next-generation aircraft.(omitted)

*** Efforts to promote CO2 emission reductions throughout the entire life cycle from construction to demolition.**

Development of the methodology of the Life Cycle Assessment for buildings

- Discussion on the life cycle assessment, counting on not only operational carbon but also carbon discharged from construction to the end of life, has been deepened rapidly mainly in the European nations.
- MLIT set up "Zero Carbon building Promotion Council" in December 2022 under Public-Private partnership, to develop the life cycle carbon calculation methodology, considering the Japanese construction culture.
- Out new assessment tools "J-CAT (Japan-Carbon Assessment Tool) " has been released in May 2024.

Coverage of the life cycle carbon



Project Structure

Zero Carbon building Promotion Council

Institute for Built Environment and Carbon Neutral for SDGs

WG for the basic study in Whole life Carbon calculation

- SWG for the development of calculation tools
- SWG for the material database
- SWG for the international information

Cooperation

Committee for the development of GHG emissions calculation in construction period

(The Real Estate Companies Association of Japan)

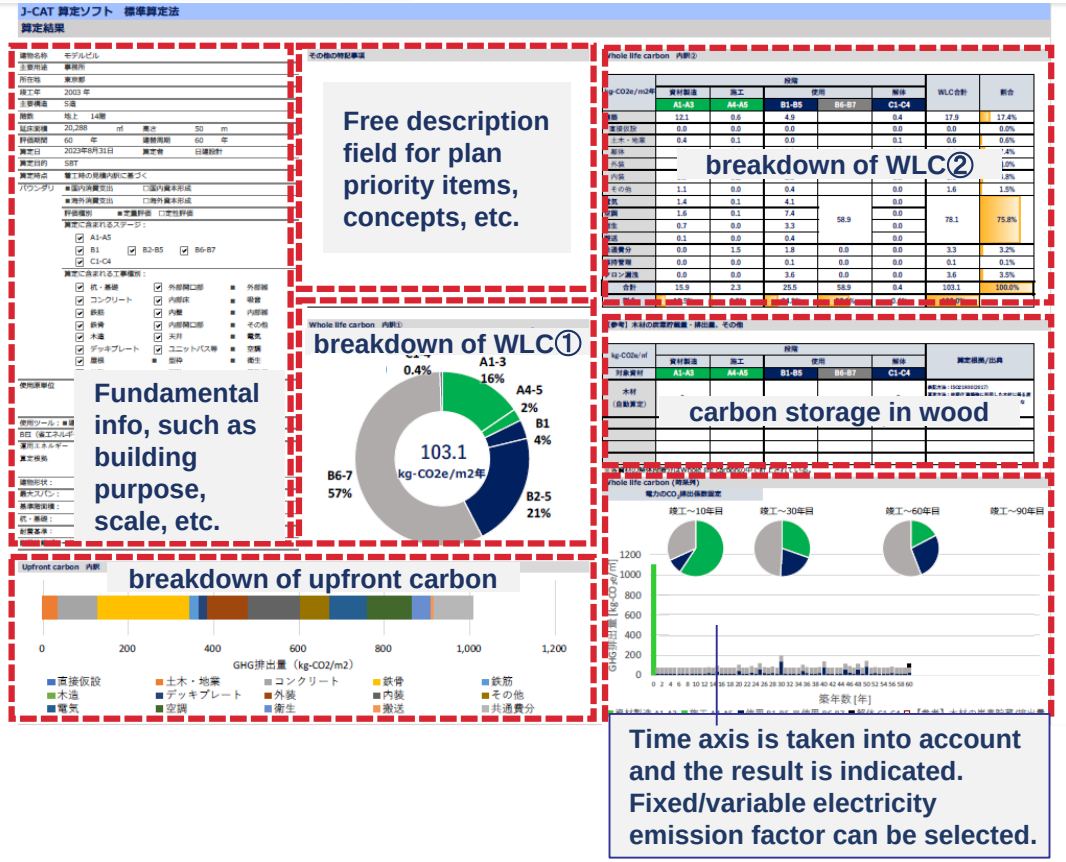
LCA by J-CAT (Japan-Carbon Assessment Tool)

LCA is basically calculated by the following method.
Materials manufacturing stage: Calculated by multiplying **the amount of building materials and equipment used by the CO2 emissions intensity** of each building material, etc.
Construction, maintenance and demolition: Calculated based on certain scenarios and assumptions. (e.g., Factor of construction, repair rates, renewal cycles, reuse rates, etc.)

Example of input info to J-CAT

		Input info	
Product	A1	Raw material Supply	**Amount of materials x CO2 intensity**
	A2	Transport	
	A3	Manufacturing	
Construction	A4	Transport	
	A5	Construction and Installation	**Factor of construction**
In-use	B1	Use	**Freon fill rate x Assumed leak rate**
	B2	Maintenance	**-**
	B3	Repair	**Repair rate x Renewal cycle (initial value or individual input)**
	B4	Replacement	
	B4	Refurbishment	
End of Life	C1	Deconstruction and Demolition	**Edge material rate / waste material reuse rate, waste material recycling rate (initial value or input individually)**
	C2	Transport	
	C3	Waste Processing	
	C4	Disposal	

Result display image



Ref. https://ibecs.or.jp/english/JCAT/index.html

Example of Building Parts Employed for a Detached House

↓↓This house consists of some 60,000 building parts, with 500-1,000 kinds of products.↓↓

“House with a dormer window,” two-story detached house with light-gauge steel frames, produced by SEKISUI in 1983

Source: SEKISUI HOUSE, LTD.

- ✓ Maintenance of GHG emission units is essential for the calculation of embodied carbon.
- ✓ Promote EPD/CFP acquisition for individual products to reflect company efforts!!

Description of carbon storage

Carbon storage and sequestration are not included in the whole-life carbon calculation results, which are currently the majority internationally. However, as reference information, a column that can be included with the basis for calculation should be included in the results.

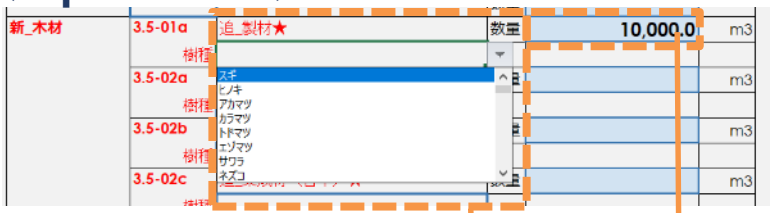
①Wood

Automatic calculation of biogenic carbon storage and emissions by inputting the amount and species of wood (lumber, laminated wood, plywood) used

Expression method: Based on ISO 21930 (2017)

Calculation method: Based on the Guidelines for the Indication of Carbon Storage in Wood Used for Buildings (Forestry Agency)

<input sheet>



② Other than wood (concrete, etc.)

The calculator will optionally include the calculated value and the basis / source of calculation in the result sheet.

<draft carbon storage notation>

kg-CO2e/㎡	Phase					Basis / Source of Calcutlation
	Product	Construction	In-use		End of life	
Target Materials	A1-A3	A4-A5	B1-B5	B6-B7	C1-C4	
wood (auto-calculate)	-346				346	Expression method: ISO 21930 (2017) Calculation method: the Guidelines for the Indication of Carbon Storage in Wood Used for Buildings (Forestry Agency)

Materials other than wood, such as concrete, can be noted at the calculator's discretion.

※The amount of each material's demolition phase is accounted for in the WLC.

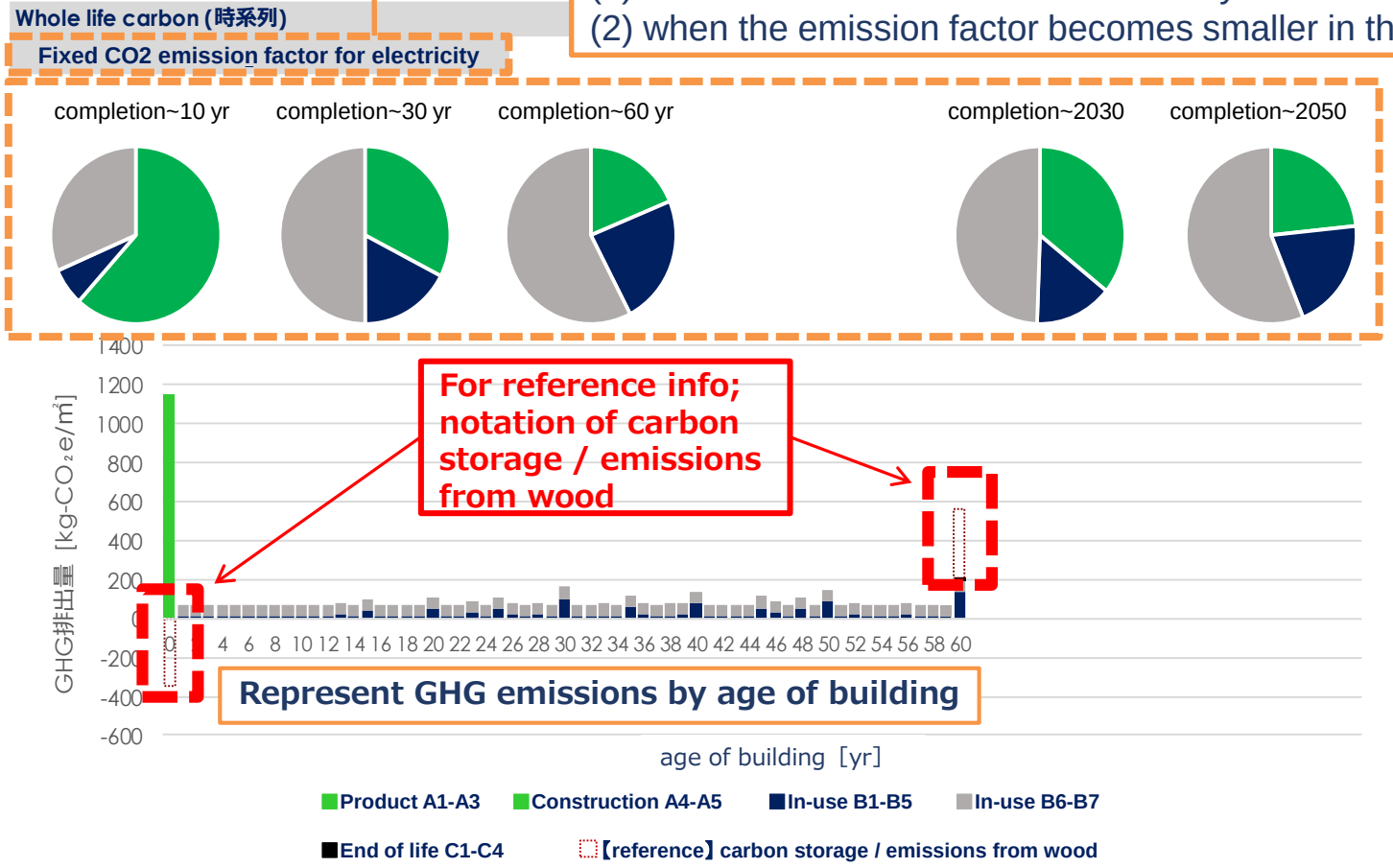
Wood: Based on ISO21930(2017), expressed as -1 kg CO2e/kgCO2 at the material production stage (A) and +1 kg CO2e/kgCO2 at the demolition stage (C3). In the "regulatory approach" in the U.K., France, and Germany, there is an example of subtracting wood carbon storage from lifetime carbon emissions of a building under certain conditions, but we recognize that this is a rare case worldwide. While keeping a close eye on future trends overseas, for the time being, the following notation will be used separately.

Description of carbon storage in wood in J-CAT

Notation of results taking into account changes in calculation conditions over time

Added a new result expression that takes into account changes in calculation conditions over time in order to express the impact of Embodied carbon for short-term mass emissions.

Notation can be switched between two results:
(1) when the emission factor of electricity does not change in the future,
(2) when the emission factor becomes smaller in the future.



Notation of ratio of Embodied and Operational other than Upfront and Upfront carbon

Notation can be switched between two results:

(1) Total for the 10th, 30th, and 60th years after completion of construction

(2) Total for 2030 and 2050 after completion of construction

Future Direction on Life Cycle Assessment

- **Discussion towards institutionalization** of life cycle assessment (LCA) for widespread use.

- **Ensure the link between J-CAT** (: Japan Carbon Assessment Tool for Building Lifecycle) **and BIM**, and also promote **the web-based LCA tool.**

- **Accelerate the development of EPDs. Create a flow of encouragement** from building clients, general contractors, and designers **to develop EPDs for their component and equipment manufacturing divisions.**

- **Accelerate the development of systems and human resources** for the maintenance of EPDs.

（Ref.） LCCM(Lifecycle-Carbon-minus) housing in Japan

[Definition of LCCM housing in Japan]

Housing that reduces CO2 emissions throughout the entire life cycle (from construction to demolition, reuse, etc.) by reducing CO2 emissions at material manufacturing and construction stages in addition to CO2 emissions at the use stage, and by extending the service life.

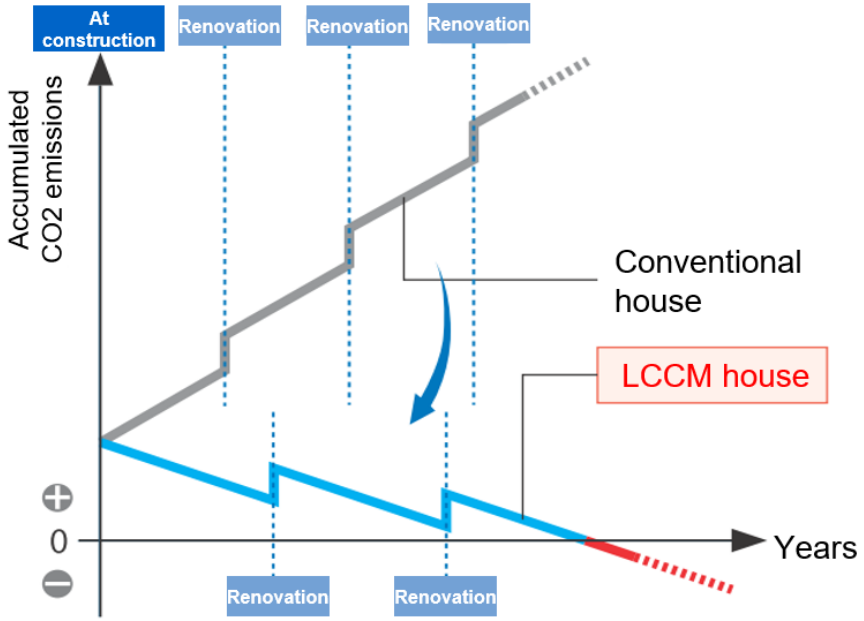
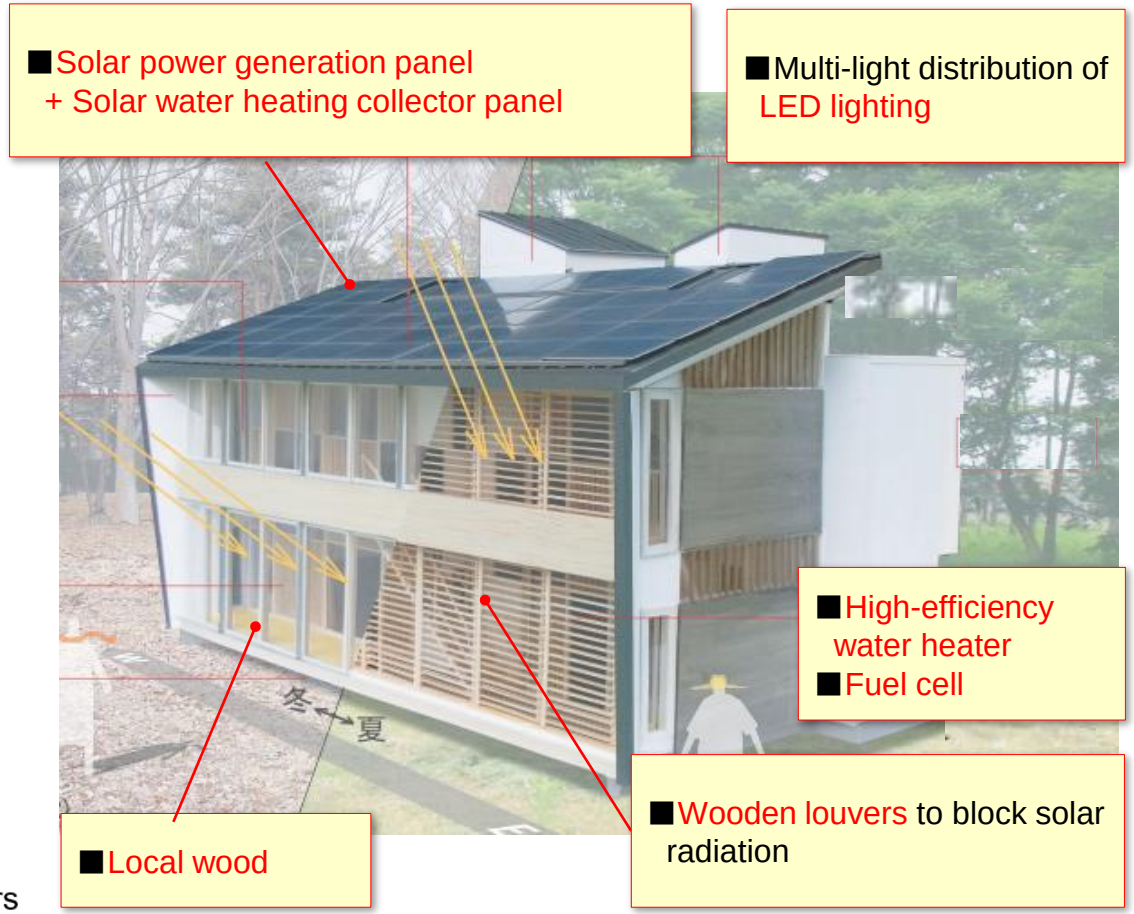


Image of the transition of C02 emissions throughout the entire life cycle



Example of LCCM housing

Thank you for your attention.