How Carbon Metric Standard Could Facilitate Innovation for Reduction of GHG Emission from Buildings?

Tomonari Yashiro[1], Thomas Lützkendorf[2]
David Crowhurst[3], Rodney McPhee[4]
Guido Hoff[5], Gérard Senior[6], Ning Huang[7]

1 The University of Tokyo, 2 Karlsruhe Institute of Technology (KIT),
3 Building Research Establishment, 4 Canadian Wood Council,
5 DIN, 6 Architecte A.E.T.I.C., 7 GWS

WORLD SBE HONG KONG 2017
WORLD Sustainable Built Environment Conference
Organisers:
CONSTRUCTION INDUSTRY COUNCIL 建造業議會
HKGBC 香港綠色建築議會
International Co-owners:
SBE SERIES
iiSBE
Sustainable Buildings and Climate Initiative
FIDIC
Global Alliance for Buildings and Construction

Why globally agreed method to measure, report, verify in a consistent and comparable way?

Possible policy/trading instruments for for reduction of GHG emission

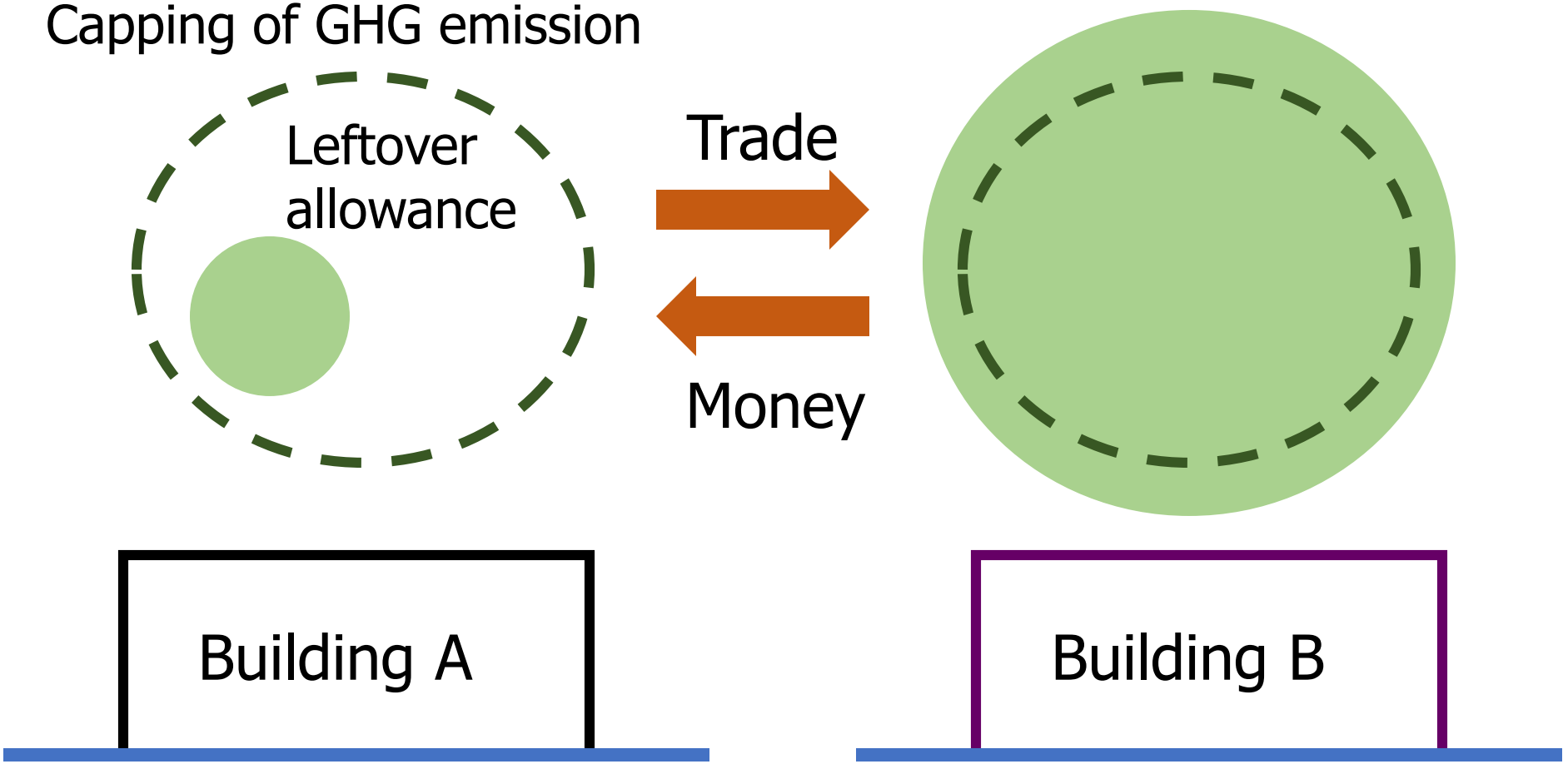
For example;

- Setting of naational targets
- Base-lining of GHG emission in regulations
- Prescribing in a contractual agreement
- Carbon financing including
  - Carbon trading

etc.

Carbon Trading

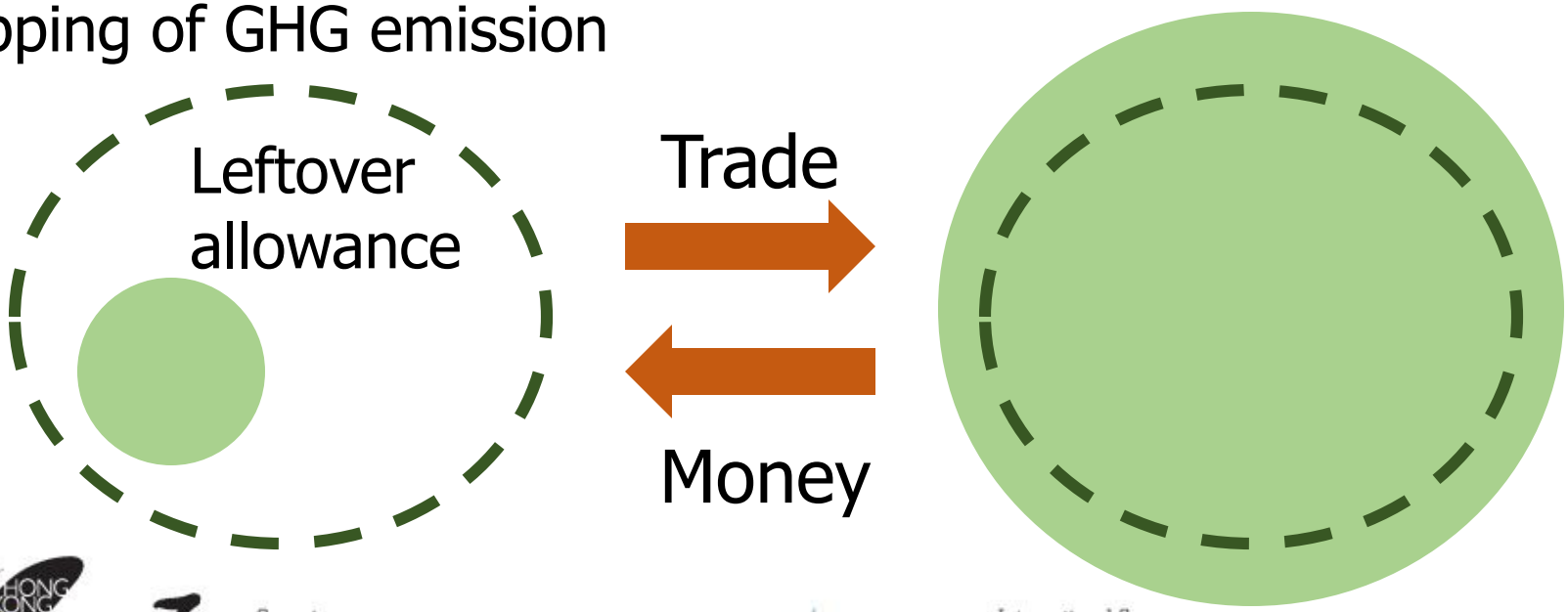
Capping of GHG emission



Carbon Trading

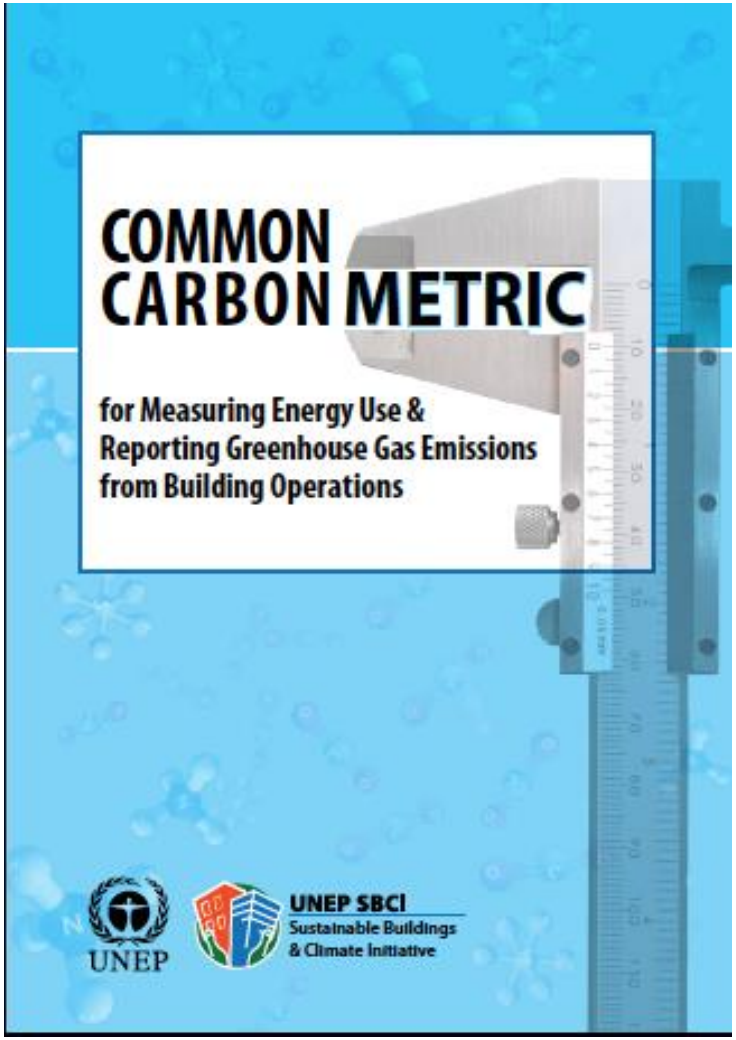
requires a globally agreed method to measure, report, and verify reductions of GHG emissions from existing buildings
in a consistent and comparable way.

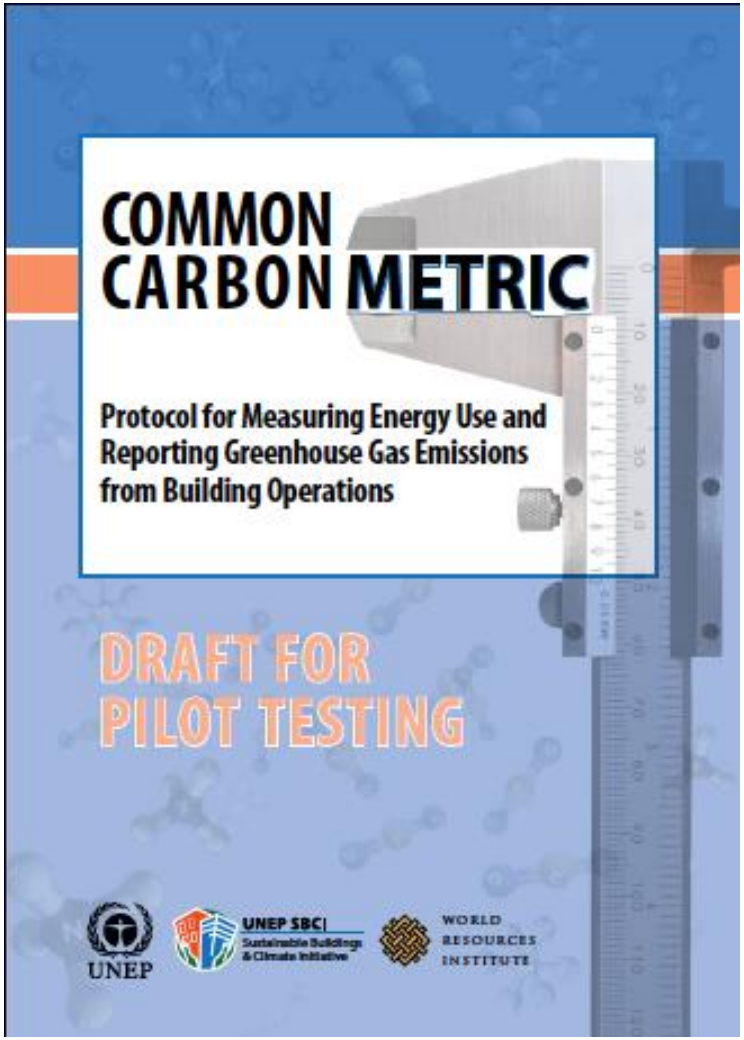
Capping of GHG emission



Common Carbon Metric

Initiative by UNEP SBCI



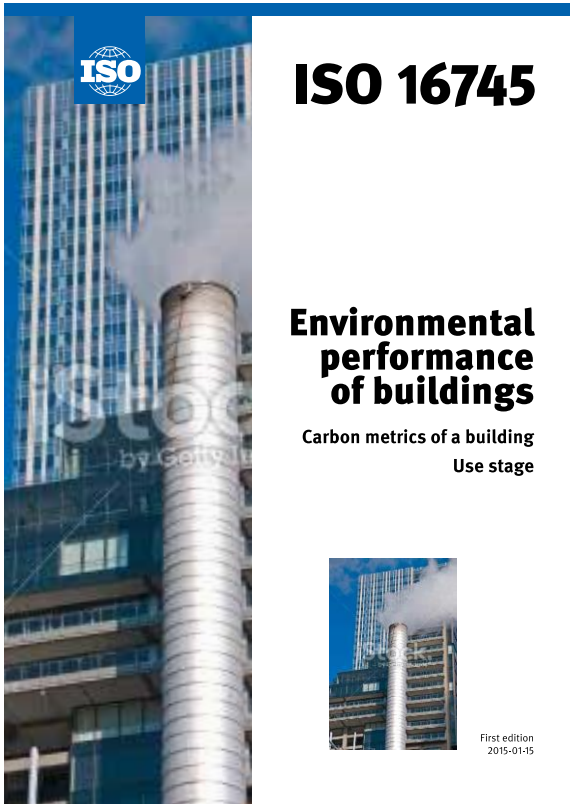


ISO 16745-2015

Environmental performance of buildings — Carbon metric of a building during the use stage

Collaboration UNEP SBCI & ISO/TC59/SC17/W4

- Set out a globally applicable common method of measuring, reporting and verifying of
- associated GHG emissions (and removals)
- attributable to existing buildings,
- by providing requirements
- for the determining and reporting of a carbon metric(s) of a building.



How could we measure, report, verify in a consistent and comparable way?

Why focuses on use stage of a building ?

- 70 %–80 % share over the building life
- simple metric that is usable by non-expert
- Data available from
  - utility provider reports and contracts
  - bills
  - invoices for fuel deliveries
  - meter readings
  - pipeline measurements
  - energy management software.
- usable both in the developed world and in developing countries

Carbon metric (CM)

"sum of annual greenhouse gas (GHG) emissions and removals, expressed as CO2 equivalents, associated with the use stage of a building"

measured by kg CO2e/year

Carbon intensity

"carbon metric expressed in relation to a specific reference unit related to the function of the building"

measured by kg CO2e/year/m2,
kg CO2e/year/occupants etc.

Principles in determining the CM

- Completeness
- Consistency
- Relevance
- Coherence
- Accuracy
- Transparency
- Avoidance of Double Counting

System boundaries of CM

the sum of annual GHG emissions, expressed as CO2 equivalents,

CM3

plus from other building-related sources

CM1

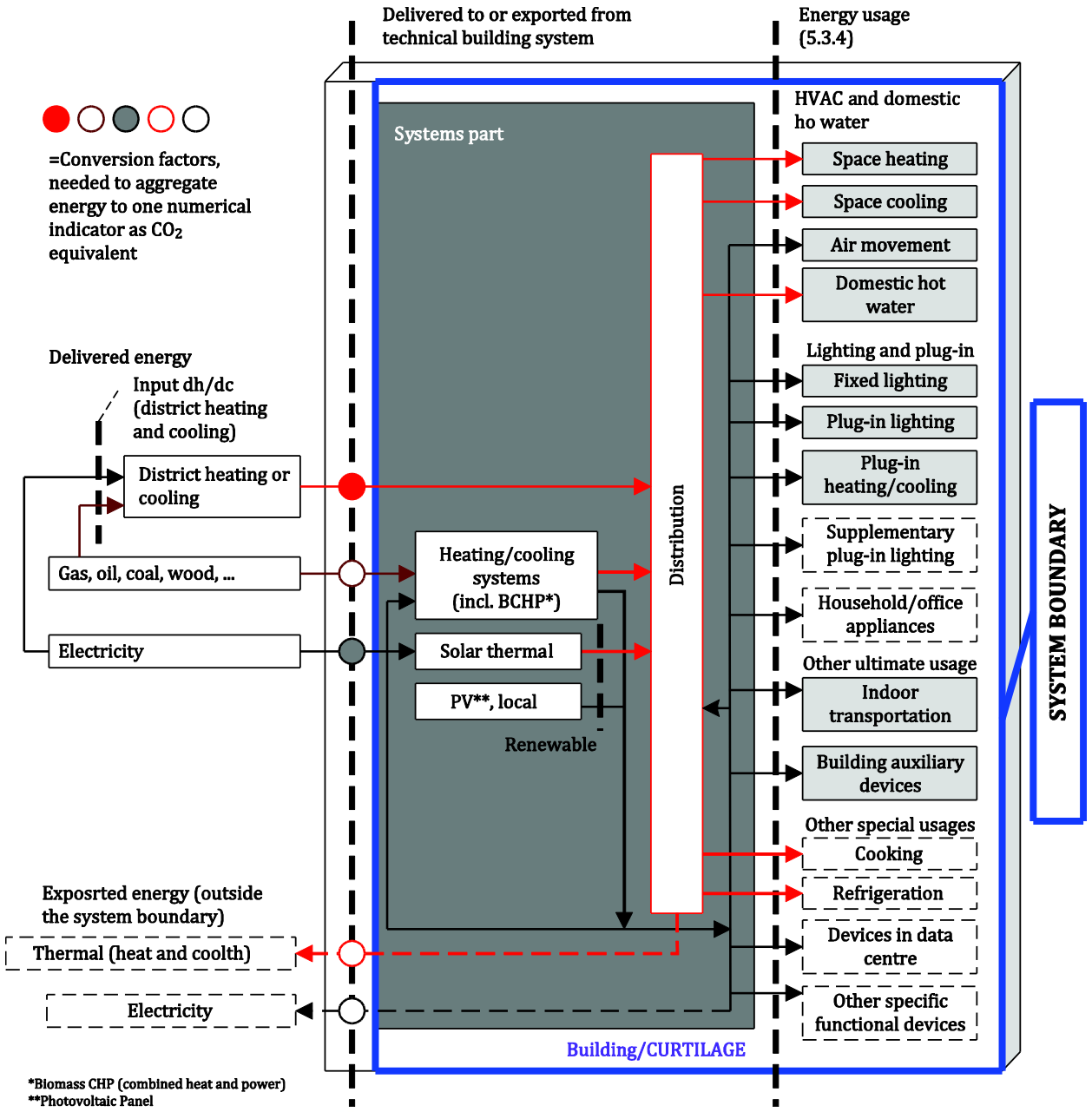
from building-related energy use

CM2

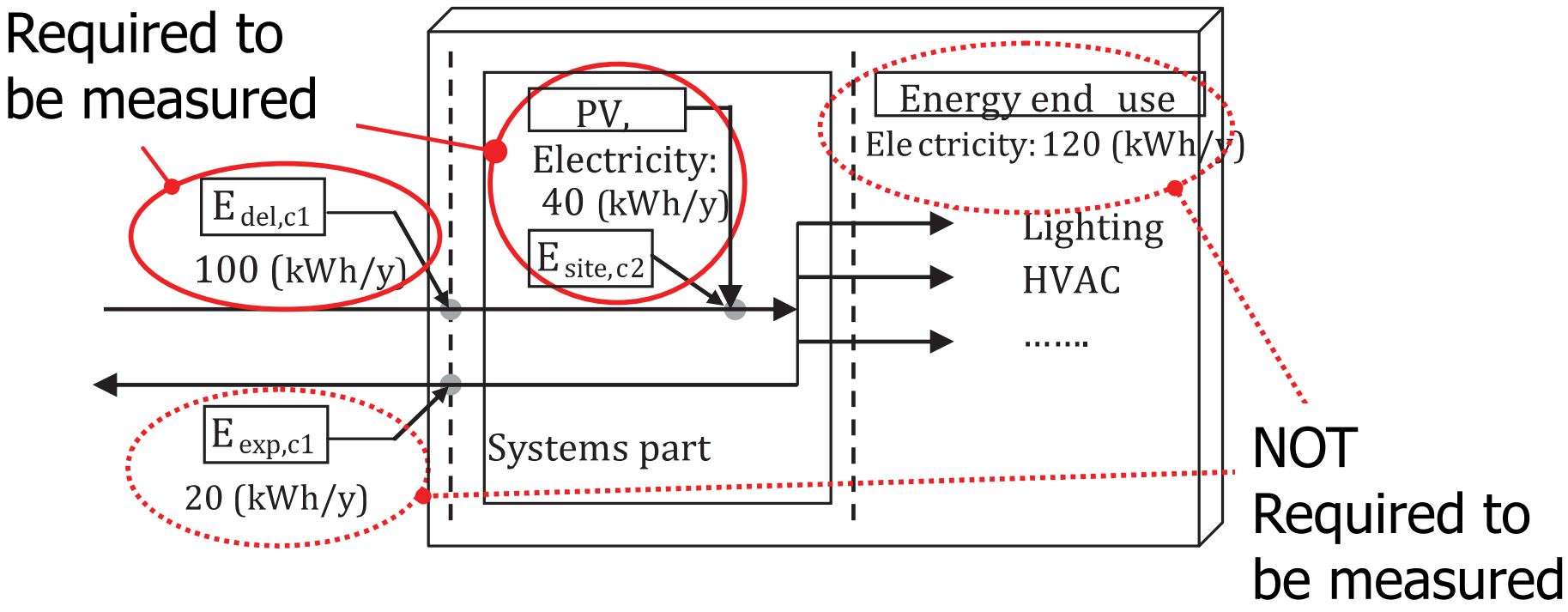
plus from user-related energy use

System boundaries of CM

ISO16745



System Boundary in case of using PV



Energy Carrier; c1 Electricity; c2 Electricity on site

List of energy end use included in CM1

	Energy consumption related service		Present in the building (a)	Included in the CM(b)	Separately metered(c)	Measured or Estimated(d)	Energy carrier(e)
1	Building-related energy use	Space heating					
2		Space cooling					
3		Air movement					
4		Domestic hot water					
5		Lighting for basic building function					
6		Auxiliary energy					
7		Indoor transportation					
8		Building auxiliary devices					

- Present in the building (a)
- Included in the CM(b)
- Separately metered(c)
- Measured or Estimated(d)
- Energy carrier(e)

- Space heating
- Space cooling
- Air movement
- Domestic hot water
- Lighting for basic building function
- Auxiliary energy
- Indoor transportation
- Building auxiliary devices

Equation to calculate CM

$$m \cdot co_{2eqv} = \sum \left(\left(E_{del,ci} \times K_{del,ci} \right) + \left(E_{site,ci} \times K_{site,ci} \right) \right)$$

m·co2eqv :CM

$E_{del,}$:the delivered energy for energy carrier del,ci;

$E_{site,ci}$:the energy produced onsite for the energy carrier site,ci;

$K_{del,c}$:the GHG emission coefficient for delivered energy carrier del,ci

$K_{site,ci}$:the GHG emission coefficient for on-site energy carrier *site,ci.*

GHG emission coefficient

- Nationally agreed data
- Independently provided information
- Internationally agreed data

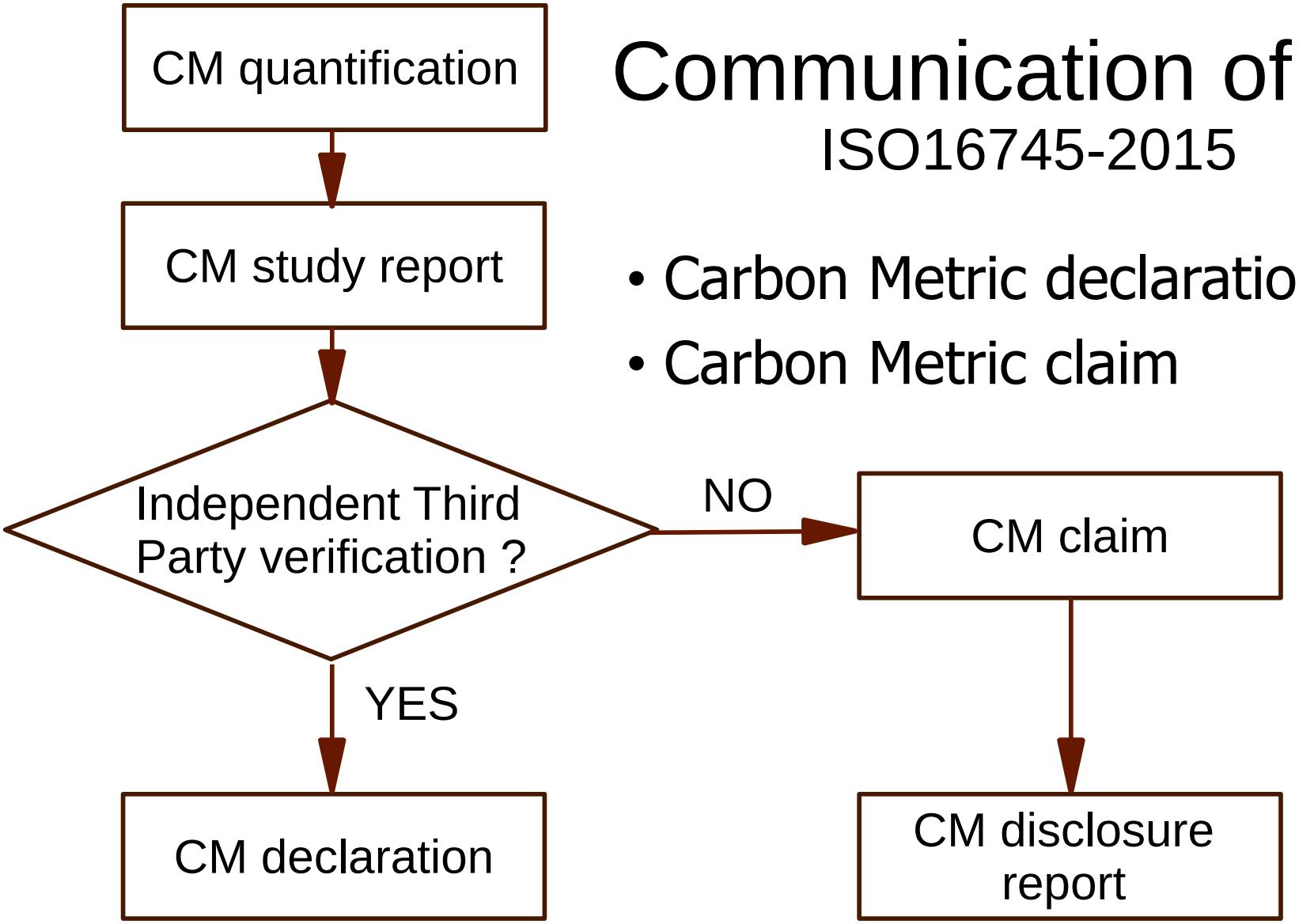
Reporting of CM

a. building identification
b. type of the carbon metric (e.g. CM1, CM2, or CM3)
c. value of the carbon metric(s),
d. value(s) of the carbon intensity(ies) determined,
e. purpose of the reporting,
f. reporting period
g. whether the CM has been normalized to average annualized conditions such as local climate
h. date of the evaluation
i. name of the organization or individual doing evaluation
j. client of the evaluation

etc.

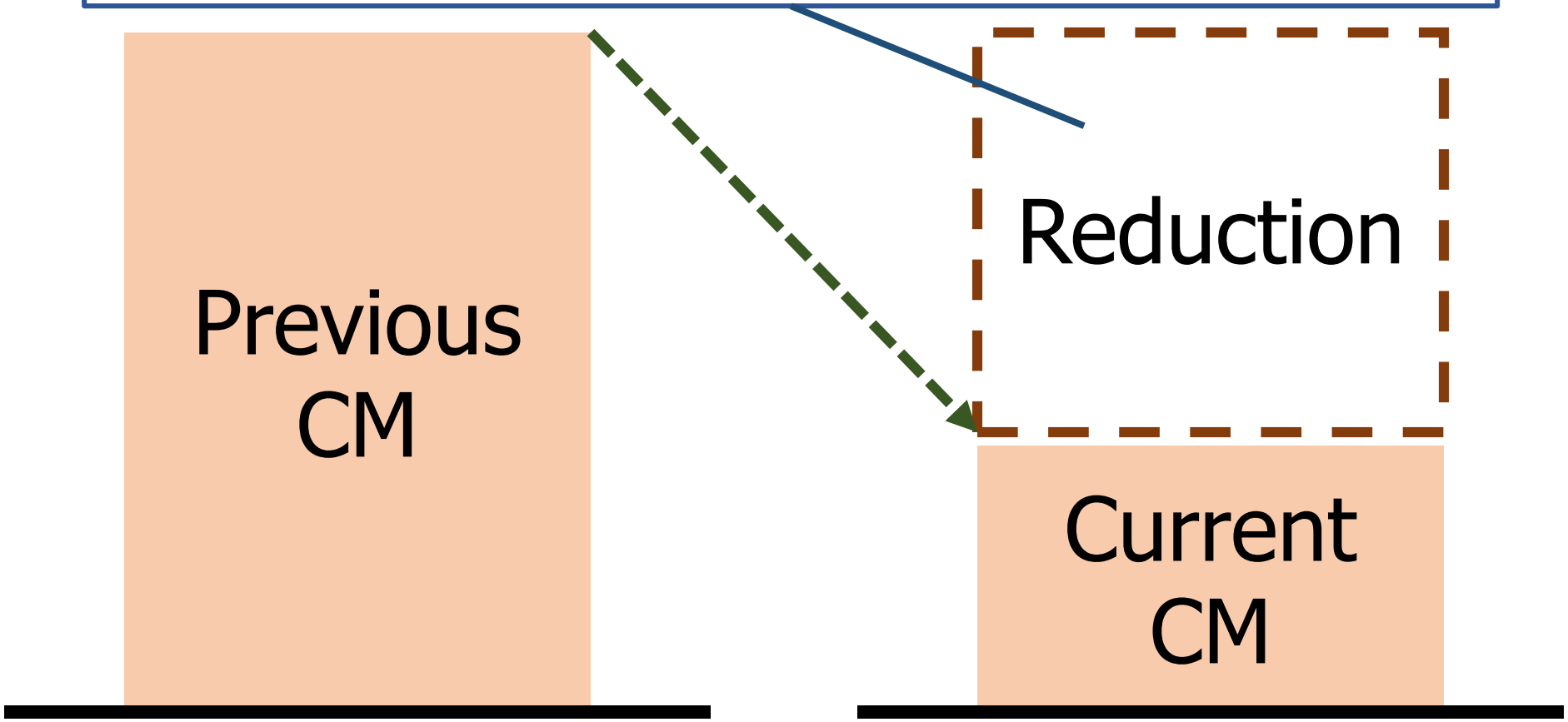
Communication of CM
ISO16745-2015

- Carbon Metric declaration
- Carbon Metric claim



How CM is used as an enabler for social innovation?

ISO 16745 provides Measurable, Reportable, Verifiable CM



MRV-able reference

- Measurable
- Reportable
- Verifiable

} MRV-able CM

Basis of social innovation for reduction of GHG emission

Possible Social Innovation by CM

- CDM in building sectors
  - Certified-Emission Reductions (CER) by MRV-able CM
  - Enables global scale cap-and-trade
- Green investment fund for building sector
  - Shortlisting of investment target by MRV-able CM
- Green Lease
  - Contract based on MRV-able CM

Concluding comments

MRV-able Carbon Metric (CM)

Reference for

- GHG emission based trading
- Contracts
- Policy implementation.

Innovation
through learning by using of CM

Thank you