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

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Why globally agreed method to measure, report, verify in a consistent and comparable way?
Possible policy/trading instruments for reduction of GHG emission

For example;
• Setting of national 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

Leftover allowance

Trade

Money

Building A

Building B
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.
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

**Required to be measured**

- $E_{del,c1}$: 100 (kWh/y)
- $E_{exp,c1}$: 20 (kWh/y)
- PV, Electricity: 40 (kWh/y)
- $E_{site,c2}$

**Energy Carrier:** c1 Electricity; c2 Electricity on site

**NOT Required to be measured**

- Energy end use
  - Electricity: 120 (kWh/y)
  - Lighting
  - HVAC
  - ........

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**Energy Carrier:** c1 Electricity; c2 Electricity on site
List of energy end use included in CM1

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

- 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

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

\( m \cdot co2eqv \) : CM

\( E_{del,ci} \) : the delivered energy for energy carrier del,ci;

\( E_{site,ci} \) : the energy produced onsite for the energy carrier site,ci;

\( K_{del,ci} \) : 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

CM quantification

CM study report

Independent Third Party verification?

NO

CM claim

YES

CM declaration

CM disclosure report
How CM is used as an enabler for social innovation?
ISO 16745 provides Measurable, Reportable, Verifiable CM

Previous CM

Reduction

Current CM
MRV-able reference

• Measurable
• Reportable
• Verifiable

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