The Institution of **StructuralEngineers**

Regulating embodied carbon

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www.istructe.org

Agenda



International agreement



National policies



Sub-national requirements



Project implications

IStruct Icons from the Noun project (Andrei Yushchenko, Tom Walsh, Vectors Point & Randomhero)





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International

Progress through revised contributions since the Paris Agreement



International Remaining emissions gap



IStruct Figure 9 from UNFCCC (2021) Nationally determined contributions under the Paris Agreement. Synthesis report by the secretariat



Longer term analysis

2100 WARMING PROJECTIONS

Emissions and expected warming based on pledges and current policies



Climate **Action**

Tracker



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United Nations Environment Programme (2020) 2020 Global Status Report for Buildings and Construction: Towards a Zero-emission, Efficient and Resilient Buildings and Construction Sector.



International Contribution of industrial materials



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IRP (2020) <u>Resource Efficiency and Climate Change: Material Efficiency Strategies for a Low-Carbon Future</u>. Hertwich, E., Lifset, R., Pauliuk, S., Heeren, N. A report of the International Resource Panel. United Nations Environment Programme.

International

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Moving from supply-side to demand-side policies



today: Scaling up demand for climate neutral basic materials and products.

rket

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National Old reviews of embodied carbon policies



Bionova (2018) The Embodied Carbon Review **IStruct**

FII (2017) Embodied carbon of buildings and infrastructure - international policy review

One Click



National Range of policy responses to embodied carbon

Approaches

- With quantification
 - Assessment plus disclosure (e.g. quantify whole life emissions & submit report)
 - Assessment plus qualitative statements (e.g. quantify whole life emissions & demonstrate design choices to achieve reductions)
 - Environmental performance-based requirements (e.g. building must be <1000 kgCO₂/m² to practical completion)
- ➢ Without quantification
 - Prescription of, or preference for, specific design options (e.g. timber first)
 - Implicitly targeted through related policy (e.g. retrofit first)

Policy instruments

- Public procurement
- > Planning
- Building regulations

Assessment

- Scale product vs building
 - Limits for certain materials (e.g. Buy Clean California)
 - Limits for buildings (e.g. Finland)
- Methodology
 - Singular methodology vs simplified + detailed method
 - Static vs dynamic life cycle assessment
 - Different boundaries, building elements & life cycle stages
 - Biogenic carbon, sequestration, footprints and handprints

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Location	Instrument	Policy owner	Brief description	Status
Netherlands	Bouwbesluit (Building Act) <u>2012</u> <u>Building Decree</u> + subsequent amendments	Ministerie van Binnenlandse Zaken en Koninkrijksrelaties (Ministry of the Interior and Kingdom Relations)	Mandatory Life Cycle Assessment (LCA) calculation using <u>national assessment method</u> , <u>database</u> and approved tools. The combined monetised impacts of 11 LCA impact categories are capped.	Reporting in force since 2013. Cap in place since Jan 2018.
Finland	Reform of the Land Use and Building Act	Ministry of the Environment	Assessment of building footprint and handprint in accordance with <u>national methodology</u> using <u>national</u> <u>database</u> will be required for building permit.	First limits to be introduced for public projects with limits for most buildings to be introduced by 2025
Sweden	New Act on climate declarations for new buildings is <u>under</u> <u>development</u>	Boverket (National Board of Housing, Building & Planning)	Will require a 'climate declaration' using common <u>database</u> and methodology with results deposited in a climate register for buildings. Limits will be introduced after an initial period of data gathering following a <u>proposed roadmap</u> .	Reporting requirements intended from 01/01/22. Limit values (and additional reporting modules) proposed from 2027 and subsequently ratcheted down.
France	RE2020 (Environmental Regulations 2020) + <u>decrees</u>	Ministry of Ecological Transition	Introduces whole life dynamic LCA requirements followed by limits. Supported by <u>national database</u> (with its own associated requirements driven by regulations).	Requirements relating to buildings for residential, office, primary and secondary education were <u>published in</u> <u>July 2021</u> and apply from 2022/23
Denmark	National Strategy for Sustainable Construction + building regulations	Ministry of Transport and Housing	Mandatory LCA calculation for new buildings, with impact limits for buildings over 1000m ²	Political agreement in March 2021 plans introduction from 2023. Overview in English here. Ratcheting down of limits proposed in 2025, 2027 and 2029.
EU	Level(s)	European Commission	Framework launched in October 2020 after 5 years of testing, including set of indicators intended to harmonise metrics and language on sustainability performance of buildings across the EU. Just starting process of integration into requirements.	EC has proposed green public procurement criteria using Level(s) for offices & schools from June 2022 and integrated Level(s) into the <u>EU</u> taxonomy for sustainable activities

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National Example – Finland

Policy development

- Roadmap in 2017 set out desire to take carbon footprint of buildings into account
- Methodology for the whole life carbon assessment of buildings developed in 2018/19
- Consultation, piloting & feedback phase
- Emissions database for construction launched in March 2021 (next update in Autumn)
- > Draft regulation on the climate assessment of buildings consulted on in April-August 2021 with updated methodology
- > Requirements will form part of the ongoing Reform of the Land Use and Building Act
- Aim to introduce <u>limit values</u> by use category by 2025
- Supports national goal of carbon neutrality by 2035





Proposed amendment to UK building regulations – Part Z



Requirement

Limits on application:

PART Z WHOLE LIFE CARBON

Carbon assessment

Z1. Whole life carbon emissions shall be assessed and reported for the building and any other parts of the project where Building Regulations apply.

Carbon efficiency

Z2. Reasonable provision shall be made for the minimisation of whole life carbon emissions by.

- (a) Minimising upfront embodied carbon; and
- (b) Where an item provides whole life carbon benefit, this is taken into account.

Requirements Z1 and Z2 only apply to projects with a gross internal area of more than [1000]m2, or that create more than [10no.] dwellings.

Requirement Z1 will apply to buildings other than dwellings from [1 January 2023], and dwellings from [1 January 2025].

Requirement Z2 will apply to all buildings from [1 January 2027].



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Developers

<u>Landsec</u> <u>Stanhope PLC</u> <u>Urban Splash</u> Grosvenor Great Britain & Ireland

Architecture

Allies & Morrison Bennetts Associates dRMM Architects Feilden Clegg Bradley Studios Hawkins\Brown Haworth Tompkins Hopkins Architects Levitt Bernstein Perkins & Will tp bennett LLP Waugh Thistleton Architects White Arkitekter

Membership & Trade Bodies

<u>The Chartered Institution of Building Services Engineers</u> (CIBSE) <u>The Institution of Civil Engineers</u> (ICE) <u>The Institution of Structural Engineers</u> (IStructE) <u>The London Energy Transformation Initiative</u> (LETI) <u>The Royal Institute of British Architects</u> (RIBA) <u>UK Green Building Council</u> (UKGBC) <u>The Steel Construction Institute</u> (SCI) The Structural Timber Association (STA)

Engineering

<u>Construction</u> <u>Baily Garner</u> <u>BakerHicks</u> <u>BAM Construct UK</u> <u>Laing O'Rourke</u> <u>Morgan Sindall Group</u> <u>Multiplex Europe</u> <u>Willmott Dixon</u>

<u>AESG</u> <u>Arup</u> <u>Atkins Limited</u> <u>Buro Happold</u> <u>Cundall</u> <u>Max Fordham LLP</u> <u>Mott Macdonald</u> <u>Thornton Tomasetti</u> <u>WSP-UK</u>



"Stanhope fully supports the principle of <u>regulating</u> upfront embodied carbon in construction. The impact of these emissions arising from global supply chains cannot be overstated in the critical decade of climate action ahead"

"**BAM** are fully supportive of the proposal to <u>regulate</u> <u>the measurement and limiting of embodied carbon</u> via an addition to the building regulations"

"Atkins support the principle of <u>regulating embodied</u> <u>carbo</u>n in the construction industry. As designers, it is imperative that we are limiting embodied carbon emissions for all building projects."



National

Example policy responses in United States – Buy Clean

Location	Instrument	Materials included	Description	Status
California	Buy Clean California Act	 Carbon steel rebar Flat glass Mineral wool board insulation Structural steel 	Public works undertaken by state agencies must submit Environmental Product Declarations (EPD) demonstrating compliance against Global Warming Potential (GWP) limits determined by the Department of General Services.	Bill passed in 2017. <u>June 2021</u> <u>amendment</u> delayed introduction into 2022. Limits will be revised in 2025 and every 3 years thereafter.
Colorado	<u>HB21-1303</u> <u>Global Warming</u> <u>Potential For Public</u> <u>Project Materials</u>	 asphalt and asphalt mixtures; cement and concrete mixtures; glass; post-tension steel; reinforcing steel; structural steel; and wood structural elements 	The office of the state architect and the department of transportation are each required to establish policies regarding the global warming potential for specific categories of eligible materials used to construct certain public projects. The limits are to be based on the industry average for each material.	Bill signed in June 2021. Limits come into effect from 01/01/24. Limits will be reviewed in 2026 and every 4 years thereafter (with a slightly different timeline for transportation projects).
Federal	<u>CLEAN Future Act</u> (Title V Subtitle C Sec 521- 524)	 aluminium; iron; steel; concrete; cement; and if deemed "appropriate" by the Administrator (i) flat glass; (ii) insulation; (iii) unit masonry; and (iv) wood products 	As proposed, public works undertaken by federal agencies must submit EPD demonstrating compliance against GWP limits	Bill introduced to house 03/02/21 and referred to house committees. Would come into force 1 year after enactment with a 3 year review cycle.

7 other states have introduced other variations (some material-specific or focused at smaller scales e.g. county or city). See the University of Washington's Carbon Leadership Forum <u>policy toolkit</u> for an overview.

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Sub-national Local policies



WITH SUPPORT FROM



Ympåristöministeriö Miljöministeriet Ministry of the Environm Helsinki CITY OF TAMPERE

Number of policies and actions adopted over the years



Uptake based on C40 Clean Construction Policy Explorer



Sub-national Example – London Policy SI 2

F Development proposals referable to the Mayor should calculate whole lifecycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.

Three stage process

- 1. Pre-application
- 2. Stage 1 submission (i.e. RIBA Stage 2/3)
- 3. Post-construction

Results submitted using common template





Project implications What does it mean for you?

Plan for tougher national mitigation targets

- > Embodied carbon regulations are coming, get prepared
- > Get in front of regulations or play an active role in shaping them
- > Learn from what's happening elsewhere and ask your institution to support you in this





International

Ballpark calculation – construction alone could blow the 1.5°C budget!

1 2 3 X 1600 360 368 > 230 $bn m^2$ $kgCO_2e/m^2$ GtCO₂e GtCO₂e

¹ IEA projection of additional floor area to 2050. **IStruct**

² G-rated residential building from LETI Embodied Carbon Target Alignment

³ IPCC AR6 WG1 (2021) budget for 66% chance of avoiding more than 1.5C of warming

Thank you

Email jannik.giesekam@strath.ac.uk with any questions

