How to walk before you run

IStructE's embodied carbon calculation principles for structural engineers

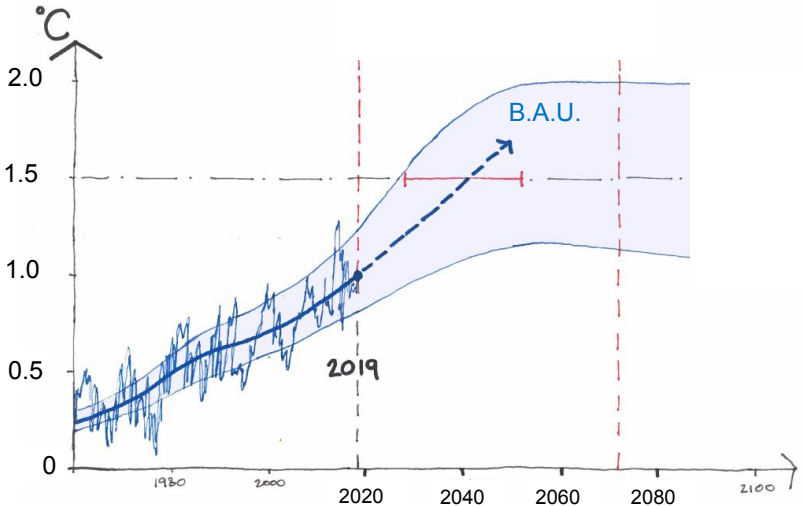
Orlando Gibbons

Structural Engineer, Arup

IStructE Sustainability Panel member

IStructE

Climate & biodiversity emergency



Special Report on Global Warming of 1.5ºC, IPCC, 2018

GHG emissions pathway to keep within 1.5ºC:

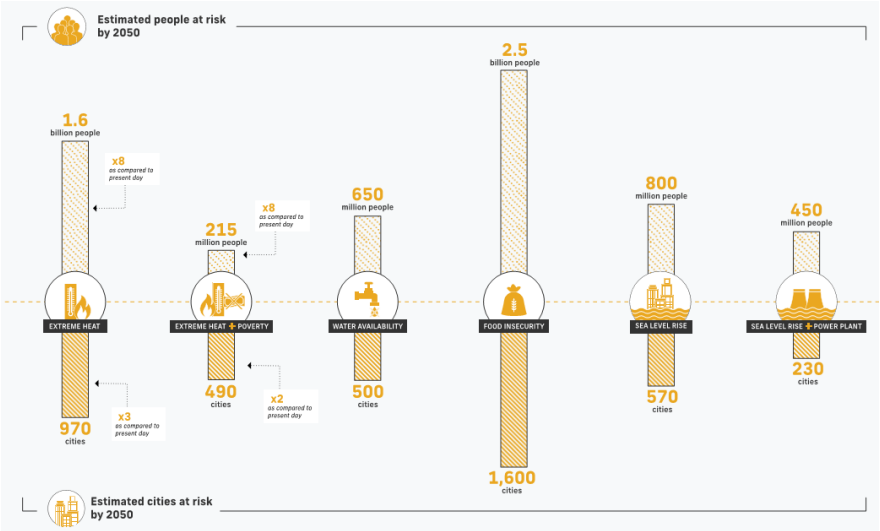
-45% by 2030

↓

Net zero by 2050

IStructE

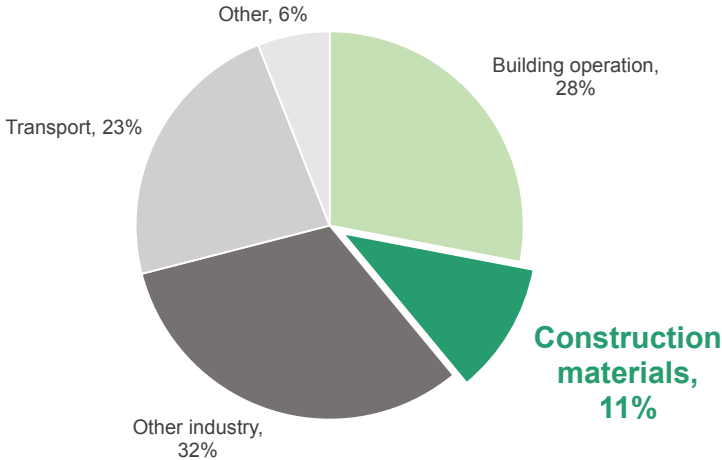
…and a humanitarian emergency



'The future of Urban Consumption in a 1.5ºC world', C40 Cities, Arup, University of Leeds

IStructE

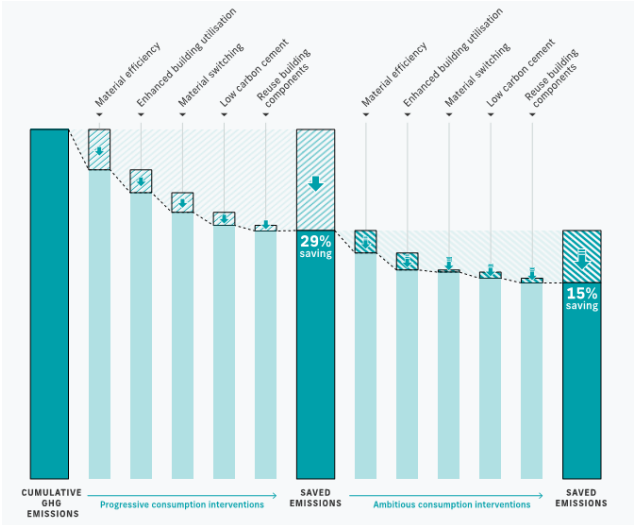
Global emissions (2017)



2018 Global Status Report, Global Alliance for Buildings and Construction, IEA

IStructE

There are opportunities…



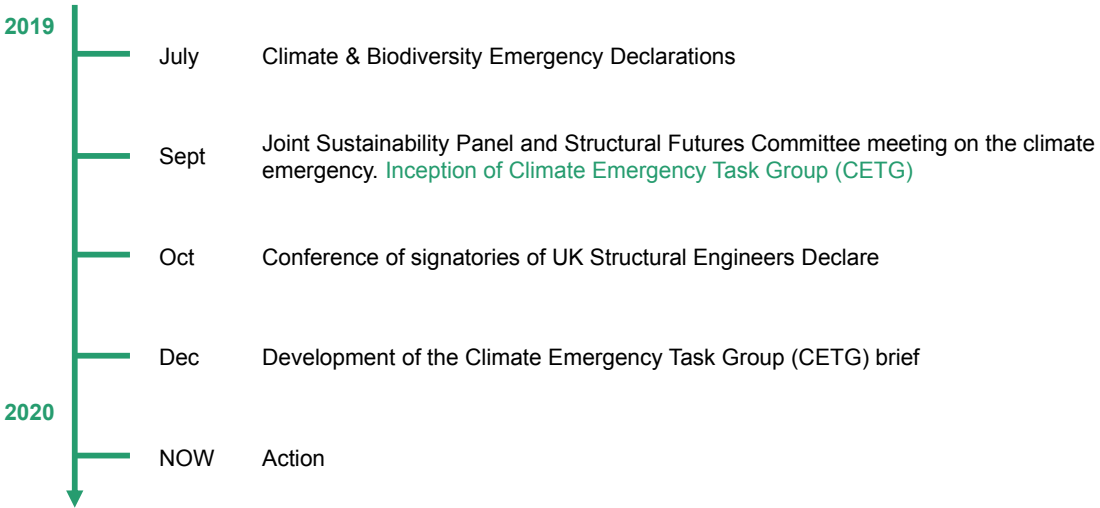
'The future of Urban Consumption in a 1.5ºC world', C40 Cities, Arup, University of Leeds

IStructE

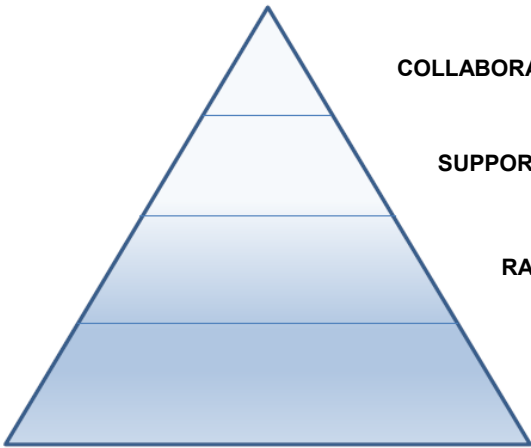
UK Structural Engineers Declare Climate & Biodiversity Emergency

As of 26 Feb 2020:

155 signatories


2019
July
Climate & Biodiversity Emergency Declarations
Sept
Joint Sustainability Panel and Structural Futures Committee meeting on the climate emergency. Inception of Climate Emergency Task Group (CETG)
Oct
Conference of signatories of UK Structural Engineers Declare
Dec
Development of the Climate Emergency Task Group (CETG) brief
2020
NOW
Action

Climate Emergency Task Group (CETG) Action priorities



COLLABORATE & INFLUENCE

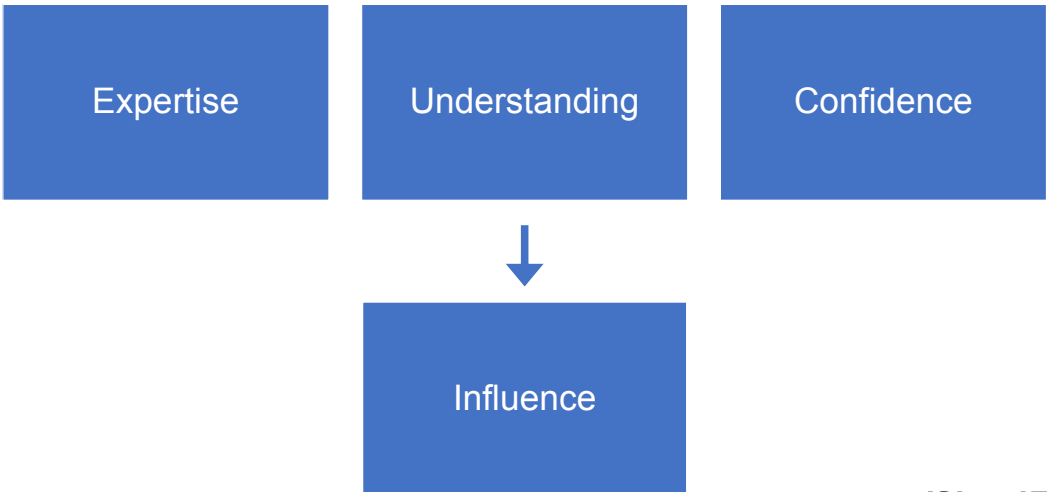
SUPPORT & CONNECT-UP THE PROFESSION

RAISE STANDARDS: Inform, guide, publicise

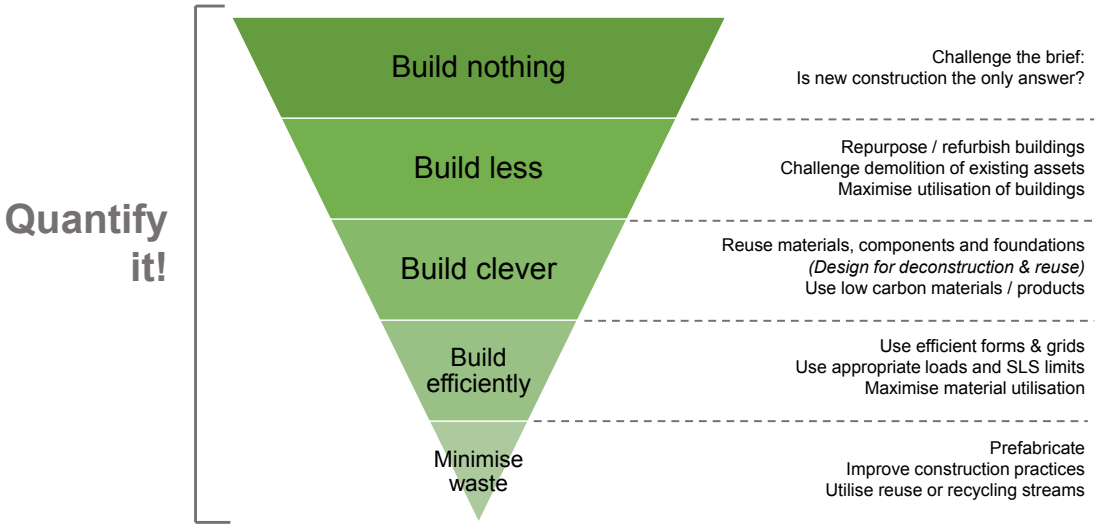
SET STANDARDS: Education, awards & membership

IStructE

Outcomes for engineers



All projects are unique



IStructE

UK Structural Engineers Declare Climate & Biodiversity Emergency

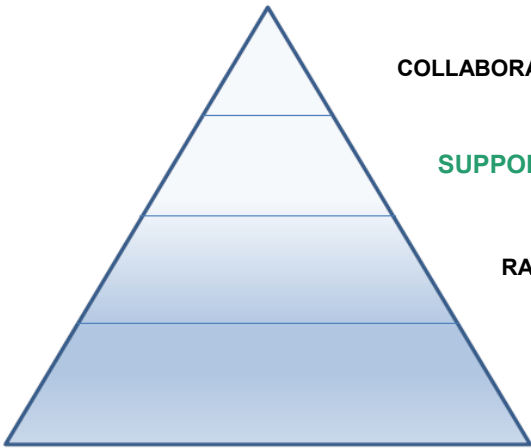
—— Evaluate all new projects against the aspiration to contribute positively to mitigating climate breakdown, and encourage our clients to adopt this approach.

—— Include life cycle costing, whole life carbon modelling and post occupancy evaluation as part of the basic scope of work, to reduce both embodied and operational resource use.

—— Accelerate the shift to low embodied carbon materials in all our work.

—— Minimise wasteful use of resources in our structural engineering design, both in quantum and in detail.

Embodied carbon calculation guidance



COLLABORATE & INFLUENCE

SUPPORT & CONNECT-UP THE PROFESSION

RAISE STANDARDS: Inform, guide, publicise

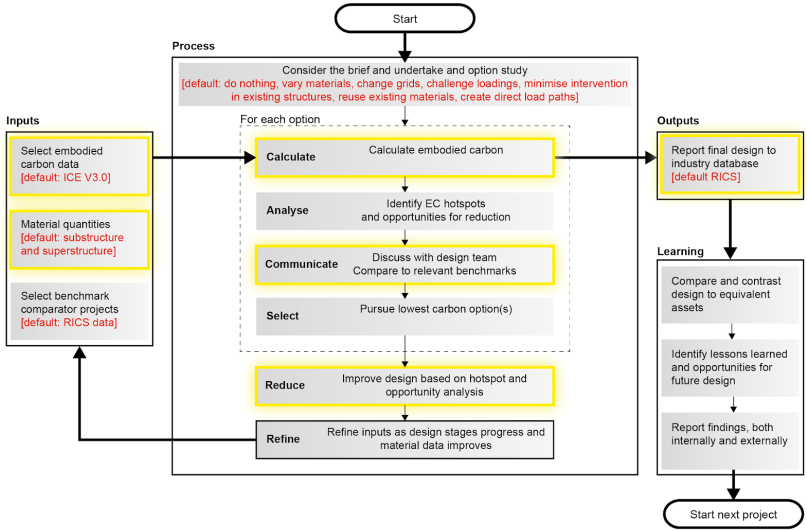
SET STANDARDS: Education, awards & membership

IStructE

The need for it

- People calculate embodied carbon in different ways. Variations in:
  - LCA scope (A1-A3, A1-A5, A-C)
  - Building elements scope
  - Reporting requirements
- Minimise misleading information
- Improve membership capability
  - SMEs may rely on the IStructE guidance
- There are contentious issues – can create barriers to calculation
- Advocate a response to the climate emergency
- Reinforce/expose RICS guidance to the membership
- Update to existing IStructE guidance

What will it do?



Credit: Dr John Orr, University of Cambridge

IStructE

What will it do?

- Provide a common set of embodied carbon calculation principles
  - Equations
  - Minimum scope of assessment
- Suggest carbon factors (ICE v3.0)
- Advise on contentious issues
- Focus on UK (but signpost to info for other countries)
- Standard everyday reporting protocol
- Easy-reading: concise & diagrammatic
- Reference key information from other existing guidance
  - RICS ‘Whole life carbon assessment for the built environment’
  - BS EN 15978
- It won’t replicate other publications, e.g. LETI

Key principles

- **There is an immediate need to dramatically cut all carbon emissions. Our ambition must be to reduce the whole life carbon of all assets to zero. Be a strong advocate of this.**
- We must calculate the embodied carbon of every project, at all design stages.
- Integrate embodied carbon calculations into the design process as early as possible. Use it as a key metric and communicate it to the design team.
- Do not let uncertainty of carbon factors or quantities stop you.
- When reporting embodied carbon, clearly state key assumptions and the scope of calculation.

Key principles

- Minimum scope: cradle to practical completion emissions (A1-5)
- Minimising A1-5 emissions should take priority over stages B (in-use) and C (end of life) (for structural engineers)
- Report benefits from reuse, recovery and recycling of materials after the life of the building (stage D), if calculated, separately
- Report final design and construction embodied carbon values to a freely accessible industry database (RICS database)
- Calculate in accordance with BS EN 15978 (2011) and '*Whole life carbon assessment for the built environment*' (RICS, 2017)

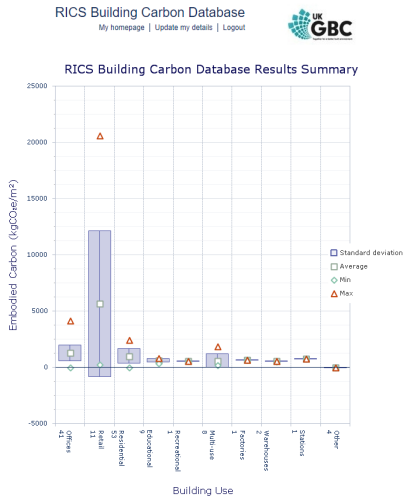
Contentious issues

- Carbon storage in timber
  - Report alongside A1-5, not within it
  - Report within A-C
- Steel carbon factors
  - Production method & recycling rate has an impact
  - Recommended way to find the most accurate value (or present a range)
- Areas
  - Roof/terrace areas on top of GIA: ‘GIA + R’?
- Which tool do I use?
  - Signpost to tools
  - Highlight scope

RICS (previously WRAP) database improvements

- Registration
- Anonymising data entries
- Categorisation of refurbishment projects
- Search function
- Presentation of data
- Fix bugs

- It needs to be used to justify RICS investment in it
- Any suggestions?
- Do we need a bigger cross-industry effort to improve it?



IStructE

Thank you for listening

- Send us your case studies!
- IStructE climate emergency conference in July – watch this space…

Orlando Gibbons

Orlando.gibbons@arup.com