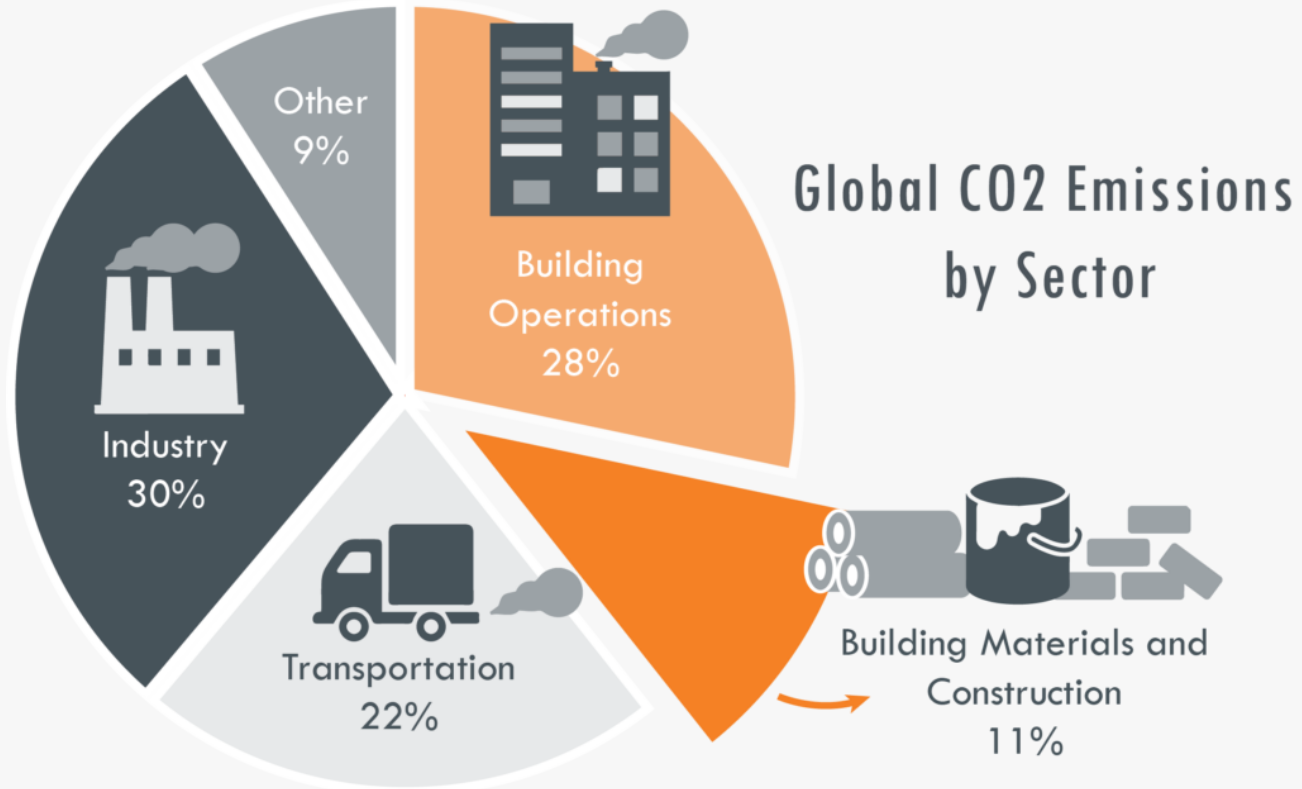


jump into STEM

Curb Your Carbon: Decarbonizing U.S. Buildings

Ryan Meyer, Ph.D

Motivation



- Globally, buildings account for more carbon emissions than any other sector
- CO₂ accounts for 75% of global GHGs

Source: vca-arch.com/wp-content/uploads/2021/04/VC-Blog-Graphics-Apr-21-Carbon-Emissions-PLZ-WORK-e1618599824939.png

Motivation

Understanding Carbon

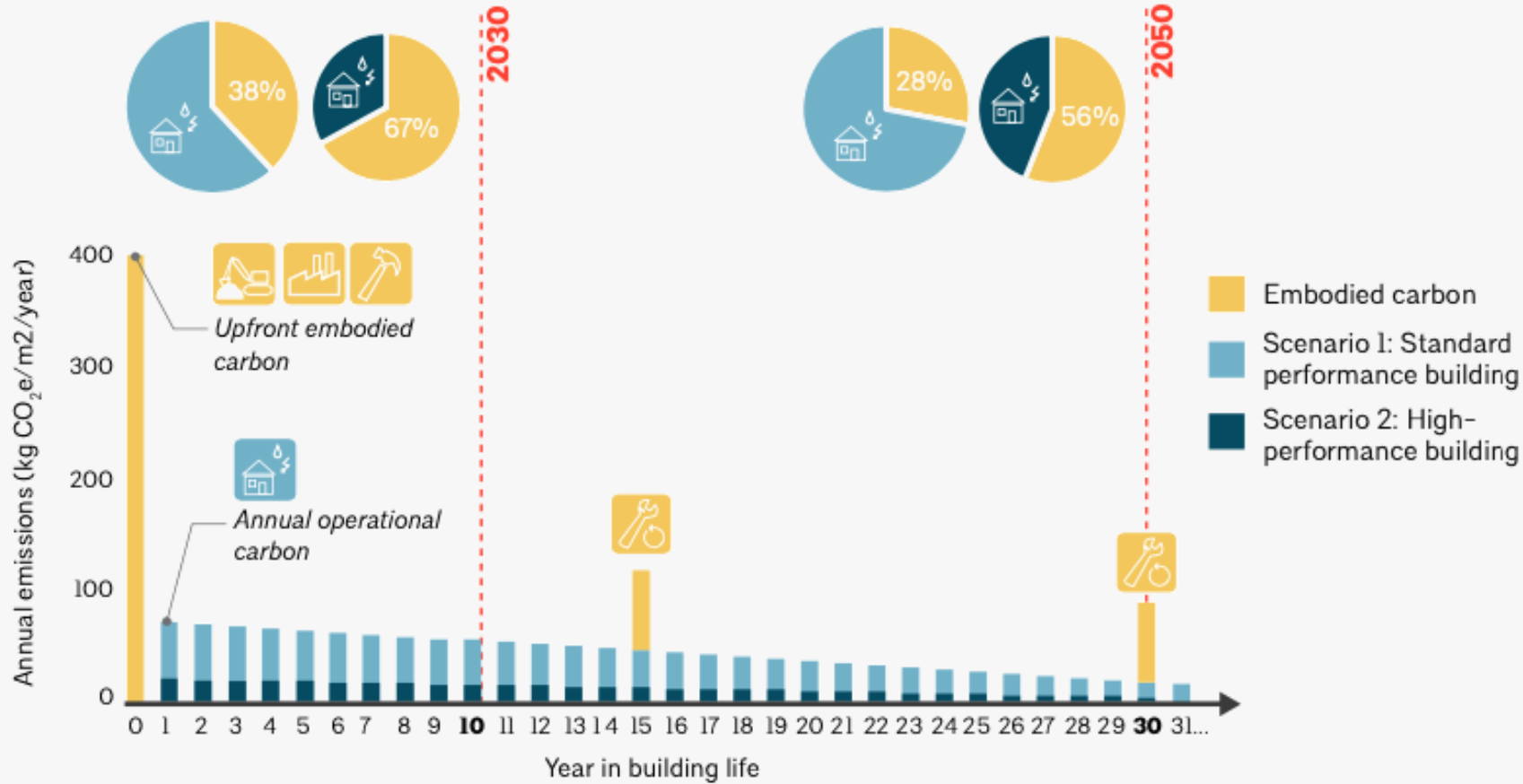


SKANSKA

Source: www.buildingwithchemistry.org/wp-content/uploads/2020/11/understanding-carbon.jpg

- Two primary forms of carbon emissions in buildings
 - Operational
 - Embodied

Motivation



Source: carbonleadershipforum.org/toolkit-1-introduction/

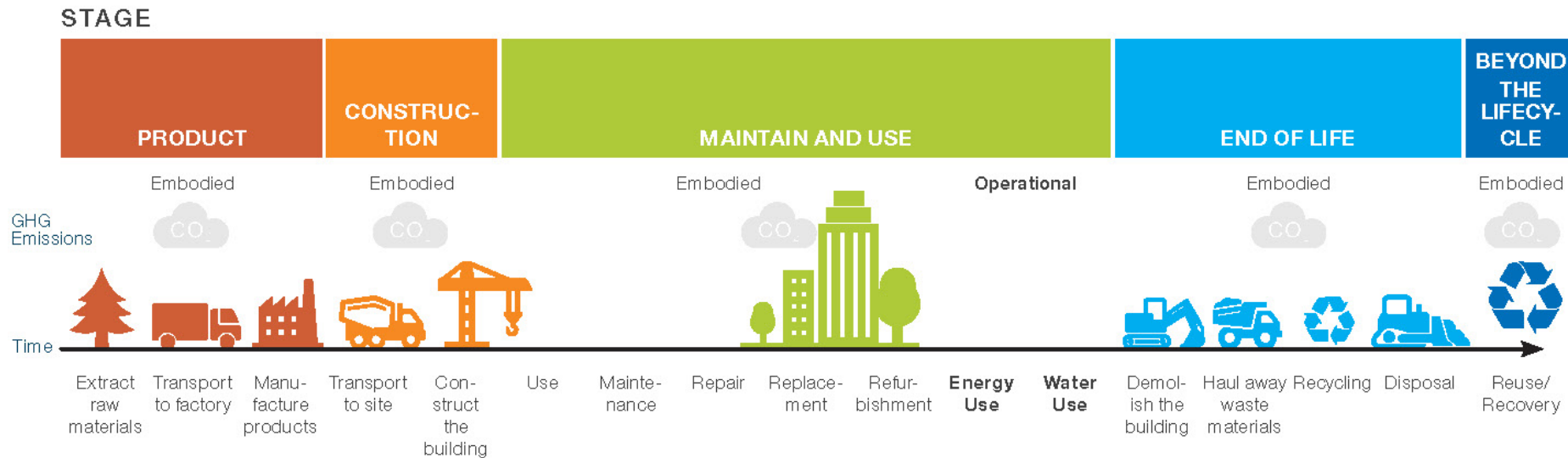
Motivation

Buildings will play an integral role in reducing carbon emissions, significantly contributing to our long-term goal of a carbon pollution-free society.

What Can We Do?

There are multiple pathways to reducing carbon emissions from buildings, both operational and embodied. Let's look at a few examples.

Embodied Carbon



Source: newbuildings.org/wp-content/uploads/2022/02/MicrosoftTeams-image-14.png

- Renovate and reuse
- Repurpose materials

- Low carbon materials
- Locally sourced materials

Carbon Capture/Sequestration



Source:
media.stylus.com/global/processedimages/2018/january/_cf_2018/made_of_air/screen_shot_2018-01-26_at_08.54.43_--_w_760_.jpg

Source:
assets.rbl.ms/25590855/origin.jpg

Source:
www.universityofcalifornia.edu/sites/default/files/co2ncrete-block.jpg



Operational Carbon

- Energy Efficiency
 - Use less = emit less
- Electrification
 - Use electricity, which is shifting towards carbon-free
 - Burning fossil fuels will never be carbon-free



Source: cdn.netzerocarbondguide.co.uk/uploads/_featured/1859/3-What-is-net-zero-x2000-long-edge.jpg?v=1611141500

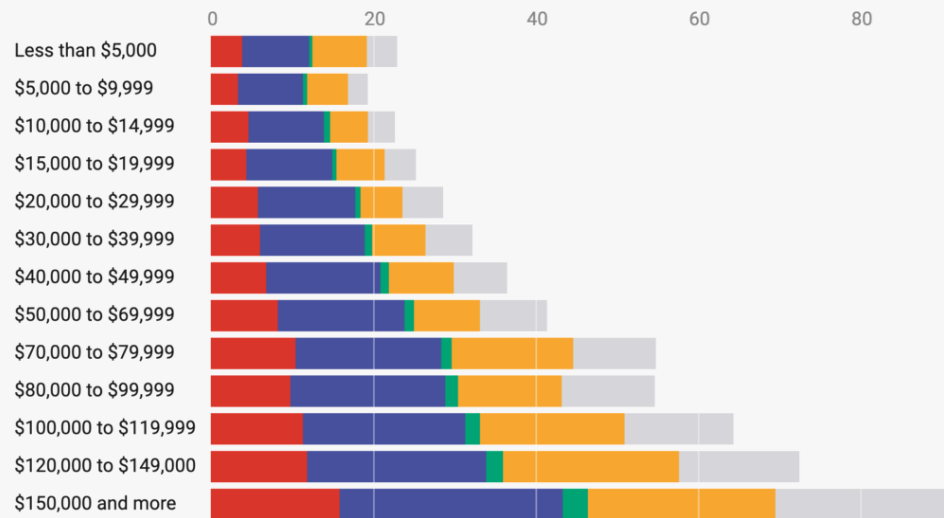
We All Do Not Consume Carbon the Same

Household carbon footprint, by income level

The more money a household has, the more average tons of carbon dioxide equivalent it emits per year.

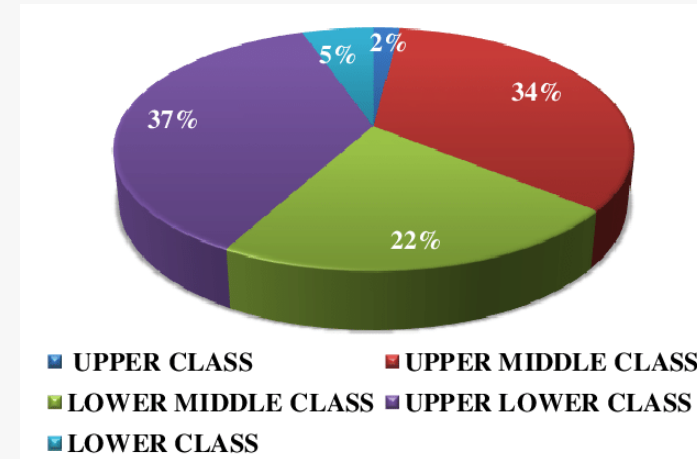
Tons of CO2 equivalent per household:

Food Housing Clothing Transportation Services



Source: d3i6fh83elv35t.cloudfront.net/static/2019/09/Screenshot-2019-09-21-at-12.43.13-PM-1024x822.png

- Socioeconomic status influences carbon emissions



Source: researchgate.net/profile/Abhinav-Jain-20/publication/341656365/figure/fig2/AS:895643455348738@1590549448607/Distribution-based-on-socio-economic-class-of-the-patient-Upper-lower-class-and-upper.png

The Challenge

This challenge asks students to develop an innovative solution that will reduce carbon emissions in buildings. Students can focus on any aspect related to carbon emissions – including operational, embodied, capture and sequestration.

Additional Resources



Embodied Carbon Resources

- <https://www.aia.org/articles/70446-ten-steps-to-reducing-embodied-carbon>
- <https://carbonleadershipforum.org/toolkit-1-introduction/>

Policy Resources

- <https://www.whitehouse.gov/briefing-room/statements-releases/2021/12/08/fact-sheet-president-biden-signs-executive-order-catalyzing-americas-clean-energy-economy-through-federal-sustainability/>

Socioeconomic Status and Carbon Resources

- <https://www.nature.com/articles/s41560-021-00900-y>
- <https://www.sciencedirect.com/science/article/pii/S0921800913000980>

Additional Resources



Energy Resources

- <https://www.eia.gov>

Energy Justice Resources

- <https://iejusa.org>
- <https://www.energy.gov/promoting-energy-justice>

Market Transformation Resources

- <https://www.energy.gov/eere/fuelcells/market-transformation>
- <https://guidehouse.com/insights/energy/2019/what-makes-market-transformation-successful>
- <https://www.aceee.org/research-report/u1715>

Thank You

www.jumpintostem.org