CLIMATE EMERGENCY!
Today, global building floor area is about 223 billion m²

Source: Global Status Report, GABC
By 2060, global building floor area will increase by 230 billion m$^2$ or double the current worldwide building stock.

About 40% of this construction is expected to take place over the next 15 years.

Source: Global Status Report, GABC
Peak CO$_2$ emissions by 2020, reduce emissions about 50% by 2030, and reach ZERO emissions by 2050.
Existing Building Floor Area (2015, Billion m²)

Source: Architecture 2030 Global ABC, Global Status Report 2016
Projected Building Floor Area Growth 2016 to 2030 (Billion m²)

Source: Global ABC, Global Status Report 2016
Projected Building Floor Area Growth 2030 to 2050 (Billion m$^2$)

Source: Global ABC, Global Status Report 2016
Building Energy Codes

Source: Architecture 2030, Adapted from IEA – Tracking Clean Energy Progress 2017
CALIFORNIA ELECTRICITY CONSUMPTION (Non-Res Buildings)

Source: California Energy Commission
U.S. Building Sector Operations Energy Consumption

Source: Architecture 2030, U.S. Energy Information Administration, Annual Energy Outlook
Introducing the ZERO Code standard for new commercial, institutional, and mid- to high-rise residential buildings.
In 2007 the CPUC ordered the development of a Strategic Plan.

2008 – CPUC adopted California’s Long Term Energy Efficiency Strategic Plan

**Residential** energy use will be transformed to ultra-high levels of energy efficiency resulting in Zero Net Energy new buildings by 2020

**Commercial** buildings will be put on a path to Zero Net Energy by 2030 for all new and a substantial proportion of existing buildings.
In 2009 the CPUC presented the Strategic Plan in Europe.

Investing in Energy Efficiency:
Experience from California

Managing Energy Demand – Bern ’09
November 4, 2009

Julie A. Fitch
Director, Energy Division
California Public Utilities Commission
In 2010 the EU issued Directive 2010/31/EU.

New public buildings **NZEB** Dec. 31 **2018**
All new buildings **NZEB** by Dec. 31, **2020**

**NZEB** (Nearly Zero Energy Building)
Very high energy performance building with energy produced by renewable sources on-site or nearby.
In 2018 we went to Beijing to present the ZERO Code.
What happens in CALIFORNIA goes GLOBAL!
Governor’s Executive Order:
Climate Emergency – statewide adoption of the ZERO Code, effective January 1, 2021
Design an energy efficient building
Efficiency Standard: ASHRAE 90.1-2016 minimum;
Title 24 2019
Efficient building envelope / daylighting
Passive heating / cooling / ventilation
Efficient systems / equipment / controls

Address the remaining building’s energy needs with:
- on-site renewable energy
- and/or off-site renewable energy
- wind • solar • hydro
(other non-CO₂ emitting sources)

Source: Architecture 2030
Graphic adaptations: Sefaira; DOE
Meeting the ZERO CODE™

Prescriptive Path
Requirements for minimum building energy efficiency
- BUILDING ENVELOPE
- HVAC
- LIGHTING
- OTHER EQUIPMENT

Performance Path
Modeled energy performance meets or exceeds the minimum building energy efficiency requirements

MODELING
- CBEEC–Com EnergyPlus
- EnergyPro
- IES VE
Meeting the ZERO CODE™

Prescriptive Path
Requirements for minimum building energy efficiency
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Performance Path
Modeled energy performance meets or exceeds the minimum building energy efficiency requirements

TITLE 24 2019 / ASHRAE 90.1 2016

ZERO Code:
Creates a robust and predictable market for renewable energy.
Global CO$_2$ Emissions by Sector

- Building Operations: 28%
- Industry: 32%
  (incl. building finishes, equipment, and infrastructure)
- Transportation: 23%
- Building Materials & Construction: 11%
- Other: 6%

Source: 2018 Global ABC Report
Global CO$_2$ Emissions by Sector

- Building Operations: 28%
- Transportation: 23%
- Industry: 21.8%
- Concrete, Steel & Aluminum: 21.2%
- Other: 6%

Source: 2018 Global ABC Report; IEA
Building structure and sub-structure represent about 55% of a commercial building’s embodied carbon footprint.

Building enclosure and construction represent about 33% of a commercial building’s embodied carbon footprint.

Source: De Wolf, et.al; Structural Material Quantities And Embodied Carbon Coefficients: Challenges And Opportunities, April 2014.
Survey
Most Responsible for Embodied Carbon Reductions

Source: Giesekam et al., Construction Sector Views on Low Carbon Building Materials, 2015
THE 2030 CHALLENGE FOR EMBODIED CARBON
Buildings and Infrastructure

- TODAY: 35%
- 2020: 40%
- 2025: 45%
- 2030: 50%
- 2050: ZERO EMBODIED CARBON

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