CLIMATE EMERGENCY!

Edward Mazria
Architecture 2030
New Buildings

Existing Buildings

Materials, Construction & Infrastructure
Today, global building floor area is about 223 billion m$^2$.
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 CO₂ emissions by 2020, reduce emissions about 50% by 2030, and reach ZERO emissions by 2050.
Global Temperature Projections for various RCP Scenarios

- **RCP2.6 (1.5°C)**
  - 0.53 trillion tons carbon
  - zero CO₂ emissions ~2050
- **RCP4.5**
  - emissions peak 2040-50
  - 1.3 trillion tons carbon
- **RCP6.0**
  - emissions peak 2080
  - 1.6 trillion tons carbon
- **RCP8.5**
  - Business-as-usual
  - 2.2 trillion tons carbon

Source: Architecture 2030; Adapted from IPCC Fifth Assessment Report, 2013

Representative Concentration Pathways (RCP), temperature projections for SRES scenarios and the RCPs.
Global GHG Emissions Under Different Scenarios

Source: UNEP Emissions Gap Report 2018

- **Current Commitments**
  - To reach < 1.5°C by 2100
  - 24 GtCO$_2$e (range 22 - 30)
  - ~50%

- 2018: 53.5 GtCO$_2$e

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**Note:** The diagram visualizes global greenhouse gas emissions under different scenarios, illustrating the commitment to achieving a temperature rise of less than 1.5°C by 2100. The current emissions are shown as a baseline, with the target emissions indicated for a significant reduction.
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 m²)

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

Source: Architecture 2030, Adapted from IEA – Tracking Clean Energy Progress 2017
Introducing the ZERO Code standard for new commercial, institutional, and mid- to high-rise residential buildings.
Global CO$_2$ Emissions by Sector

- **Transportation**: 23%
- **Industry**: 21.8%
  - (incl. building finishes, glass, equipment, and plastics, rubber, paper, other)
- **Concrete, Steel & Aluminum**: 21.2%
  - (incl. building structure, substructure, infrastructure, auto, other)
- **Building Operations**: 28%
- **Other**: 6%

Source: 2018 Global ABC Report; IEA
2.7% of NYC’s buildings (> 50k sf) produce 48% of building sector GHG emissions
2.8% of Seattle buildings are >20k sf, and they produce 45% of building sector GHG emissions.
Less than 1% of Long Beach buildings (> 10k sf) produce 40% of building sector GHG emissions
San Francisco, CA
Los Angeles
PORTLAND, OR
Building Stock

Building Types
(Floor Area)

40%
COMMERCIAL
272.6 Mft

40%
SINGLE FAMILY
276.4 Mft

20%
MULTIFAMILY
140.7 Mft

Building Type by Size and Floor Area

<table>
<thead>
<tr>
<th>Size</th>
<th>Commercial</th>
<th>Multifamily</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-20k ft²</td>
<td>40%</td>
<td>20%</td>
</tr>
<tr>
<td>20-200k+ ft²</td>
<td>60%</td>
<td>80%</td>
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<table>
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<tr>
<th>Floor Area</th>
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<tr>
<td>185,902</td>
</tr>
<tr>
<td>3,529</td>
</tr>
<tr>
<td>590</td>
</tr>
<tr>
<td>236</td>
</tr>
<tr>
<td>381</td>
</tr>
<tr>
<td>282</td>
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PORTLAND, OR
Building Stock

COMMERCIAL
272.6 Mft

SINGLE FAMILY
276.4 Mft

MULTIFAMILY
140.7 Mft
PORTLAND, OR
Building Stock

Buildings by Size
(Number)

Big Buildings
1.9%
Over 20k ft²
3,529 Buildings

Small Buildings
98.1%
Under 20k ft²
185,902 Buildings

Building Type by Size, Floor Area and Number of Buildings

1.9% (Big Buildings) of the total number of buildings in Portland, or 3,529 buildings, are greater than 20,000 ft² and contain

41% of the total building floor area.

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PORTLAND, OR
Building Stock
PORTLAND, OR
Building Stock

Buildings by Size
(Number)

Big Buildings
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3,529 Buildings

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98.1%
Under 20k ft²
185,902 Buildings

Building Type by Size / Number
(Energy Consumption)

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Trillion Btu/yr

Commercial

Multifamily
PORTLAND, OR
Building Stock

Buildings by Size
(Number)

Big Buildings
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3,529 Buildings

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Building Types by Size / Number
(GHG Emissions)

1.9% (Big Buildings)
of the total number of buildings in Portland are greater than 20,000 ft² and are responsible for

50.2%
of total citywide building sector GHG emissions.
Policies for Existing Buildings

**Big Buildings Policy**
- Require energy upgrade by 2030 (efficiency, renewables, and/or electrification)
- Require zero emissions by 2050

**Small Buildings Policy**
- Integrate an energy upgrade at building intervention points:
  - seismic or flooding resilience upgrade
  - zoning or use change (within 2 years)
  - point-of-sale (within 2 years)
  - point-of-renovation

**Electric grid decarbonization coupled with building electrification**

**Provide incentives**
(zero emissions & early adopters)
- fast track permitting
- low interest loans
- tax abatements, rebates
PROBLEM

Each team of 4 or 5 participants:
• Identify a city and gather data about its building stock
  (gather data on building type and size, energy consumption, fuel type, and emissions)

• Group data by building type, floor area, number of buildings, energy consumption, fuel type, and emissions.
  (single family, multi-family, commercial, etc.)

• Analyze data and groupings, and develop ZERO BY 2050 emissions policy strategies.