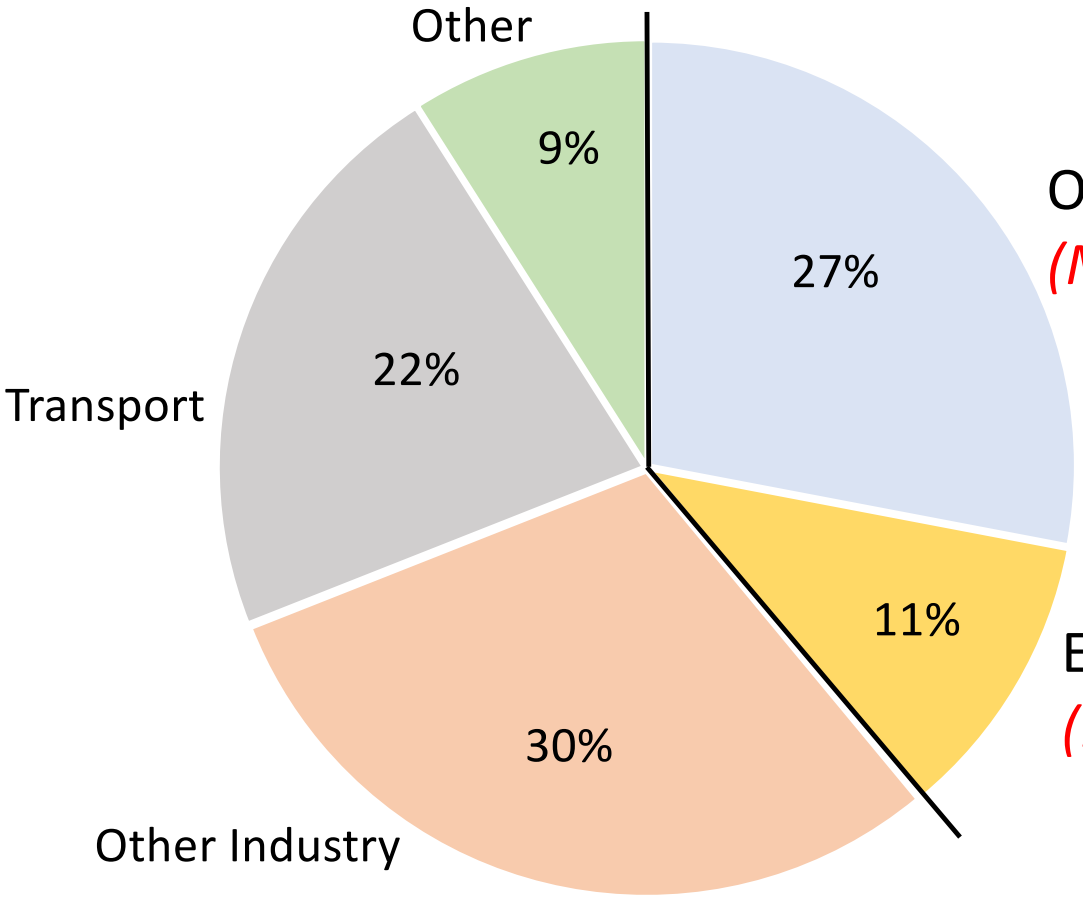
Why Existing Buildings Matter

- We have a lot of buildings
- They contain a lot of materials
- They are not very efficient
- We can’t afford to replace them all

Annual Global GHG Emissions by End Use



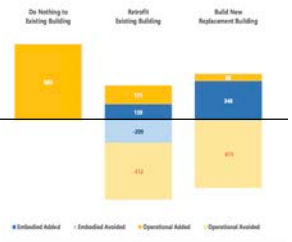
Buildings 38%

Operating Emissions
(Mostly Existing Buildings)

Embodied Emissions
(Mostly New Buildings)

2019 Global Status Report, Global Alliance for Building and Construction and Architecture(GABC)

2Build or not 2Build - Carbon Calculator



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ONEder GRANT

2Build or not 2Build - Carbon Calculator

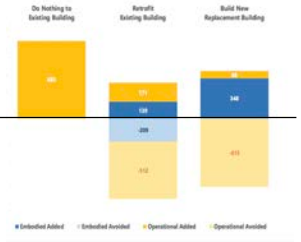
What it Does

Evaluates total carbon emissions of existing building reuse compared to new construction

Who it's For

- Planners
- Preservation officers
- Building owners
- Developers
- Designers in early design

2Build or not 2Build - Carbon Calculator



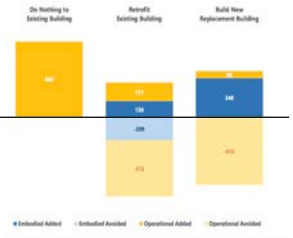
Compares

- Embodied Carbon
- Operational Carbon
- Avoided Carbon

Existing, New & Reuse Scenarios

- Existing Baseline Building
- Replace Existing w/New
- Reuse & Retrofit Existing

2Build or not 2Build - Carbon Calculator



User Interface:

- Excel dashboard with drop down menus
- Four new building options
- A menu of renovation and upgrade options
- Options for operational efficiency
- Embodied carbon modifiers

2Build or not 2Build - Carbon Calculator

Embodied Carbon – New Buildings			
Light - Wood Framed Building	Mixed – Wood + Concrete / Steel	Mid-Rise Concrete /Steel	High Rise Glass Skyscraper
200 kg/m^2 (~40 lbs/sf)	300 kg/m^2 (~60 lbs/sf)	500 kg/m^2 (~100 lbs/sf)	700 kg/m^2 (~150 lbs/sf)

2Build or not 2Build - Carbon Calculator

Embodied Carbon – Renovations & Upgrades				
MEP	**Envelope**	**Interiors**	**Cladding**	**Structure**
No Upgrade	No Upgrade	No Upgrade	No Upgrade	No Upgrade
Upgrade Gas	Minor: Insulation, Air	Minor: Finishes only	25% Replacement	Light: Wood: 25% Upgrade
New Heat pumps, LED Lighting	Major: Insulation, Windows	Major: Gut and Replace	50% Replacement	Light: Wood: 50% Upgrade
			100% Replacement	Heavy: Conc/steel 25% upgrade
				Heavy: Conc/steel 25% upgrade

2Build or not 2Build - Carbon Calculator

Operational Carbon		
Existing Building	**Retrofit Existing**	**New Building**
Baseline - CBECS 2012	Baseline - no efficiency upgrade	Baseline: Code Average
	20% better than baseline	20% better than code average
	40% better than baseline	40% better than code average
	60% better than baseline	60% better than code average
	80% better than baseline	60% better than code average
	Net Zero Carbon	Net Zero Carbon

2Build or not 2Build - Carbon Calculator

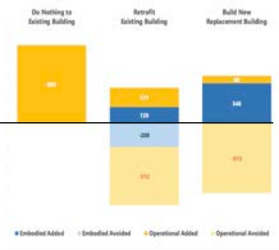
BUILDING SITE & PROJECT USE TYPE

Click in the white cells to select from a dropdown menu or enter information about your building site and planned project use type.

State	Massachusetts
Climate Zone	Very cold/cold
Primary Use Type	Education
Existing Building Floor Area	18,000 sf
Operational Timeline	15 years

key climate dates: 2030 & 2040

2Build or not 2Build - Carbon Calculator

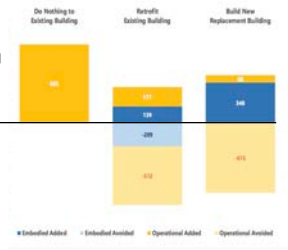


ABOUT THE EXISTING BUILDING RETROFIT

Click in the white cells to select from a dropdown menu or enter information about retrofitting the existing building. Embodied emissions and operational energy values associated with each selection will automatically populate to the right.

Retrofit Building Floor Area	**18,000 sf**	
EFFICIENCY UPGRADES		kg/m2
MEP	**Replace: New Heat Pumps, LED**	**60**
Envelope	**Major Upgrade: Insulation, New Windows**	**50**
RENOVATIONS		kg/m2
Interior	**Gut & Replace Interior**	**50**
Cladding	**Minor: 25% Replacement**	**20**
Structure	**Heavy, Conc./Steel - Minor: 25% Upgrade**	**90**
OPERATIONAL PERFORMANCE		kBtu/sf-yr
Baseline EUI	*Defaults to CBECS 2012, or enter own EUI number*	**75**
Performance Target	**75% Better than Baseline**	**19**

2Build or not 2Build - Carbon Calculator



ABOUT THE NEW BUILDING

Click in the white cells to select from a dropdown menu or enter information about building a new building. Embodied emissions and operational energy values associated with each selection will automatically populate to the right.

New Building Floor Area	**18,000 sf**	
EMBODIED PERFORMANCE		kg/m2
Structural System	**Mid Rise, Concrete or Steel**	**500**
OPERATIONAL PERFORMANCE		kBtu/sf-yr
Baseline EUI	*Defaults to Code Average, or enter EUI number*	**37**
Performance Target	**80% Better than Baseline**	**7**

2Build or not 2Build - Carbon Calculator

EMBODIED EMISSIONS MODIFIERS

Click in the white cells and select from the dropdown menus to add additional project details. The modifiers impact the embodied emissions of the existing building retrofit and the new building.

		kg/m2
Poor Soil/High Seismic Zone/Similar?	No	
Demolish Existing Building?	No	0
Add Floor Below Grade?	No	0
Add On-Site PV Panels?	No	0
Use Low Carbon Concrete?	No	

2Build or not 2Build - Carbon Calculator

INPUTS

BUILDING SITE & PROJECT USE TYPE

Click in the white cells to select from a dropdown menu or enter information about your building site and planned project use type.

State	California
Climate Zone	Marine
Primary Use Type	Office
Existing Building Floor Area	14,263 sf
Operational Timeline	10 years

key climate dates: 2030 & 2040

ABOUT THE EXISTING BUILDING RETROFIT

Click in the white cells to select from a dropdown menu or enter information about retrofitting the existing building. Embodied emissions and operational energy values associated with each selection will automatically populate to the right.

Retrofit Building Floor Area	14,263 sf	
EFFICIENCY UPGRADES		kg/m2
MEP	Upgrade: Upgrade Gas, Resuse Ducts	25
Envelope	Minor Upgrade: Insulation, Air Sealing	20
RENOVATIONS		kg/m2
Interior	Gut & Replace Interior	50
Cladding	Minor: 25% Replacement	20
Structure	No Structural Upgrade	0
OPERATIONAL PERFORMANCE		kBtu/sf-yr
Baseline EUI	*Defaults to CBECS 2012, or enter own EUI number*	80
Performance Target	75% Better than Baseline	20

ABOUT THE NEW BUILDING

Click in the white cells to select from a dropdown menu or enter information about building a new building. Embodied emissions and operational energy values associated with each selection will automatically populate to the right.

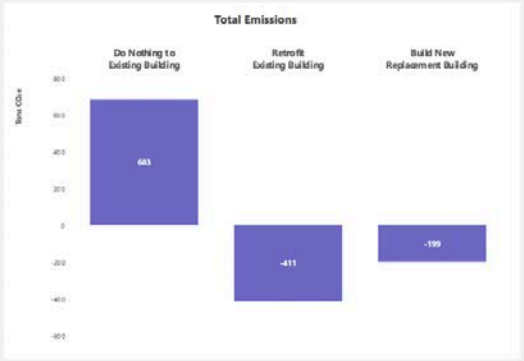
New Building Floor Area	14,263 sf	
EMBODIED PERFORMANCE		kg/m2
Structural System	Mixed Wood + Concrete or Steel	300
OPERATIONAL PERFORMANCE		kBtu/sf-yr
Baseline EUI	*Defaults to Code Average, or enter EUI number*	40
Performance Target	80% Better than Baseline	8

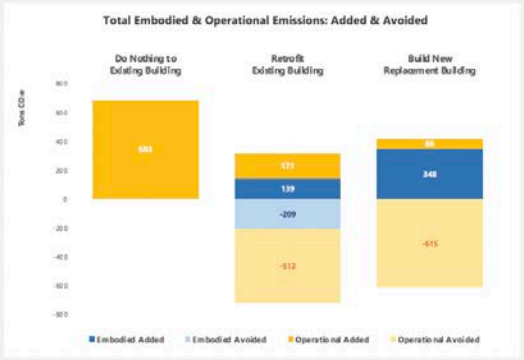
EMBODIED EMISSIONS MODIFIERS

Click in the white cells and select from the dropdown menus to add additional project details. The modifiers impact the embodied emissions of the existing building retrofit and the new building.

		kg/m2
Poor Soil/High Seismic Zone/Similar?	No	
Demolish Existing Building?	Yes	25
Add Floor Below Grade?	No	0
Add On-Site PV Panels?	Yes	25
Use Low Carbon Concrete?	Yes	-25%

RESULTS





	(CO2e, cradle to gate)				OPERATIONAL EMISSIONS (CO2e, years)				TOTAL EMISSIONS
	Added kg/m2	Added Tons	Avoided Tons	Total Tons	EUI (kBtu/sf-yr)	Added Tons	Avoided Tons	Total Tons	Tons CO2e 10 years
Do Nothing	0	0	0	0	80	683	0	683	683
Retrofit Existing	105	139	-209	-70	20	171	-512	-342	-411
Build New Replacement	263	348	0	348	8	68	-615	-547	-199