

SRE Econ Lecture 8

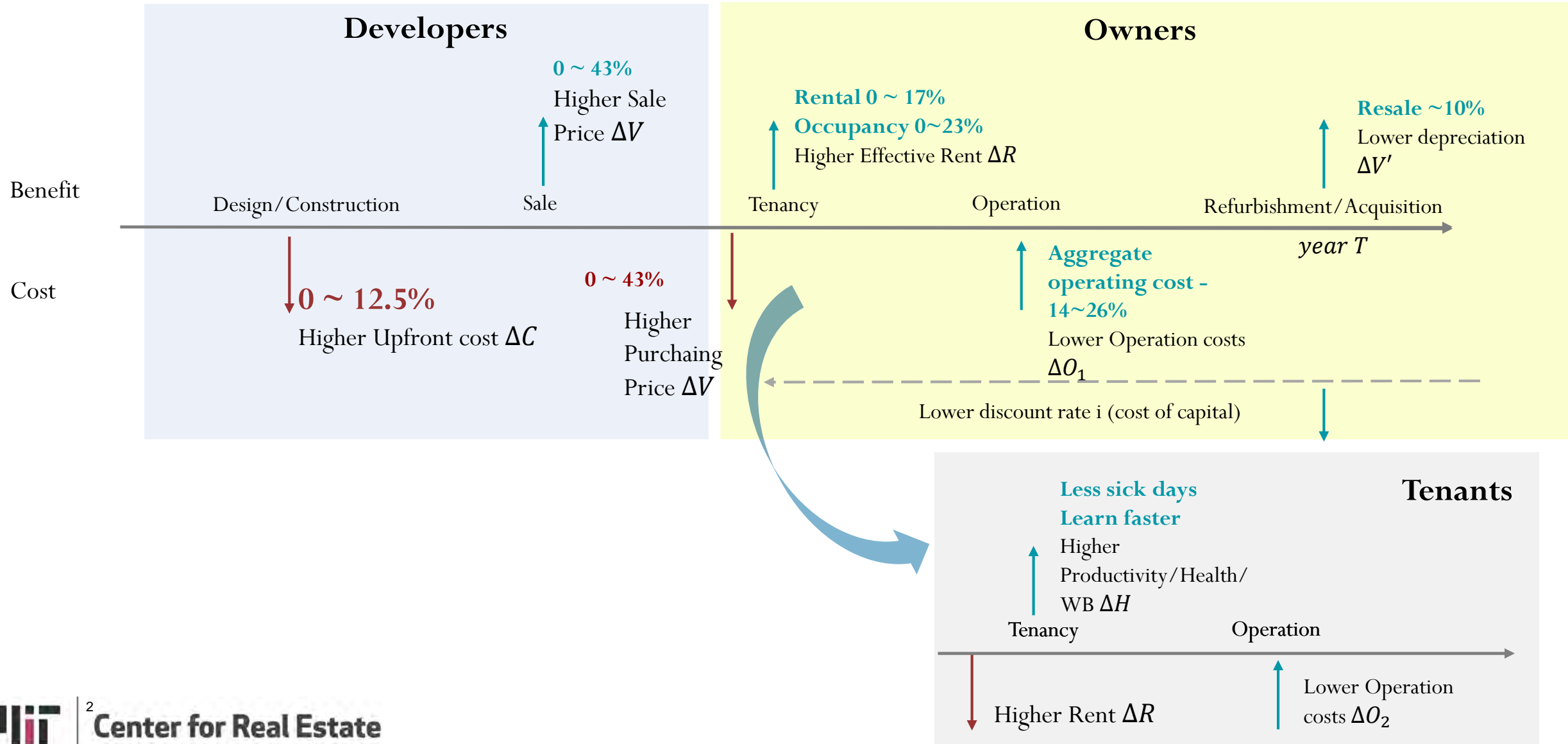
Policy as a Game Changer for Sustainable Real Estate

Siqi Zheng

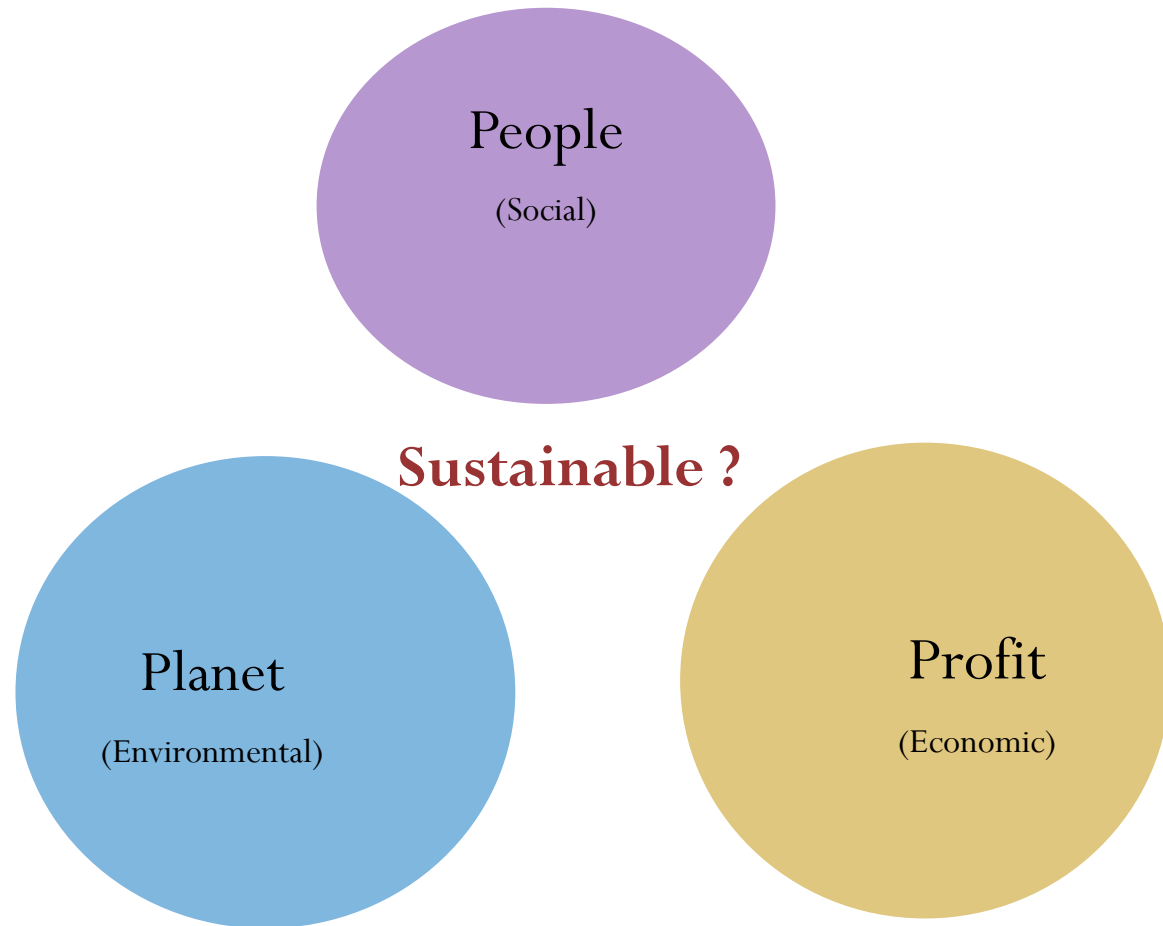
March 2023

(MIT Center for Real Estate)

Is There a Business Case for Green Buildings?



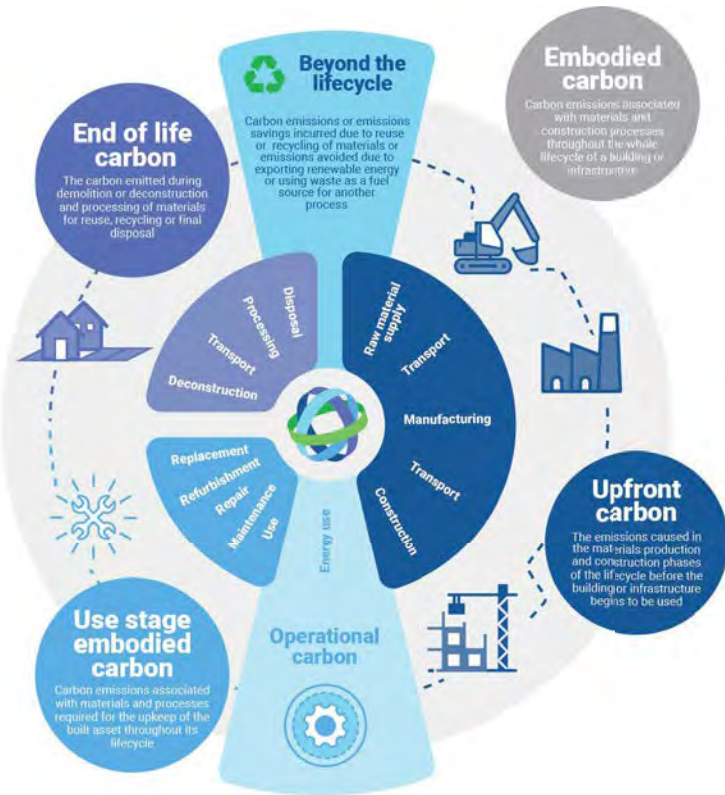
Market Failures Threaten the Three Bottom Lines



Market Failures:

1. Information Asymmetry
2. Split Incentive
- 3. Externality**

Green Buildings Generate Positive Externalities



Standard policy instruments to address positive externality:

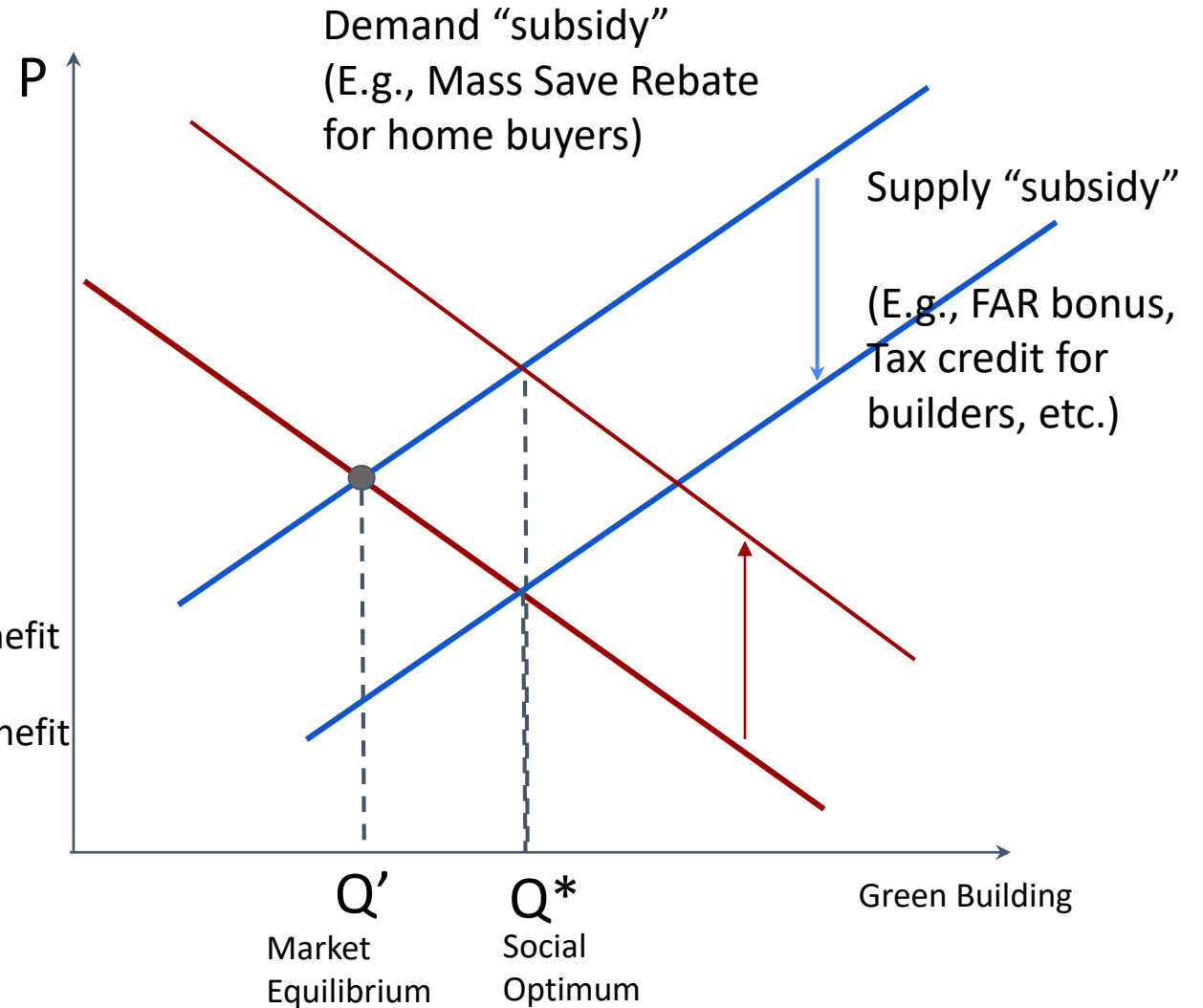
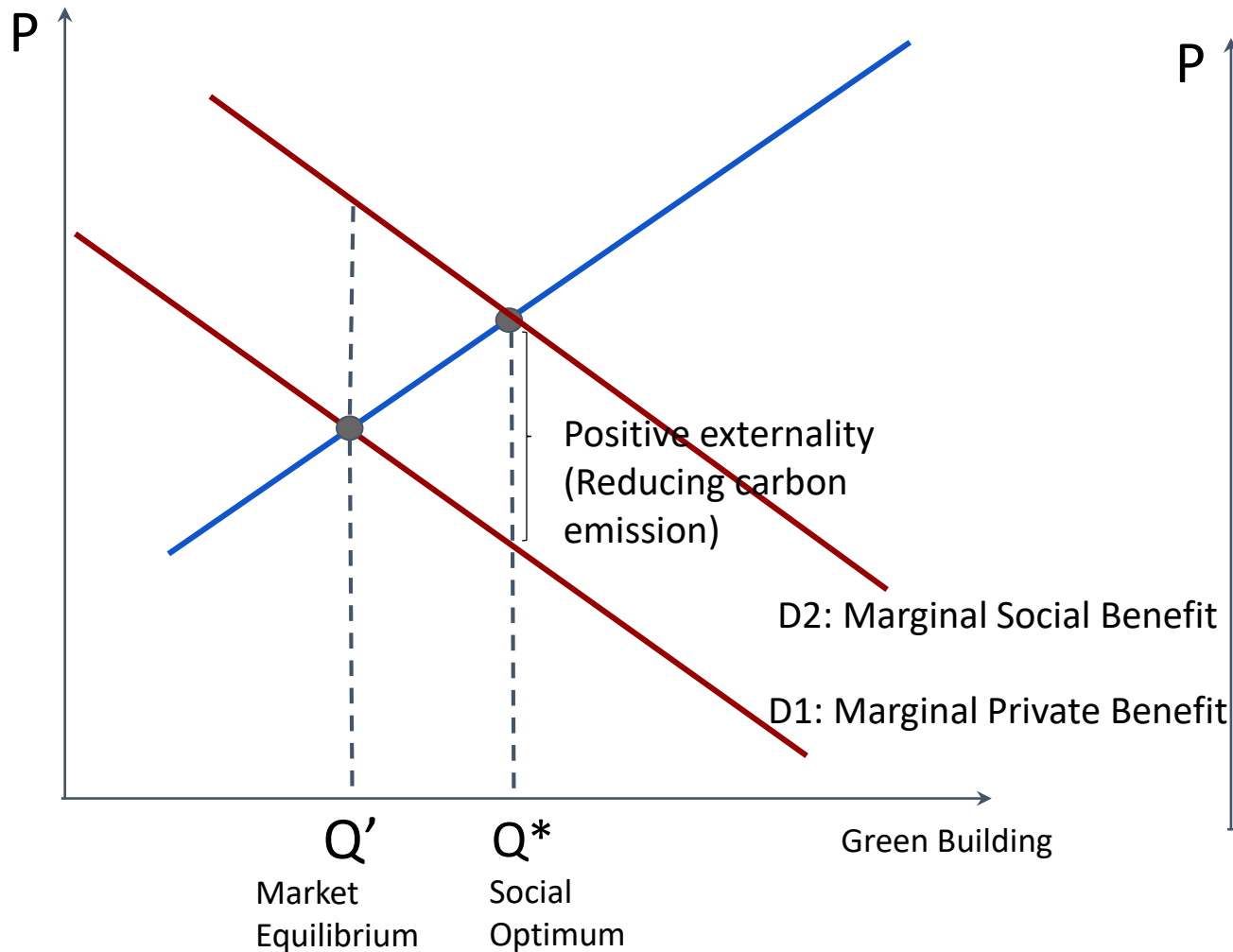
- Pigouvian subsidy or tax reduction to incentivize supply side to produce more or demand side to pay higher price.

In reality, state/county:

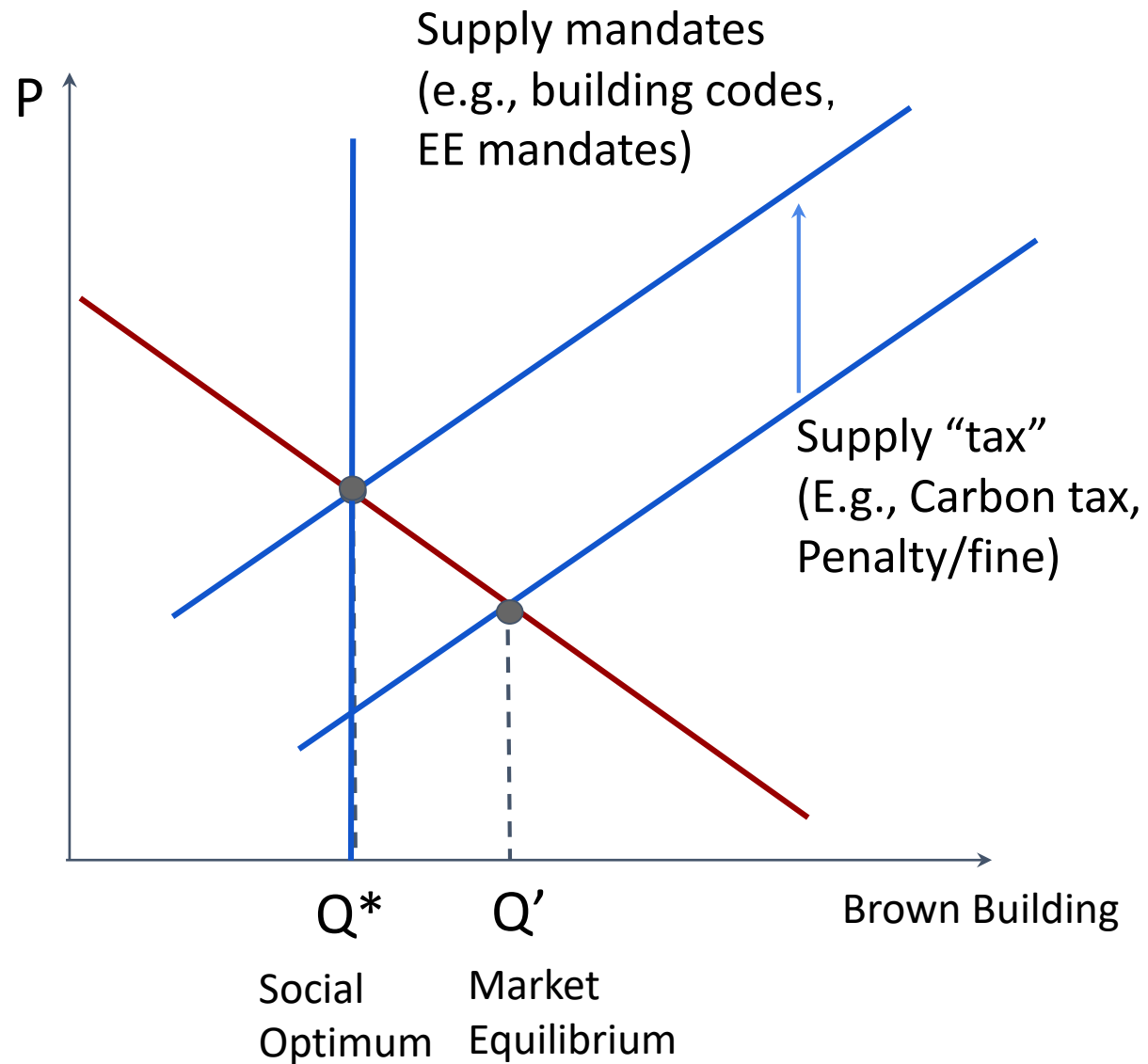
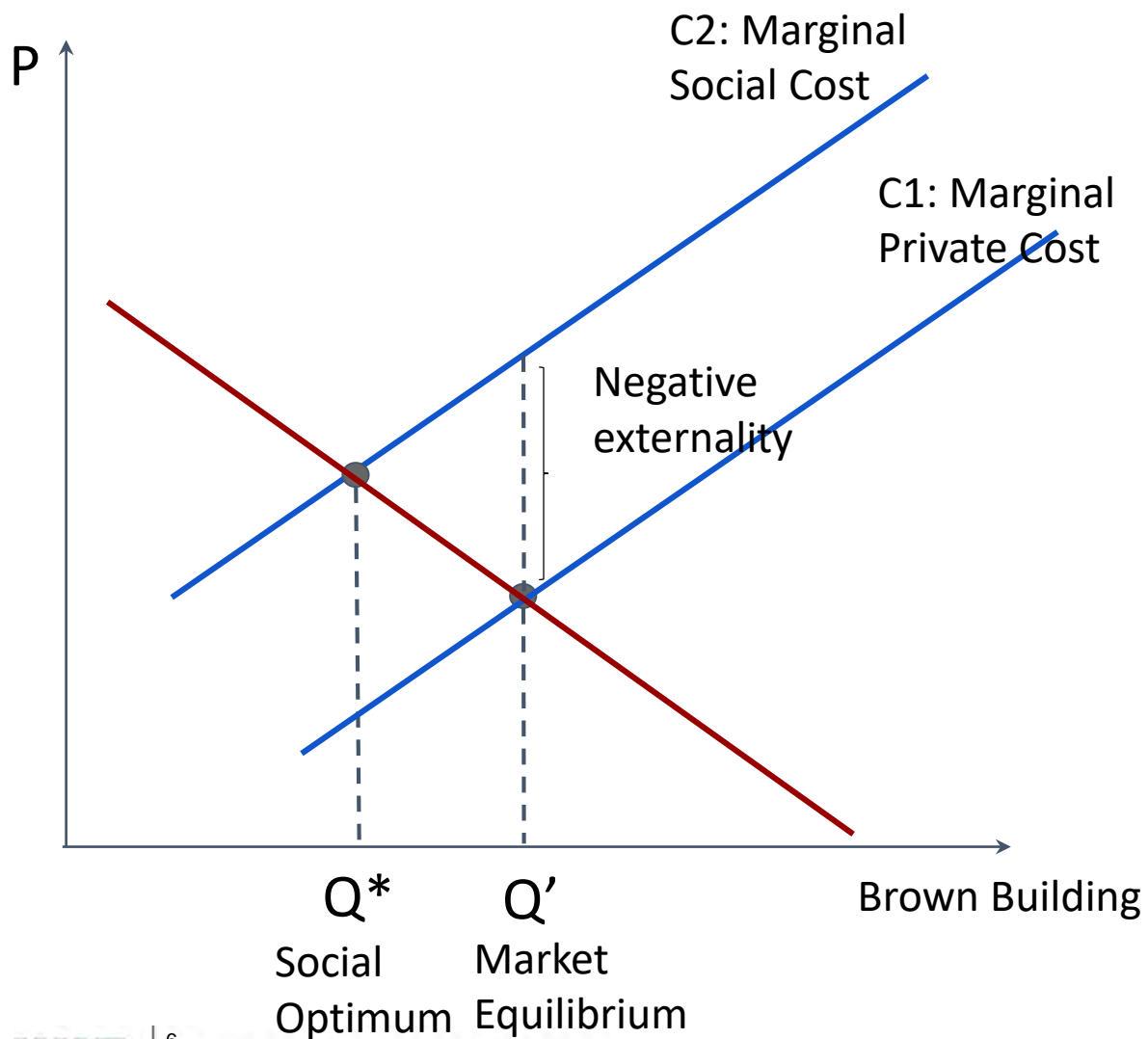
- Tax rebates
- Subsidy
- Links to other planning goals (e.g., FAR bonus smart growth, affordable housing)

- Without considering externalities, equilibrium in markets will underproduce green buildings

Positive Externality: “Carrots”



Negative Externality: “Sticks” to discourage brown buildings



The types of policies

	MITIGATION	ADAPTATION
<p>STICKS (Enforcement)</p>	<p>Building Codes</p> <p>Minimum EE Standards (UK) Energy Performance Criteria (LL97, NYC/BERDO 2.0, Boston) EE Reporting Mandates</p>	<p>Climate Risk Disclosure Mandates Flood Insurance Mandates</p>
<p>CARROTS (Incentives)</p>	<p>FAR Bonus Tax Credits/Rebates EE Subsidies</p>	<p>Weatherization Programs</p>

Table I Summary of green building policies across U.S. states, counties, and cities

	Common designs	Impacted U.S. regions				Example locations	
		States	Counties	Cities	Total U.S. population, %	State	City
Mandate	LEED/equivalent: government	24	30	170	57.77	VA	Honolulu, HI
	LEED/equivalent: residential	3	12	76	11.33	MN	Annapolis, MD
	LEED/equivalent: commercial	1	10	58	7.60	CT	Washington, DC
	GreenPoint/LEED checklist for permit	0	0	51	3.52	—	Atlanta, GA
	LEED AP required on design team	0	2	17	1.31	—	San Francisco, CA
Incentive	Grants for certification costs	5	1	14	22.60	NY	Portland, OR
	Property tax abatement, exemption, credit, rebate, or refund	10	10	11	21.08	NV	Salt Lake City, UT
	Fee reduction or rebate	1	10	46	9.16	OH	Las Vegas, NV
	Expedited permitting	1	13	48	7.97	HA	Chicago, IL
	Density (floor area ratio) bonus	0	3	54	2.70	—	Tampa, FL
	Publicity	0	2	18	1.19	—	Columbia, SC
	Height bonus	0	0	20	0.64	—	Pittsburg, PA
Other	Symbolic gestures	3	5	59	4.87	KY	Madison, WI
	Energy emphasis	34	12	42	66.72	SC	Fort Worth, TX
	Water or open space emphasis	0	2	10	0.53	—	Chattanooga, TN
	Multiple certifiers incentivized	17	14	83	46.15	IN	St Paul, MN
	Incentive tiered by certification level	3	8	37	9.18	OR	Nashville, TN
	Incentive tiered by building size	5	0	15	8.66	NM	Eugene, OR
	Incentive tiered by building vintage	0	0	2	0.02	—	Portland, ME

Note: The number of jurisdictions with each policy is presented alongside the total number of people residing within these jurisdictions as a percentage of the U.S. population.

Sources: Author calculations based on policy data provided by USGBC, IEA, and DSIRE.

“Carrots”: Subsidies for Retrofit

- One of the key programs of the new **European Green Deal** is the “renovation wave”
- The objective is to double the annual energy renovation rate of residential and non-residential buildings by 2030. This will result in 35 million building units renovated by 2030.
- EU funding drives such investments for renovation
 - The European Council agreed to endow with EUR 672.5 billion, 37% of which would be targeted to renovation investment and energy efficiency-related reforms.
- Attracting private investment and stimulating green loan financing
 - Member States explore innovative financing solutions as well as taxation tools to generate economic incentives to finance building renovation.



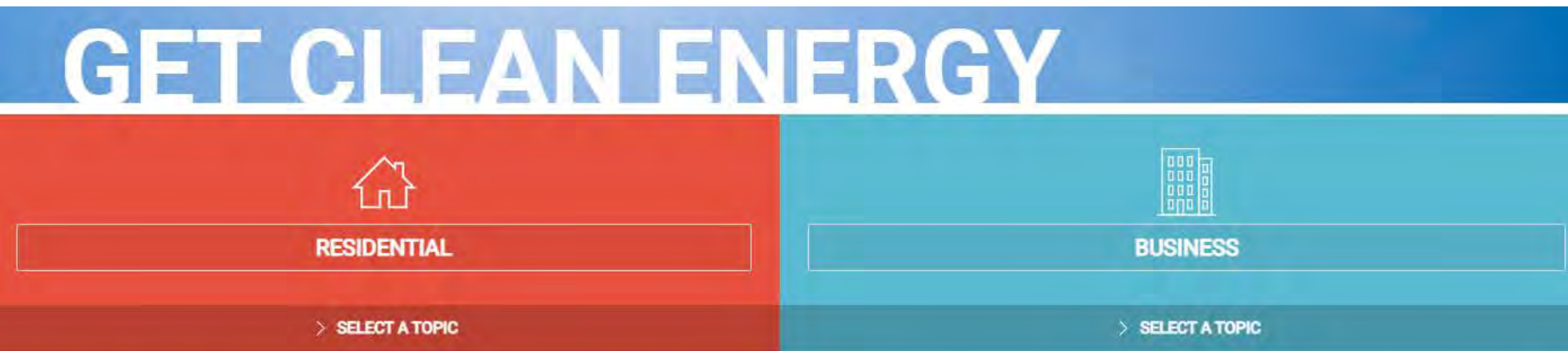
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“Carrots”: Subsidies for Green Buildings

Funding opportunities for green buildings: <https://archive.epa.gov/greenbuilding/web/html/funding.html#guides>

Massachusetts:



MassCEC offers rebates, vouchers and loans to residents looking to install renewable energy technologies in their homes.

Community aggregation

- [Solarize Massachusetts](#)
- [HeatSmart Mass](#)

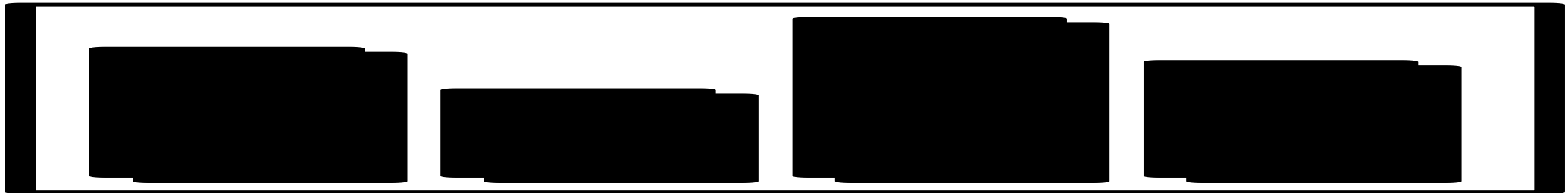
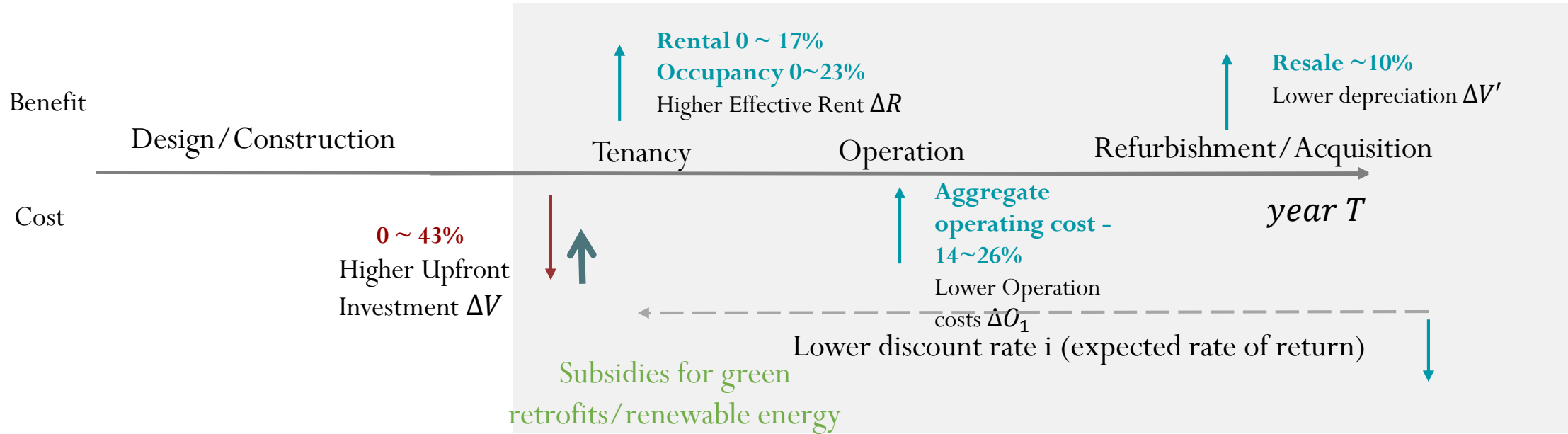
MassCEC provides rebates and technical assistance to businesses looking to increase their clean energy output.

Rebates and technical assistance for renewable energy projects

- [Hydropower](#)
- [Commonwealth Wind \(CommWind\) Program](#)

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“Carrots”: Subsidies for Green Buildings



Investment cost decrease

“Carrots”: Density Bonus

Some local governments adopt other formats of subsidy.

Arlington , VA : [Green Building Incentive Program](#)

Green Building Bonus Density Program

Note:

- The information below applies to the 2014 Green Building Program.
- Updates for the 2020 program will be posted soon.

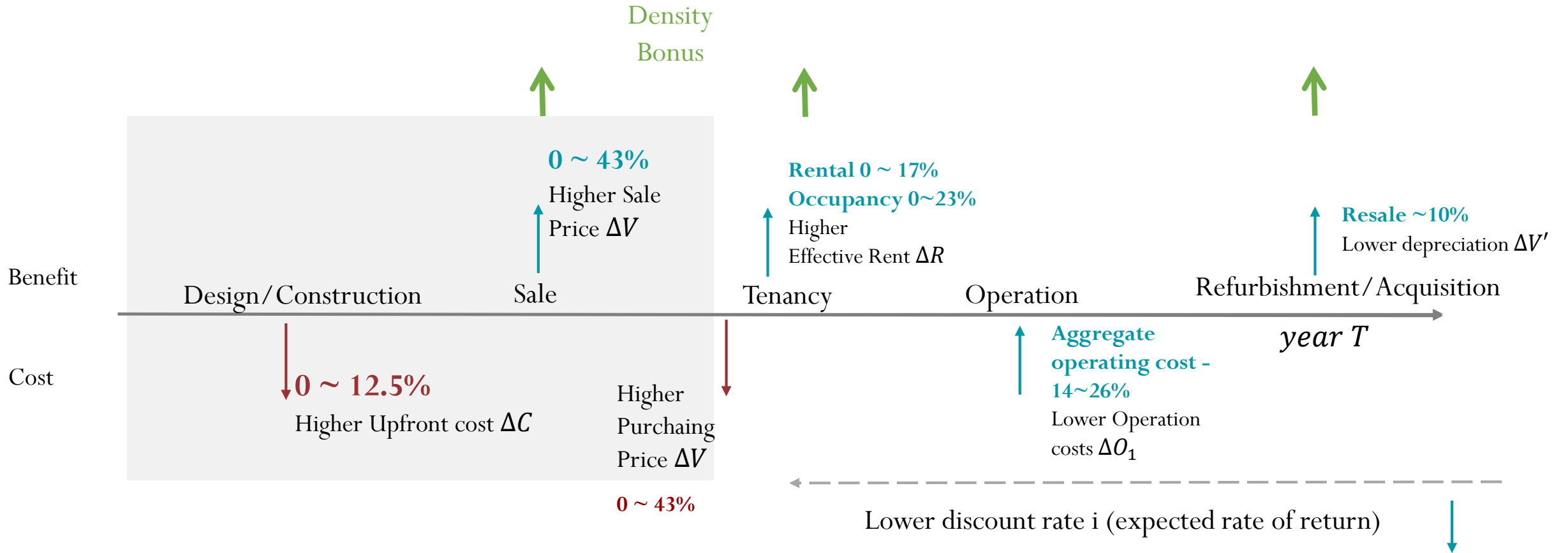
New development project teams may request additional bonus density and/or height in exchange for green building certification as outlined below.

LEED version 4	Office or Residential*	Two Arlington Priority Credits	Total Bonus FAR Available
Silver	0.25 FAR	+ 0.05 FAR	0.30
Gold	0.35	+ 0.05 FAR	0.40
Platinum	0.50	+ 0.05 FAR	0.55

* Minimum Program Requirements include ENERGY STAR certification for commercial office, 10 years of energy reporting, and ENERGY STAR lighting and appliances for multifamily.

- Under 2020 new updates, LEED Gold becomes the minimum level of green building certification required in order to receive **bonus density** in the program

“Carrots”: Density Bonus



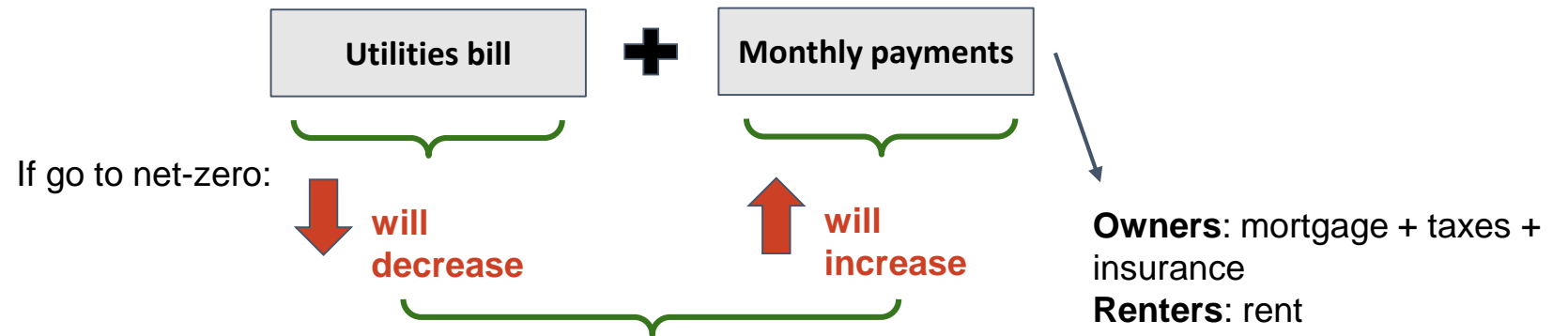
Balance between sustainability and affordability



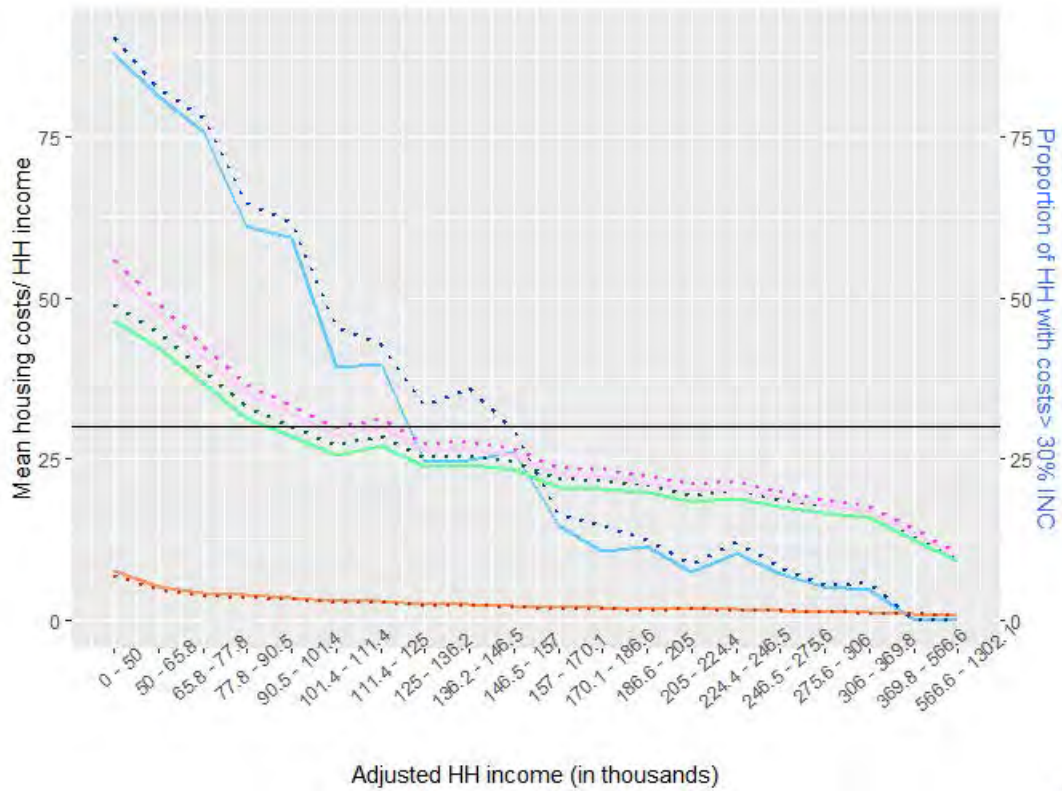
“Net-Zero” and housing affordability project

Housing affordability = housing cost / household income

Total housing costs can be broken down into*:

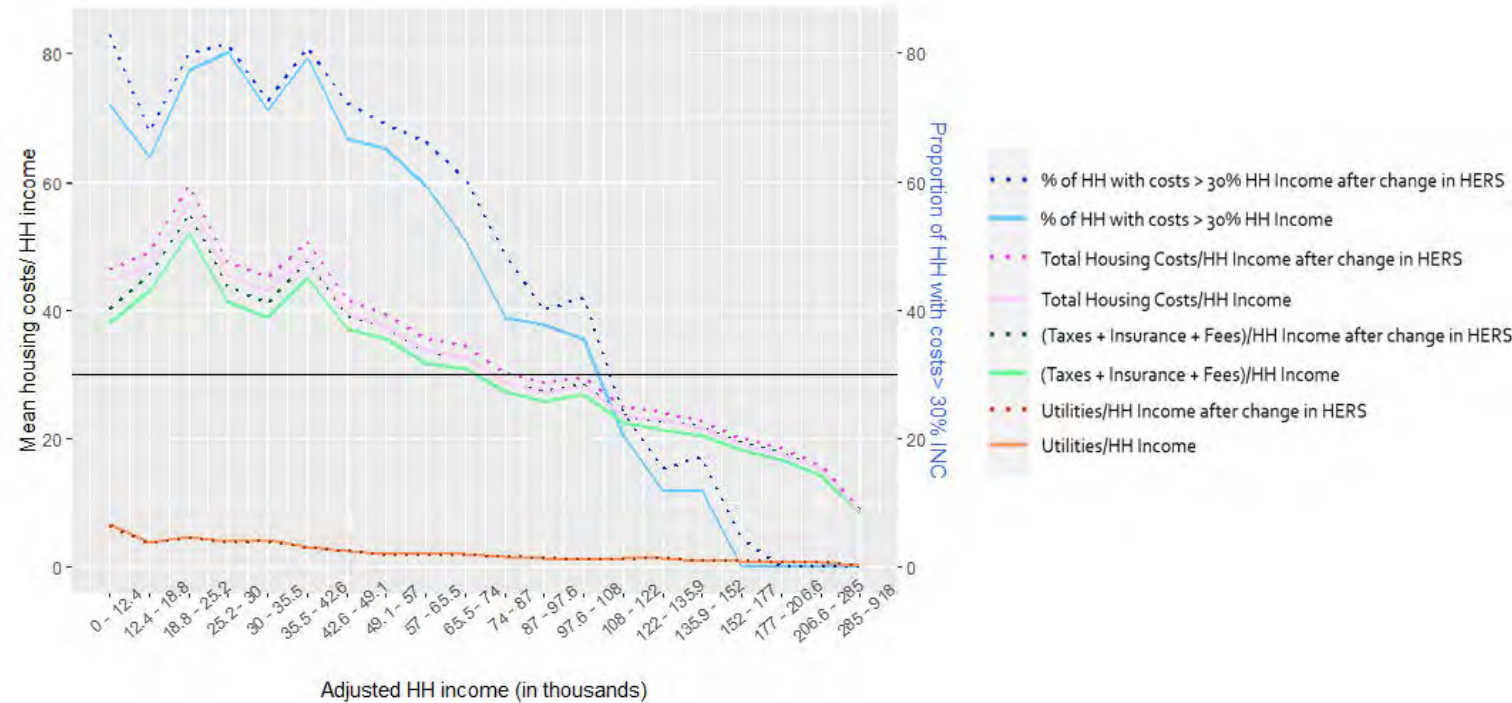


- Empirical question: Which effect will dominate?
- How to mitigate the increased upfront cost?



Adjusted HH income (in thousands)

SINGLE-FAMILY HOMES: HERS SCORE 55 TO 42



Adjusted HH income (in thousands)

MULTI-FAMILY HOMES: HERS SCORE 55 TO 42

“Sticks”: Energy Efficiency Benchmark and Disclosure

Building Energy Efficiency Rating

B

75

2018 RATING
B / 75
2017 RATING
C / 64



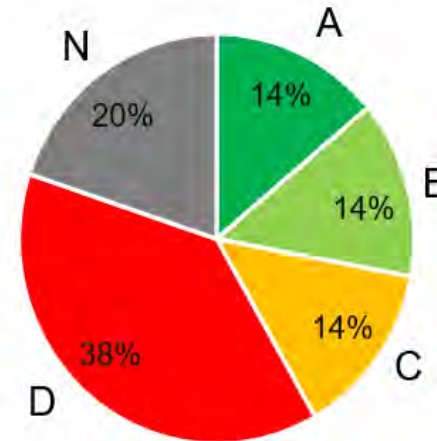
Building Specifications
DOB Property Address
Year of Compliance..... 2019
Borough, Block and Lot... 1-12345-1234
NYC Average..... 50

More Information
The 1-100 ENERGY STAR® score compares this building's energy consumption to similar buildings. Buildings with a score of 75 or better are high performers and eligible for ENERGY STAR certification.

Learn more about Building Energy Ratings.
Find ways to improve. Visit nyc.gov/energyrating

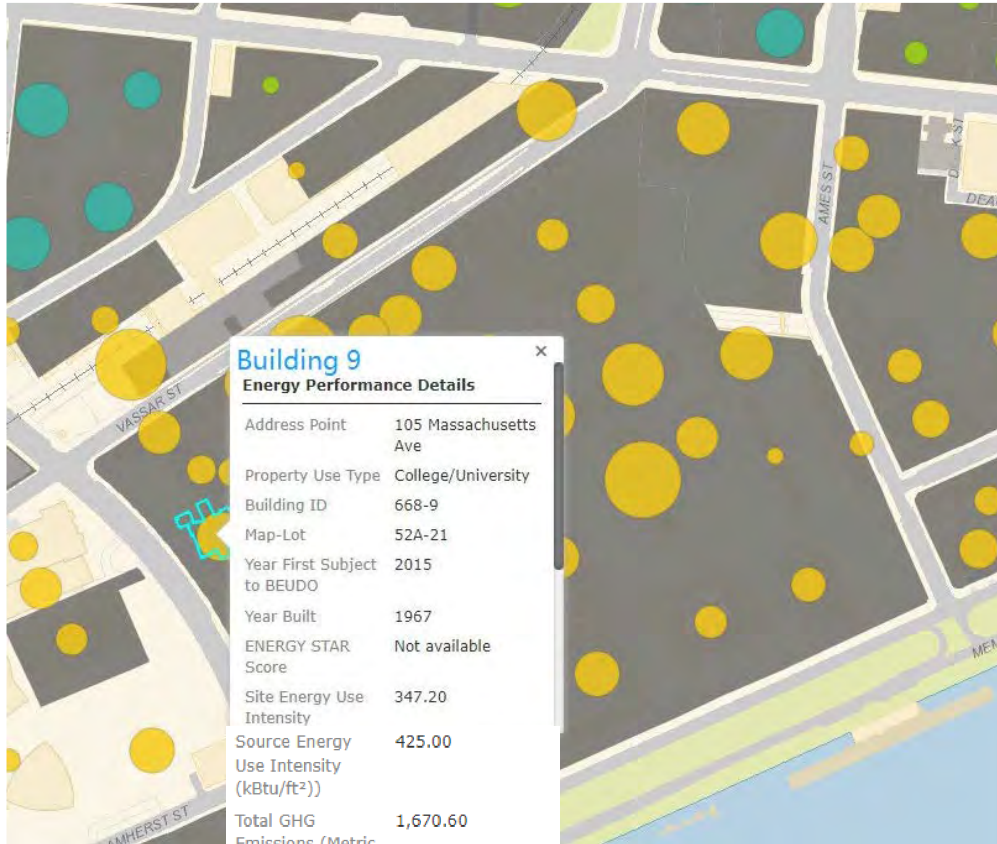


2020 NYC Letter Grade Breakdown - Based on 2019 ENERGY STAR Scores



MIT Energy Use Intensity and LEED Certificates

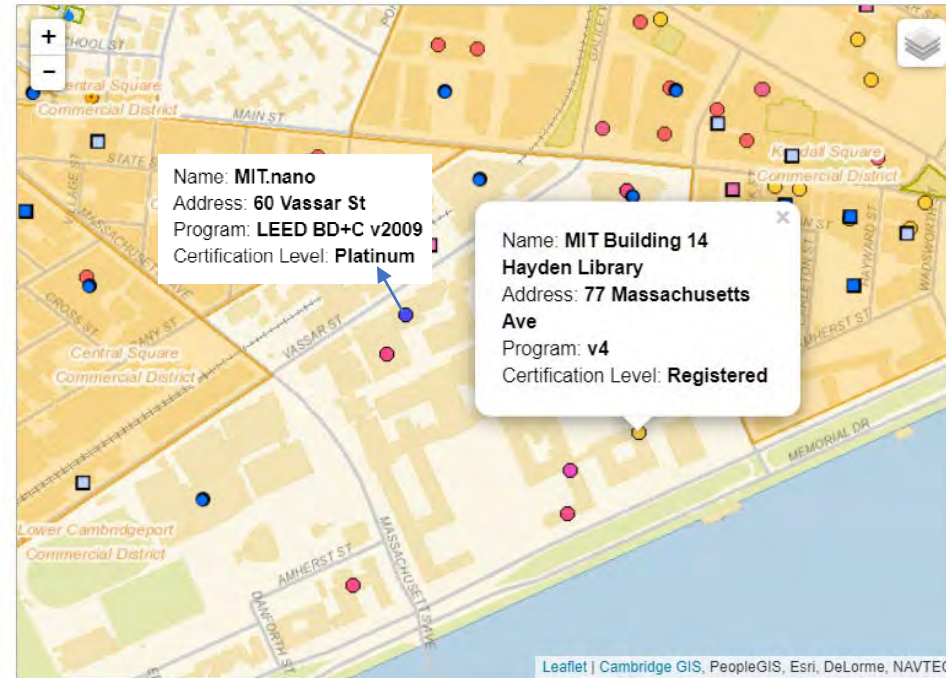
MIT Energy Use Intensity and LEED Certificates.



Total GHG Emissions Intensity (kg CO ₂ e/ft ²)	22.15
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Source: [link](#).

CDD Locator Map



Map Legend

Active and Completed Special Permits	Green Buildings	Parks and Waterplay	Commercial Districts
● Built (older)	● Registered	■ Public Park	■ Commercial Districts
■ Built (recent)	● Certified	■ Privately-Owned Park	● CPA Supported Housing
■ Under construction	● Silver	● Waterplay	● Affordable Housing
■ Permitted	● Gold		
■ Applied	● Platinum		

2018 performance (gets better after the retrofit)

Year Built	1951
ENERGY STAR Score	Not available
Site Energy Use Intensity (kBtu/ft ²)	169.50
Source Energy Use Intensity (kBtu/ft ²)	228.50
Total GHG Emissions (Metric Tons CO ₂ e)	1,701.40
Total GHG Emissions Intensity (kg CO ₂ e/ft ²)	11.01

Source: <https://www.cambridgema.gov/CDD/cddlocatormap#map>.

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MIT Hayden Library



STATUS

In construction

COMPLETION DATE

2021

THEMES AND PRIORITIES

Renovation and renewal

Sustainability

Enhancement of life and learning

Originally designed by Voorhees, Walker, Foley & Smith, Hayden Library first opened in 1951 and has served for nearly 70 years as a central element of the campus. MIT is undertaking a project to renew and restore the Library's first two floors, updating the main reading rooms and office spaces to reflect the changing nature of the research library for today's students and faculty.

- LEED Gold V4 Certification
- Fitwel Health Certification
- Material:
“Red List Free” materials for all interior finish materials and fabrics
- Water:
Use 1.0 gallon-per-flush toilets.
- Energy:
 - Reduce thermal loss by replacing single-pane glass in the large bay windows with high-performance sealed insulated windows.
 - Update air-handling units and perimeter radiators with new controls to optimize energy use.
 - Upgrade all lighting to low-energy LEDs controlled with daylight and occupancy sensors.
 - EnergyStar appliances throughout the building.

BUSINESS & FINANCE

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THE WALL STREET JOURNAL.

Tuesday, March 22, 2022 | B1

See more at WSJ.com/Markets

SEC Pushes on Climate Disclosure

Plan would mandate that public companies estimate greenhouse gas emissions

By PAUL KIERNAN

WASHINGTON—Regulators proposed stringent requirements for publicly traded companies to report information on greenhouse-gas emissions and risks related to climate change, in one of the Biden administration's potentially most significant environmental actions to date.

The Securities and Exchange Commission formally offered a 534-page proposal Monday that would force publicly traded companies to report greenhouse-gas emissions from their own operations as well as from the energy they consume and to obtain independent certification of their estimates.

In some cases, companies also would be required to report greenhouse-gas output of both their supply chains and consumers, known as Scope 3 emissions. An SEC official said most companies in the S&P 500 would likely have to report Scope 3 emissions. Companies

would have to include the information in SEC filings such as annual reports.

The proposal comes as President Biden's efforts to address global warming through legislation have stalled in Congress, putting pressure on regulatory agencies to deliver on a core Democratic priority. That has drawn criticism from Republicans, who accused Democratic SEC Chairman Gary Gensler of overreach.

Mr. Gensler said investors and asset managers representing tens of trillions of dollars have called for companies' climate-related disclosures to be

more standardized. While hundreds of companies have already begun reporting data about their carbon emissions and other climate-related metrics, SEC officials say current disclosures are inconsistent and hard for investors to compare.

"Companies and investors alike would benefit from the clear rules of the road proposed in this release," Mr. Gensler said.

Meredith Cross, a partner at corporate law firm WilmerHale and former SEC division director, said the proposed rule is "the most extensive, comprehensive and complicated disclosure initiative in decades."

SEC members voted 3-1 to issue the proposal, which will be open for public comment for at least two months before the agency will begin work on a final rule. Commissioners voted along party lines, with all three Democrats voting yes.

Republicans and some industry groups have been gearing up for months to fight the new requirements, which are a hallmark of Mr. Gensler's ambitious policy agenda. They say the proposed rules would increase compliance costs and go far beyond a strict interpretation of the SEC's mandate to protect investors. *Please turn to page B10*

FAA Staffer Testifies Ex-Boeing Pilot Lied

By ANDREW TANGEL

FORT WORTH, Texas—A Federal Aviation Administration training specialist said a former Boeing Co. pilot lied to her about how a 737 MAX flight-control system worked before two of the jets crashed three

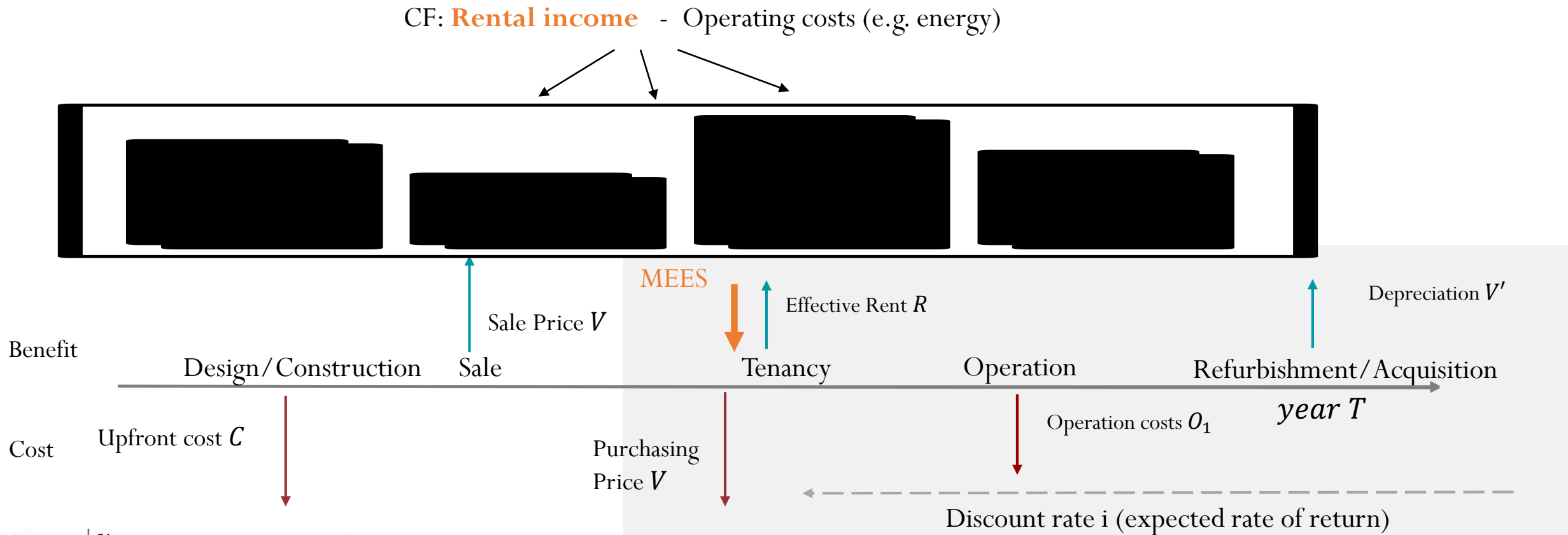
“Sticks”: Minimum Energy Efficiency Standards (MEES, UK)

- Energy Performance Certificate (EPC) labels in European markets rank buildings from A (highest energy efficiency) to F (lowest energy efficiency)
- Since 1 April 2020, landlords can no longer let or continue to let properties if they have an EPC rating below E
- Properties with EPC rating of F or G, need to improve the property’s rating to E



“Sticks”: Minimum Energy Efficiency Standards (MEEES, UK)

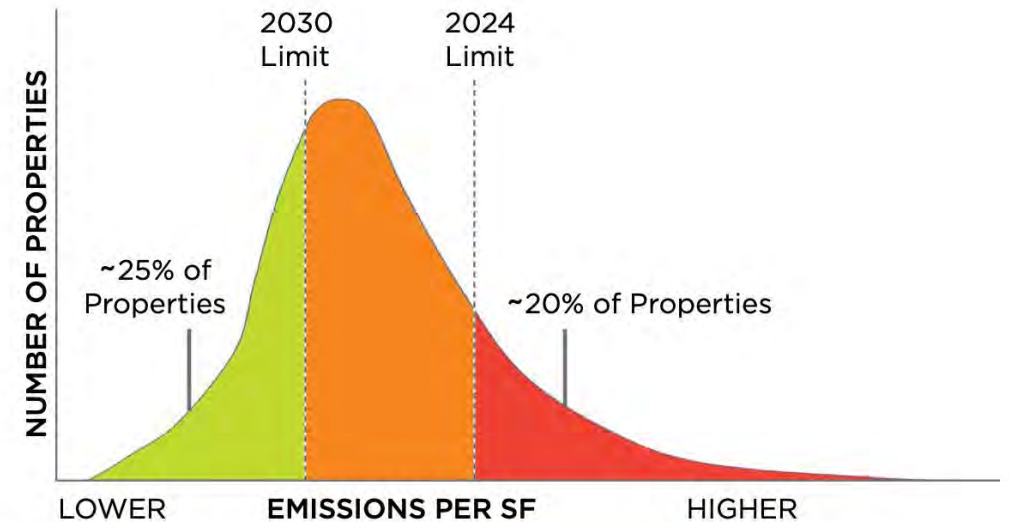
- When a property is non-compliant with the energy standards, asset value will be affected:
 - Disruption in income flow (risk of property being vacant)
 - Require a capital injection to bring the property up to standards



“Sticks”: Energy Performance Criteria - LL97 in NYC

- The City of New York enacted Local Law 97 (LL97) in 2019
- Law introduces carbon caps on 50,000 buildings and nearly 60 percent of the city’s building area: 59 percent residential and 41 percent commercial
- Sets increasingly stringent limits on carbon emissions per square foot in 2024 and 2030

Emissions Distribution of Covered Properties



This graph is meant as a conceptual aid and does not represent actual properties or emissions limits.

This graph is meant as a conceptual aid and does not represent actual properties or emissions limits.

“Sticks”: Energy Performance Criteria - LL97 in NYC

- With the current building stock, building owners face sizeable fines
- Strong need to retrofit properties to meet targets
- This will require major capital investments by building owners
 - Owners will need to replace HVAC systems, building envelopes, etc. before LL97 is active, instead of in their programmed depreciation cycle
- Owners have limited ability to pass these expenditures to tenants (split incentive):
 - Large proportion of buildings lack smart meters at the tenant level (preventing them to give personalized contracts as a function of energy consumption)
 - They need the skills and time adjust the leases

Table 4: Noncompliance Rates and Average Penalties for Noncompliant Residential and Office Buildings by Location and Size, Based on 2019 Emissions

		2024		2030	
		Share of Buildings Above Limits	Average Penalty per Square Foot for Noncompliant Buildings	Share of Buildings Above Limits	Average Penalty per Square Foot for Noncompliant Buildings
Offices	Large Core Manhattan Office	18.2%	\$0.92	82.5%	\$0.71
	Medium Core Manhattan Office	16.1%	\$4.32	83.5%	\$0.52
	Large Outside Core Manhattan Office	17.6%	\$0.76	81.7%	\$0.81
	Medium Outside Core Manhattan Office	17.0%	\$2.88	67.2%	\$2.25
Residential	Large Core Manhattan Office	13.2%	\$0.21	67.9%	\$0.44
	Medium Core Manhattan Office	18.1%	\$0.53	84.6%	\$0.45
	Large Outside Core Manhattan Office	14.2%	\$0.52	55.0%	\$0.54
	Medium Outside Core Manhattan Office	21.7%	\$0.70	76.7%	\$0.44

Source: CBC staff analysis of data from City of New York, Mayor's Office of Sustainability, "Energy and Water Data Disclosure for Local Law 84-2020" (November 2020).

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Building Inputs

Building Type ? Area (SF)
1 A (Assembly) 1,102,735 X

+ Add Building Type

Utility Inputs

Use Default Rates ?

Electricity - kWh \$/kWh
24,837,004 0.22

Natural Gas - therms \$/therm
66,741 0.997

Steam - mLbs \$/mLb
37,080 35

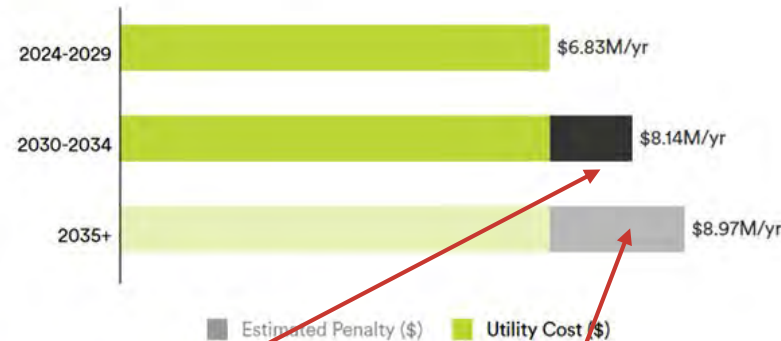
Fuel Oil 2 - gal \$/gal
0 1.65

Fuel Oil 4 - gal \$/gal
0 1.65

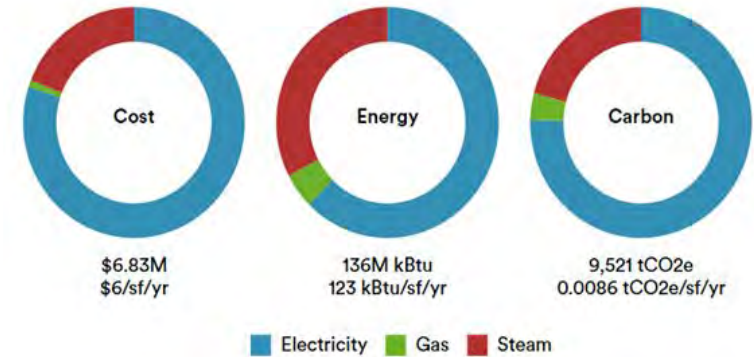
Estimated Carbon Summary



Estimated Annual Cost Summary



Estimated Building Metrics



What now? Visit NYC Accelerator for free, personalized advisory services to improve building energy efficiency and lower carbon emissions.

Calculator engine by AKF Group LLC

\$1.31M Penalty \$2.14M Penalty

Example: Madison Square Garden

Data from 2019 As Required by LL84

<https://be-exchange.org/ll97-calculator/>

BERDO 2.0 in Boston

- Boston's Building Energy Reporting and Disclosure Ordinance was amended in October 2021.
- Buildings greater than 20,000 square feet or with 15 or more units are now required to meet the requirements under BERDO.

Building use	Emissions standard (kgCO ₂ e/SF/yr.)					
	2025-2029	2030-2034	2035-2039	2040-2044	2045-2049	2050-
Assembly	7.8	4.6	3.3	2.1	1.1	0
College/ University	10.2	5.3	3.8	2.5	1.2	0
Education	3.9	2.4	1.8	1.2	0.6	0
Food Sales & Service	17.4	10.9	8.0	5.4	2.7	0
Healthcare	15.4	10.0	7.4	4.9	2.4	0
Lodging	5.8	3.7	2.7	1.8	0.9	0
Manufacturing/ Industrial	23.9	15.3	10.9	6.7	3.2	0
Multifamily housing	4.1	2.4	1.8	1.1	0.6	0
Office	5.3	3.2	2.4	1.6	0.8	0
Retail	7.1	3.4	2.4	1.5	0.7	0
Services	7.5	4.5	3.3	2.2	1.1	0
Storage	5.4	2.8	1.8	1.0	0.4	0
Technology/Science	19.2	11.1	7.8	5.1	2.5	0

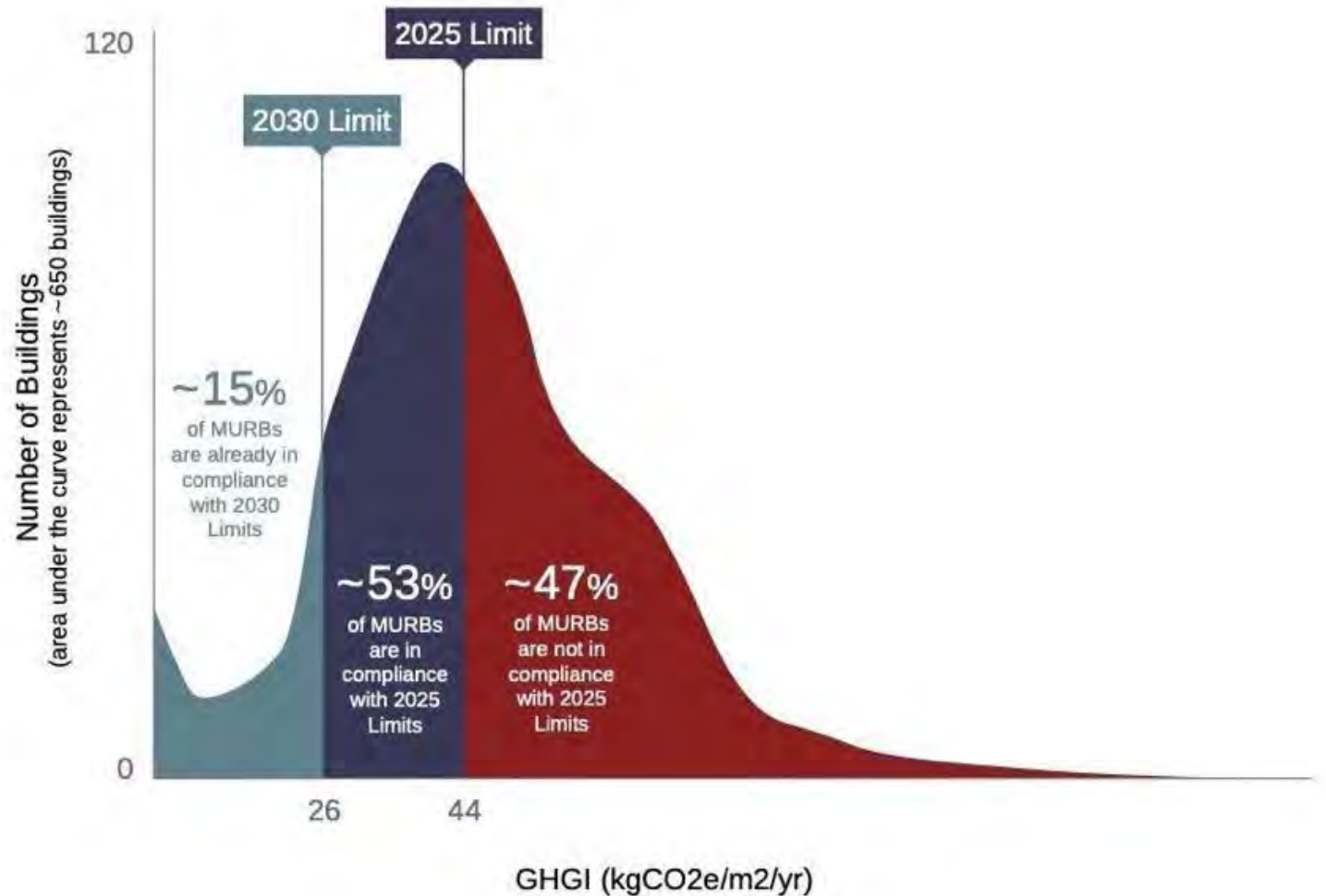
Developed by Synapse Energy Economics for the City of Boston.

BERDO 2.0 in Boston

Boston BERDO 2.0

Sets emissions standards for buildings greater than or equal to 20,000 sq.ft.

Failure to meet standards results in payments of **\$234 per metric ton of CO₂e**

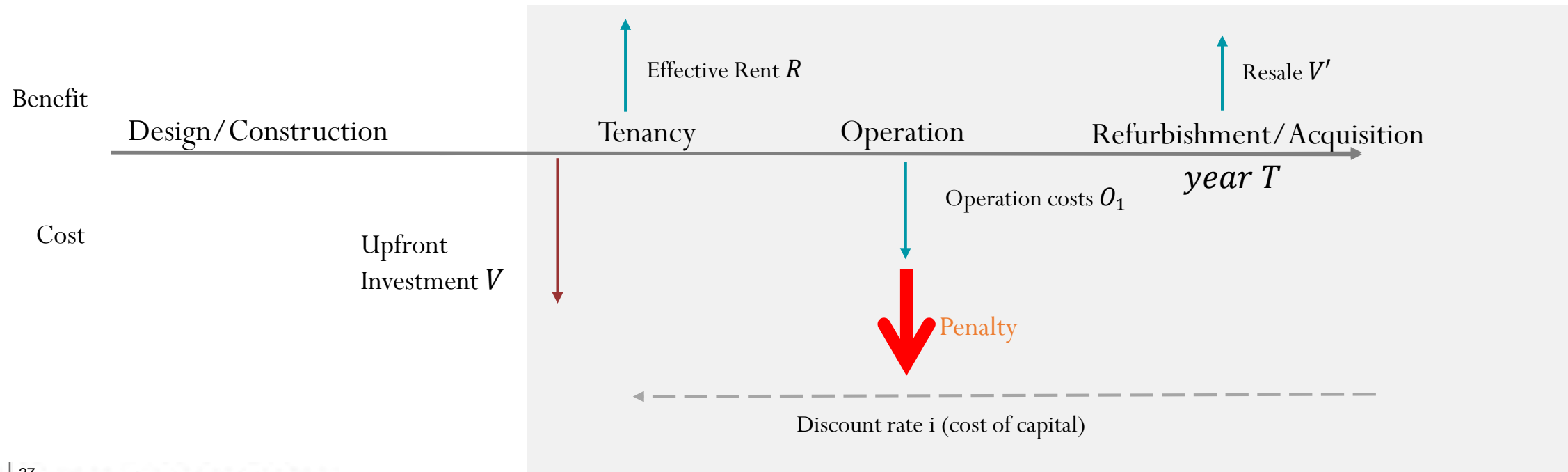


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BERDO 2.0 in Boston

Would the extra penalty make costly green retrofit having benefits outweigh costs?

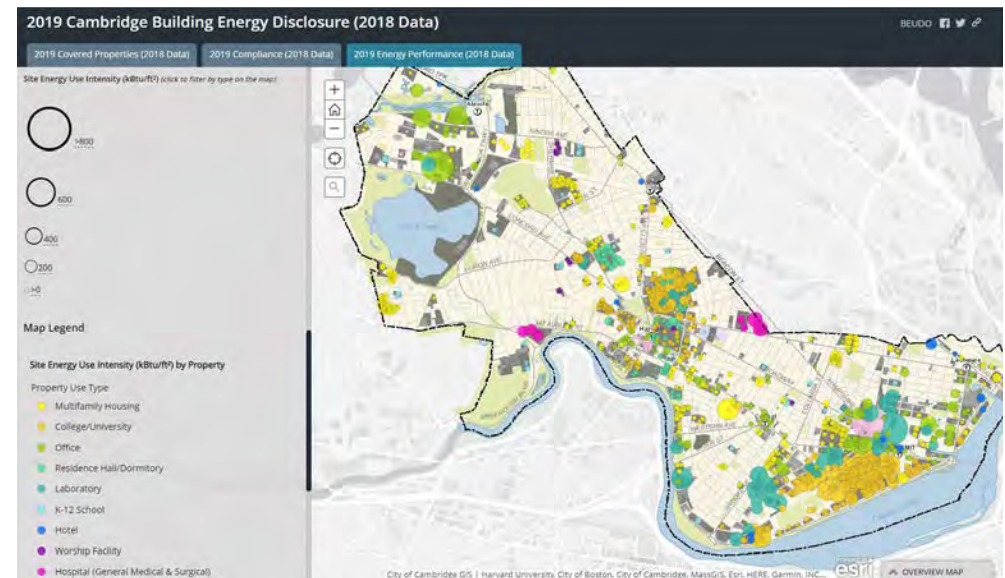
$$CF: \text{Rental income} - \text{Operating costs (e.g. energy)} - \text{Penalty}$$



Cambridge MA: BEUDO

- Cambridge [Building Energy Use Disclosure Ordinance](#):
 - BEUDO sets forth incremental decreases in GHG emissions starting in 2025

	GHG Emissions Requirement Relative to 2018-2019 Baseline
2025	80%
2026	72%
2027	64%
2028	56%
2029	48%
2030	40%
2031	32%
2032	24%
2033	16%
2034	8%
2035	0%



Source:

<https://cambridgegis.maps.arcgis.com/apps/MapSeries/index.html?appid=8c993ecbdf4f48eab403ea36c9886ed9>

Failure to comply with requirements forces buildings to purchase a **\$234 "Alternative Compliance Credit" for each ton of CO2 above the threshold**

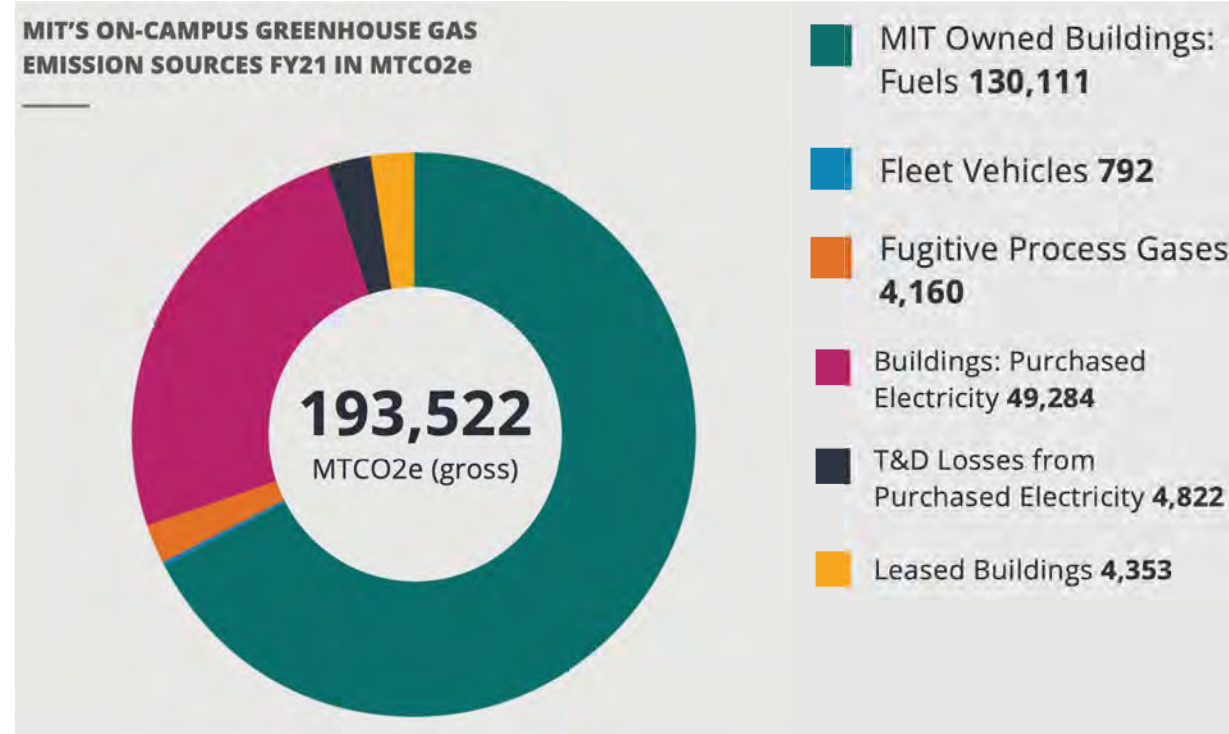
MIT Net Zero Plan

Actions:

- All new buildings and major renovations required to achieve LEED Gold certification
- Replacing MIT-owned vehicles with electric vehicles
- Expanding electric vehicle charging stations
- Installing solar panels on MIT buildings
- Implementing innovative technologies (thermal batteries, geothermal exchange, microreactors, green hydrogen)
- Purchasing carbon offsets

Challenges:

- Replacing existing infrastructure
- Importing electricity from grid vs using co-gen plant
- Growing campus, energy-intensive laboratories
- Costs



2026: Net zero emissions

2050: Zero direct emissions

MIT Net Zero Plan

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Building 9



Hayden Library

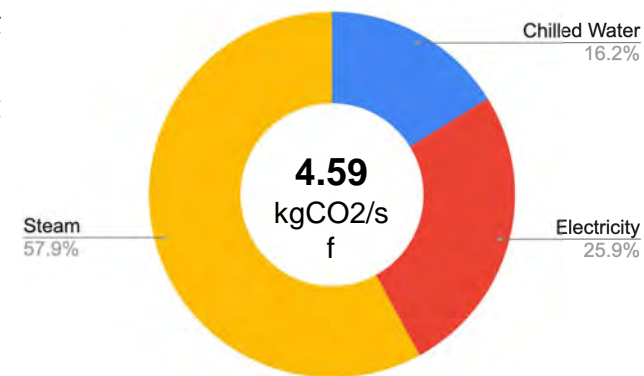
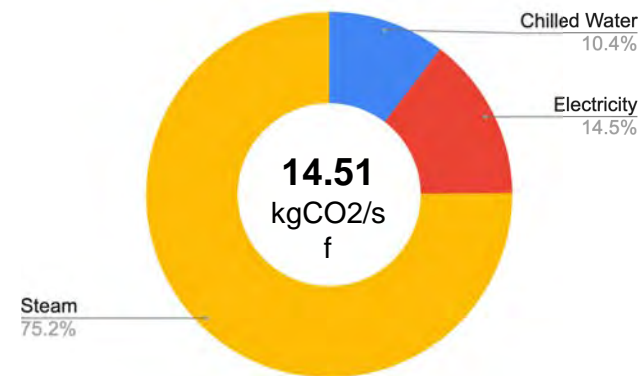
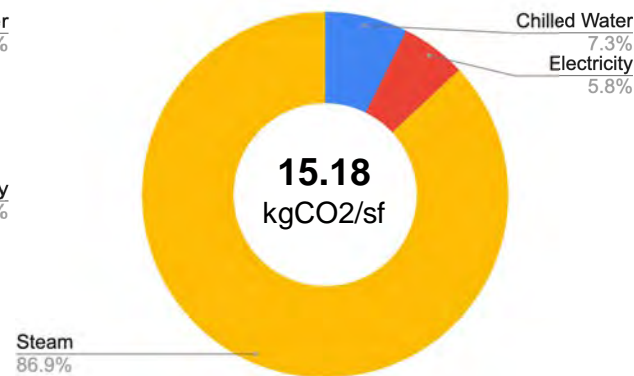
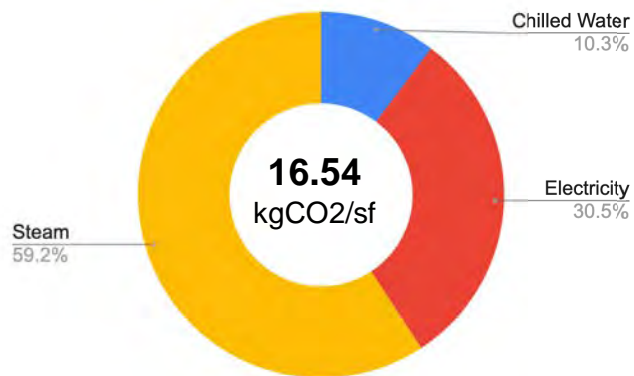


2015

2021

2015

2021

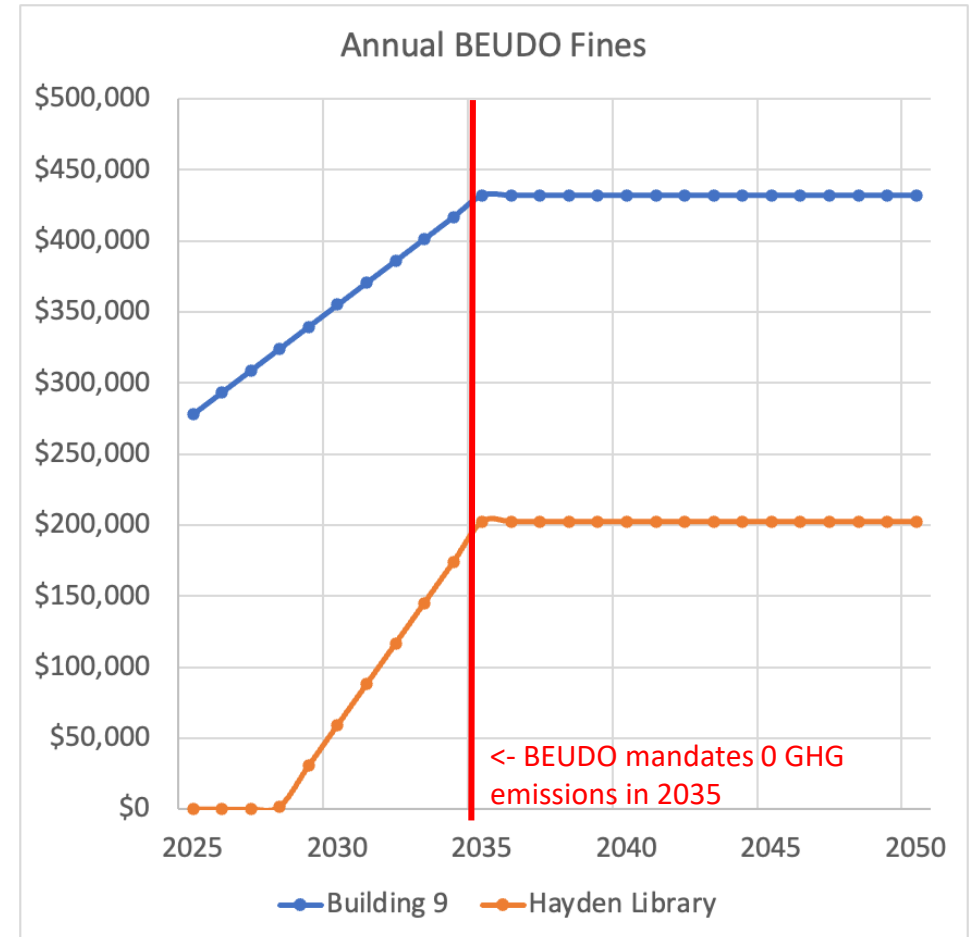


MIT Potential BEUDO Fines

- BEUDO sets forth incremental decreases in GHG emissions starting in 2025:

	GHG Emissions Requirement Relative to 2018-2019 Baseline
2025	80%
2026	72%
2027	64%
2028	56%
2029	48%
2030	40%
2031	32%
2032	24%
2033	16%
2034	8%
2035	0%

Failure to comply with requirements forces buildings to purchase a **\$234 "Alternative Compliance Credit"** for each ton of CO₂ above the threshold

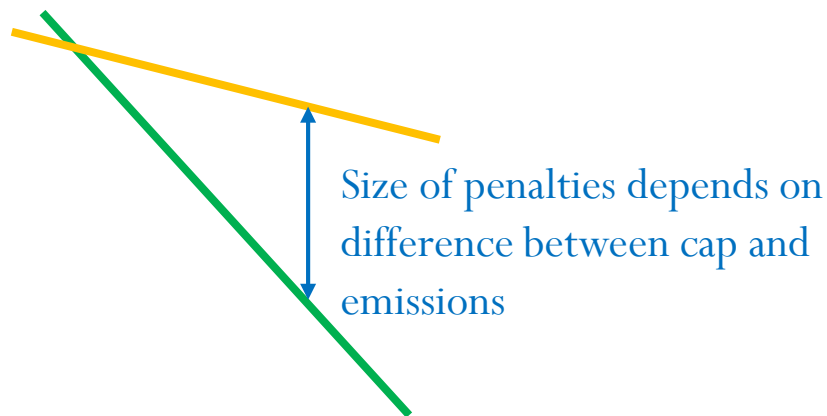


* Assuming GHG emissions remain constant after 2021

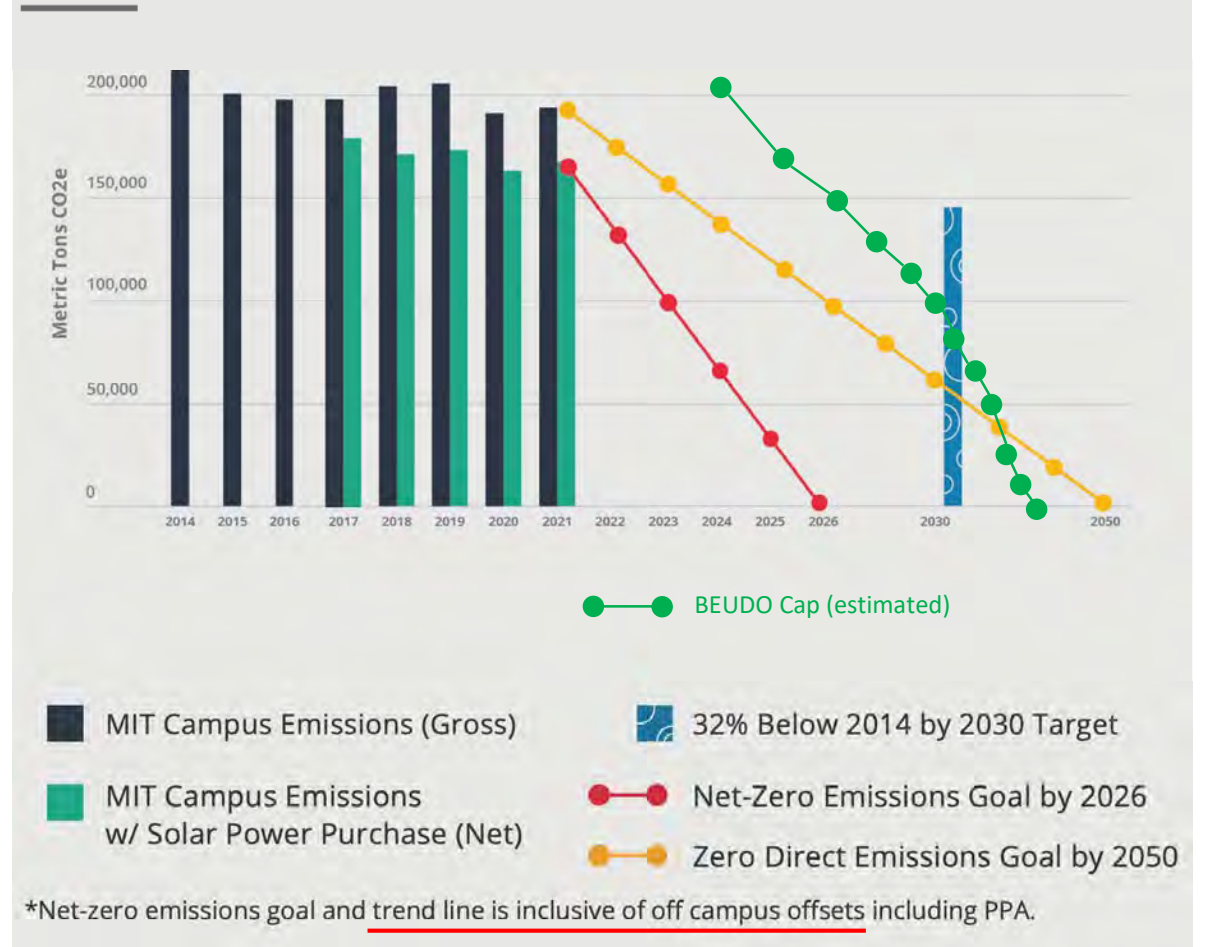
MIT Net Zero Plan & BEUDO

Will BEUDO impose penalties on MIT?

- If BEUDO **accepts offsets** (red trend line), then MIT will face no penalties
- If BEUDO **does not** accept offsets, then MIT could face penalties after 2030 based on direct emissions (yellow trend line)



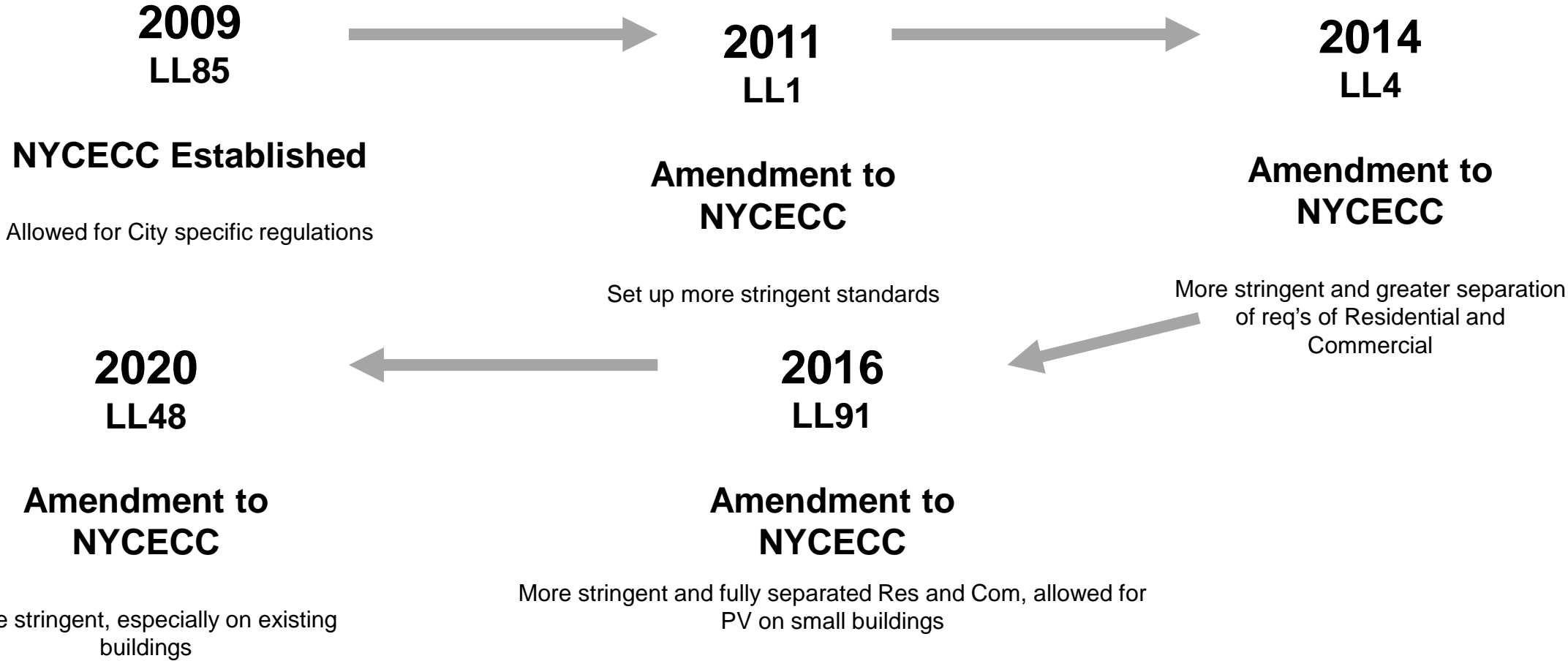
MIT CAMPUS GREENHOUSE GAS EMISSIONS*



“Sticks”: Building Energy Codes

- Energy building codes that set minimum efficiency requirements for new construction. They aim at tackling environmental externalities associated with energy use in buildings.
- Energy codes cover the building itself—for example, the walls/floors/ceiling insulation, windows, air leakage, and duct leakage.
- Enforcement is almost always done by building permitting process.
- The introduction of building codes restricts building supply for non-compliant projects. In addition, the introduction of extra layers in permitting review process is associated with higher project uncertainty for developers, which might limit the overall supply.

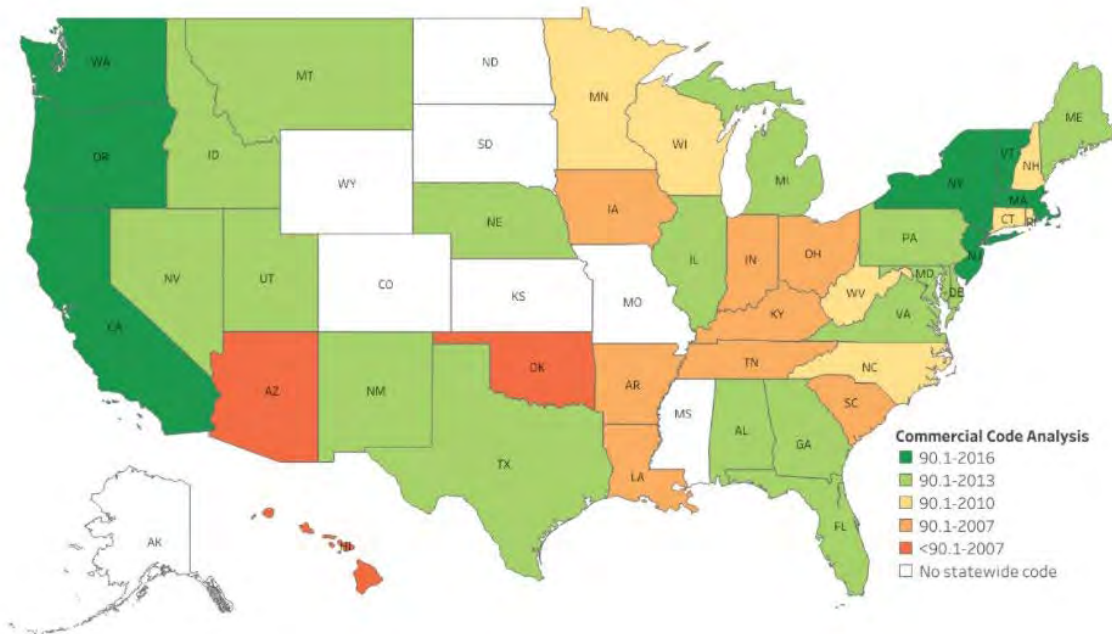
“Sticks”: Energy Building Codes in NYC



“Sticks”: US policy landscape: Building Energy Codes

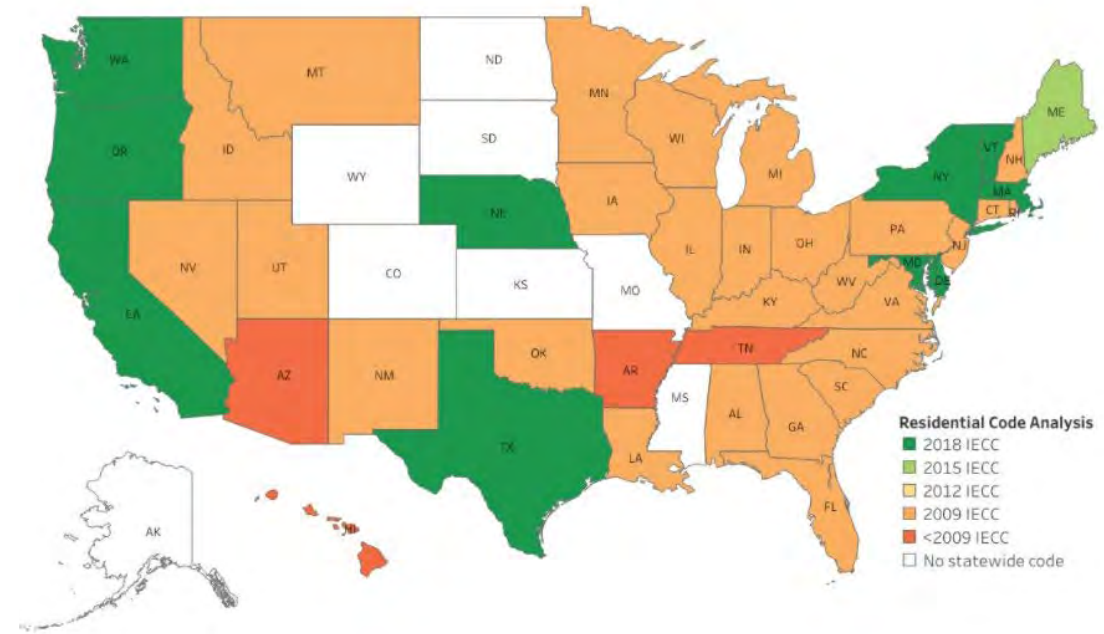
State adoption is reviewed based on the national model energy codes—the International Energy Conservation Code (IECC) for residential buildings and Standard 90.1 for commercial buildings (42 USC 6833). (i.e., the equivalent stringency level)

Commercial Buildings



US DOE BECP: Status of State Energy Code Adoption - <https://www.energycodes.gov/status/commercial>
Updated as of 10/01/21

Residential Buildings



IE BECP: Status of State Energy Code Adoption - <https://www.energycodes.gov/status/residential>
Updated as of 10/01/21

Source: <https://www.energycodes.gov/status>

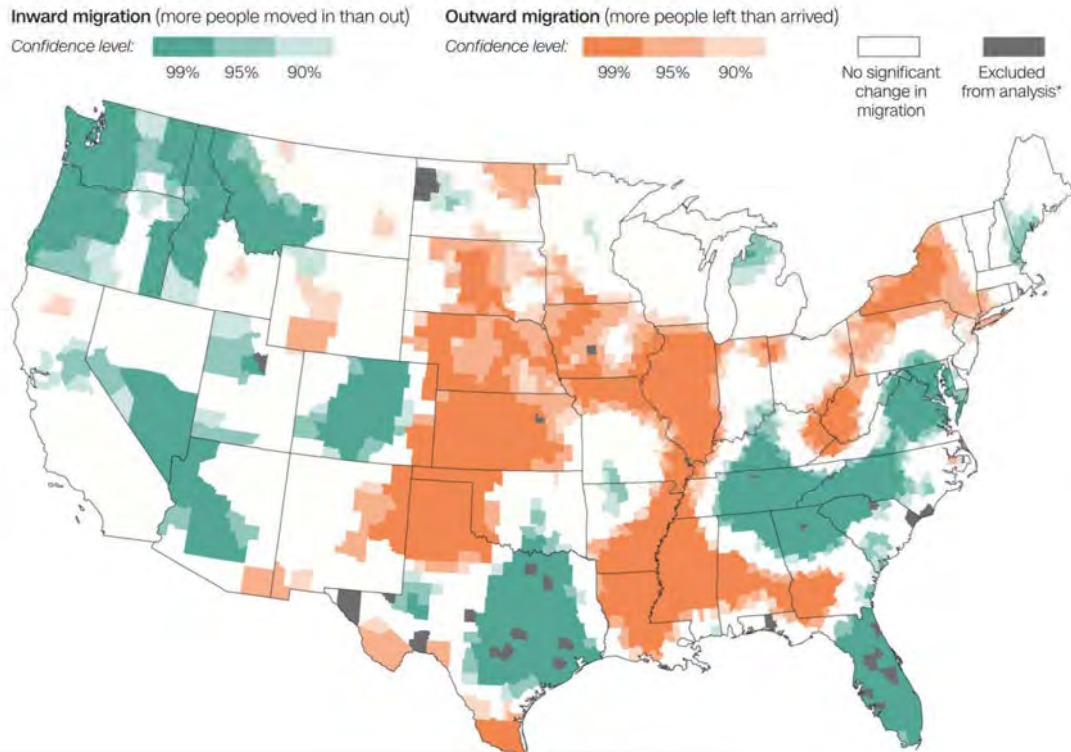
Public domain image courtesy of the US Department of Energy.

CLIMATE RESILIENCY INVESTMENTS IN COASTAL AREAS

Expanding Coastal Population Escalates the Risk

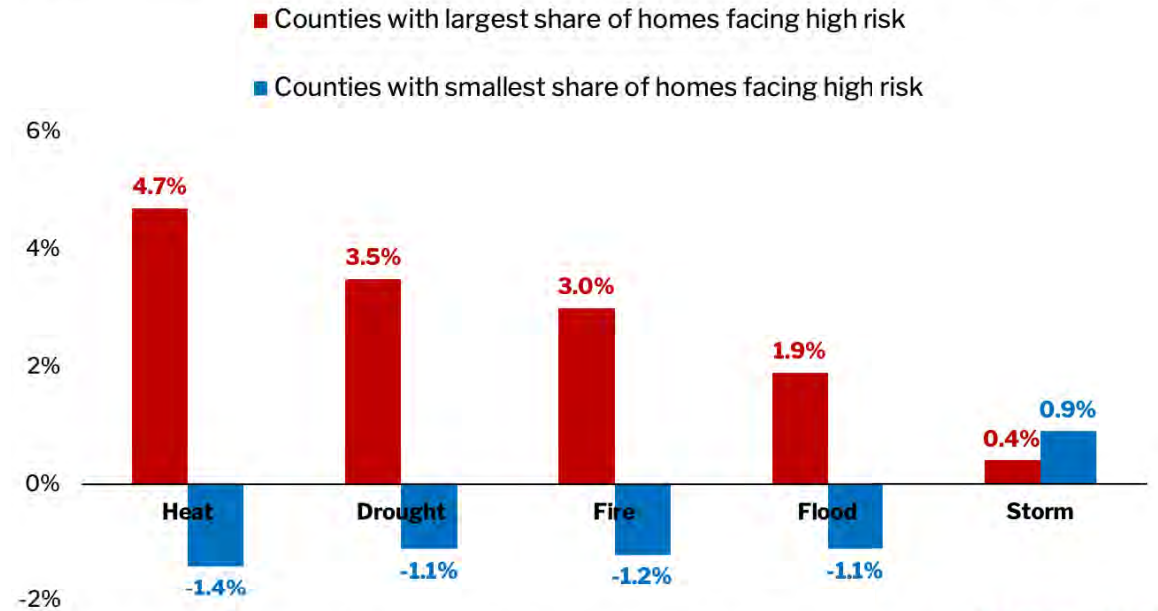
Americans are moving into high-risk zones for wildfires, drought, hurricanes

Researchers at the University of Vermont analyzed how climate and natural hazards affected migration in the United States between 2010 and 2020. Their data shows that, in general, people moved away from areas affected by frequent heat waves, but toward areas that are prone to wildfires, drought and intense hurricanes.



America's Climate-Endangered Areas Are Becoming More Populous

Population change due to net migration in counties with certain climate risks, 2016-2020



Source: Redfin analysis of data from ClimateCheck, county records, U.S. Census Bureau

REDFIN

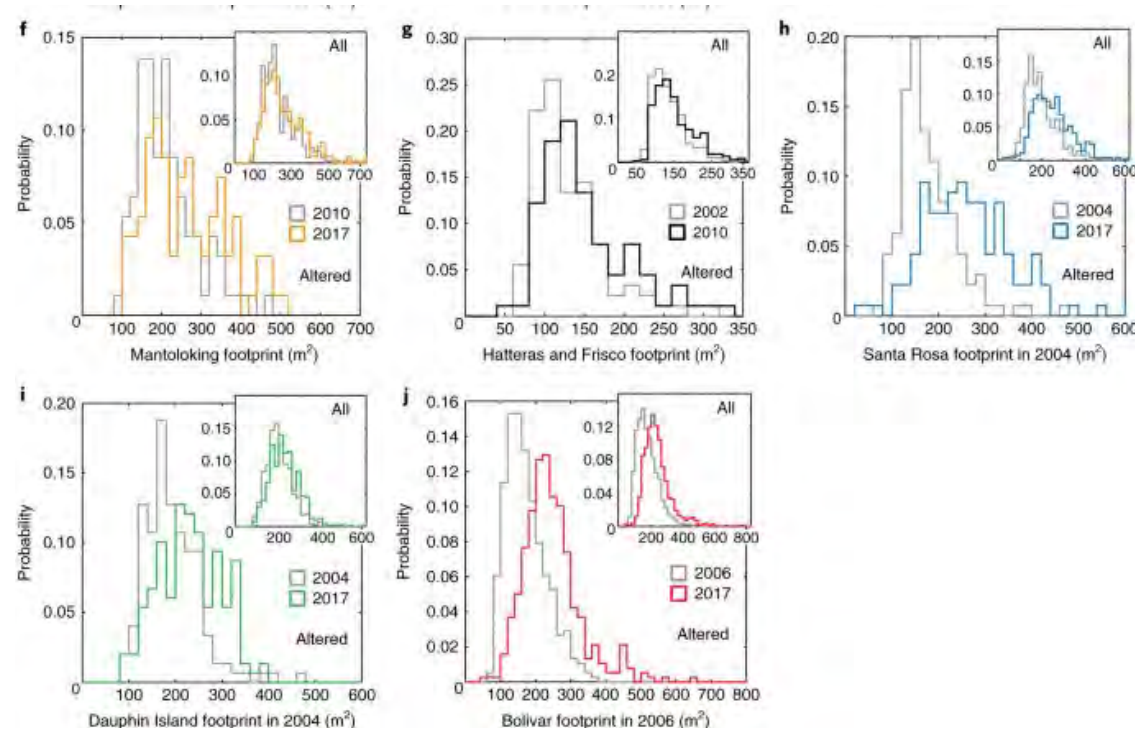
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Building Back Bigger

Expanding coastal population escalates the risk.

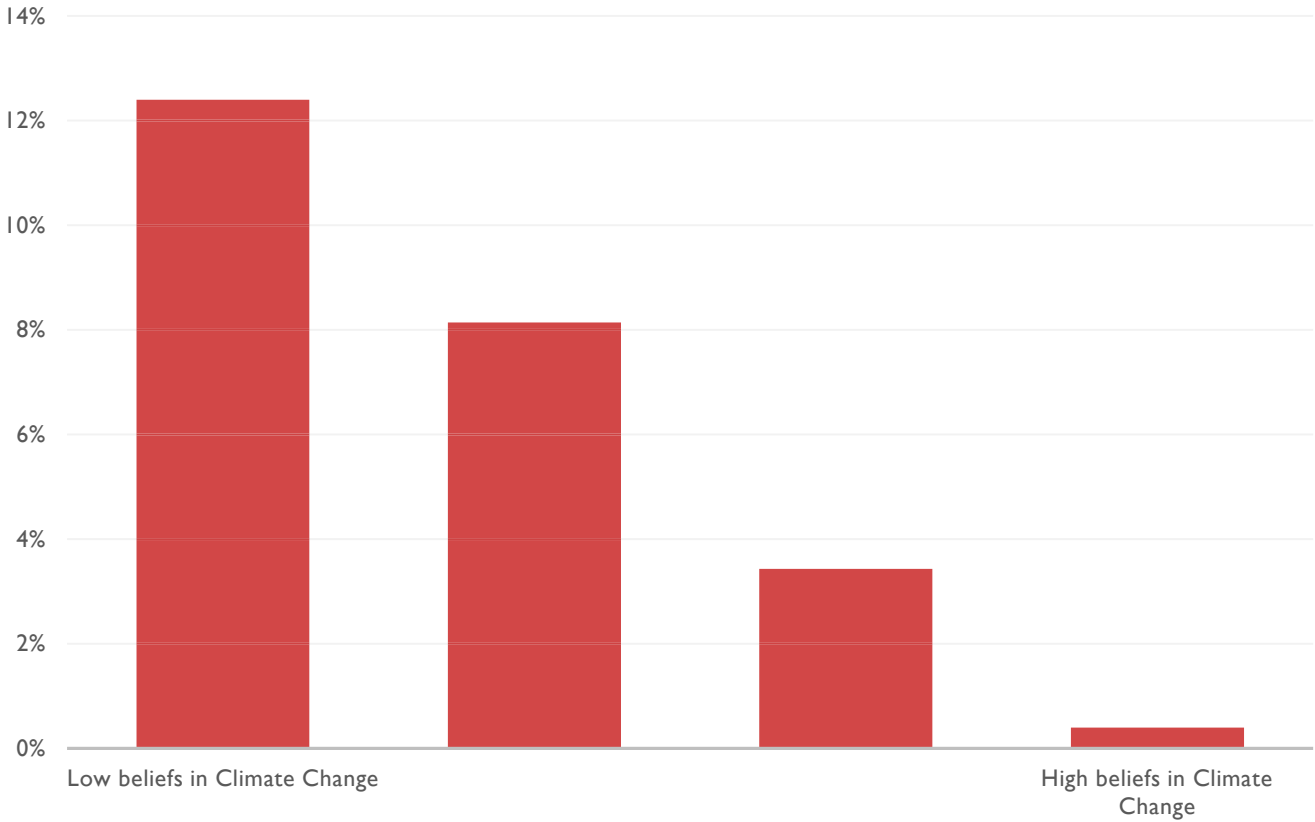
- Despite decades of regulatory efforts in the US, exposure of residential assets to hurricane damage is increasing.
- Comparing plan-view footprints of individual residential buildings before and long after major hurricane strikes, the authors find a systematic pattern of **'building back bigger'** among renovated and new properties.



Source: Lazarus, E. D., Limber, P. W., Goldstein, E. B., Dodd, R., & Armstrong, S. B. (2018). Building back bigger in hurricane strike zones. *Nature Sustainability*, 1(12), 759–762. © Springer Nature, Ltd. All rights reserved. This content is excluded from our Creative Commons license. For more information, see <https://ocw.mit.edu/help/faq-fair-use/>.

Developers Went to Locations with Low Climate Beliefs

Climate belief also plays a role.



Source: Barrage, L. and Furst, J., 2019. Housing investment, sea level rise, and climate change beliefs. *Economics letters*, 177, pp.105-108

Climate Resiliency Investment Strategies



BUILD ON FILL
Raise the land on artificial fill



BUILD LIKE THE KEYS
Elevate structures on pilings and live with more water



BUILD ON HIGH GROUND AROUND TRANSIT
Promote new development in the least flood-prone areas along transit corridors



EXPAND GREENWAYS AND BLUEWAYS
Expand waterfront parks and make room for canals in our most flood-prone neighborhoods



CREATE GREEN AND BLUE NEIGHBORHOODS
Create a network of small spaces for water in our yards, streets, and parks

Key Tools

-  A leaf icon indicates a potential co-benefit of reducing greenhouse gas emissions
-  A sun icon indicates a potential co-benefit of reducing heat

 Elevate on Fill	 Improve Seawalls	 Elevate Buildings	 Elevate Critical Equipment	 Continue Resilient Land Use Planning	 Strengthen Local & State Building Codes	 Offer Voluntary Buyouts	 Increase Waterfront Setbacks	 Increase Permeable Surfaces	 Improve the Regional Drainage System
 Raise Roads	 Protect & Restore Seagrass Beds	 Build Artificial Reefs & Breakwaters	 Restore Mangroves & Marshes	 Improve Local Stormwater Management	 Expand Green Spaces	 Increase Living Shorelines	 Deploy Temporary Flood Panels	 Preserve Wetlands	
 Restore Coral Reefs	 Enhance Barrier Islands	 Enhance Dunes	 Renourish Beaches						

Leave or Rebuild? Striking Inequality

The New York Times

Miami Says It Can Adapt to Rising Seas. Not Everyone Is Convinced.

Officials have a new plan to manage rising water. Succeed or fail, it will very likely become a case study for other cities facing climate threats.



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A Tale of Two Towns: Miami-Dade and NC- Fair Bluff

Rich coastal regions are also acting to prevent population loss.

- Disaster experts have increasingly urged local officials to reduce their exposure by encouraging people to leave vulnerable areas. But cities and counties often resist that advice, worrying that retreat would hurt their economies and upset voters.
- Example: Miami-Dade County
 - [An upbeat strategy](#) for living with more water.
 - With some of the most expensive coastal real estate in the world, it has an **ample tax base** to experiment with solutions — and also enormous **economic incentive to dissuade buyers and investors from leaving**.



Source: <https://www.nytimes.com/2021/03/02/climate/miami-sea-level-rise.html?searchResultPosition=62> . © New York Times. All rights reserved. This content is excluded from our Creative Commons license. For more information, see <https://ocw.mit.edu/help/faq-fair-use/>.

A Tale of Two Towns: Miami-Dade and NC- Fair Bluff

Repeated climate disasters cause small towns to face existential threats.

- Climate shocks are pushing small rural communities, many of which were already struggling economically, to the brink of insolvency.
- Example: Downward spiral of the Fair Bluff
 - A small town in eastern North Carolina, hit by 19 hurricanes between 1954 and 2016
 - Rather than bouncing back, repeated disasters cause residents and employers leave (aided by buyout programs), the tax base shrinks and it becomes even harder to fund basic services.
 - Rebuild plan: Turn the old downtown into park and build a new downtown. Yet \$10M is too much.



Source: <https://www.nytimes.com/2021/09/02/climate/climate-towns-bankruptcy.html?smid=em-share>. © New York Times. All rights reserved. This content is excluded from our Creative Commons license. For more information, see <https://ocw.mit.edu/help/faq-fair-use/>.

Federal Infrastructure Investment: Moral Hazard

Federal grey infrastructure reinforces coastal development.

- The **2021 Bipartisan Infrastructure Act**:
Allocate \$47 billion over several years for climate resiliency.
Mostly to protect existing infrastructure.
- **Moral Hazard**
Would government spending reinforce the expansion of high-risk zone?
- Example: In Charleston, S.C.
 - The city is considering a \$1.1 billion project, largely funded with federal money, to build an eight-mile-long sea wall to protect infrastructure.
 - It also has approved a development project to place thousands of new structures in the flood plain.

The New York Times

Billions for Climate Protection Fuel New Debate: Who Deserves It Most

The \$1 trillion infrastructure law funds programs that tend to favor wealthy, white communities — a test for Biden’s pledge to defend the most vulnerable against climate change.



Federal Infrastructure Investment: Inequality

Billions for climate protection fuel new debate: Who deserves it most?

- Historically, it is wealthier, white communities — with both high property values and the resources to apply to competitive programs — that receive the bulk of federal grants.
- The new climate provisions in the infrastructure bill inject billions of dollars into competitive grant programs. Cities/counties submit applications and federal agencies rank.
 - The **ability of local officials** to use sophisticated tools and resources to write successful applications differs.
 - Communities are required to **pay a share of the project** — often 25 percent, which is unaffordable for struggling towns/counties.
 - Cost-effective: Governments need to demonstrating the **value of the property** that would be protected is greater than the cost of the project, giving disadvantage to low-income neighborhoods.



Is Managed Retreat an Option?

The New York Times

To Save America's Coasts, Don't Always Rebuild Them

Oct. 4, 2022



The New York Times

U.S. Flood Strategy Shifts to 'Unavoidable' Relocation of Entire Neighborhoods

Using tax dollars to move whole communities out of flood zones, an idea long dismissed as radical, is swiftly becoming policy, marking a new and more disruptive phase of climate change.



Is Managed Retreat an Option?

- What is different for managed retreat?
 - (1) Buyouts on a much **larger scale**
(greater numbers of people/whole neighborhoods)
 - (2) Ideally doing it **before disaster strikes**.
- The Obama administration began experimenting with relocation after Hurricane Sandy in 2012. The program ended by President Trump.
- The Federal Emergency Management Agency detailed a new program, worth an initial [\\$500 million](#), with billions more to come, for large-scale relocation nationwide; A similar \$16 billion program is started by The Department of Housing and Urban Development.
- New Jersey has bought and torn down some 700 flood-prone homes around the state and made offers on hundreds more

Discussion: *What would be the pros and cons of managed retreat?*



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11.350 Sustainable Real Estate Spring 2023

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