



# Climate Change Adaption & Mitigation

Impacts and Opportunities for the Real Estate and Construction Sectors



**Verdani**  
PARTNERS



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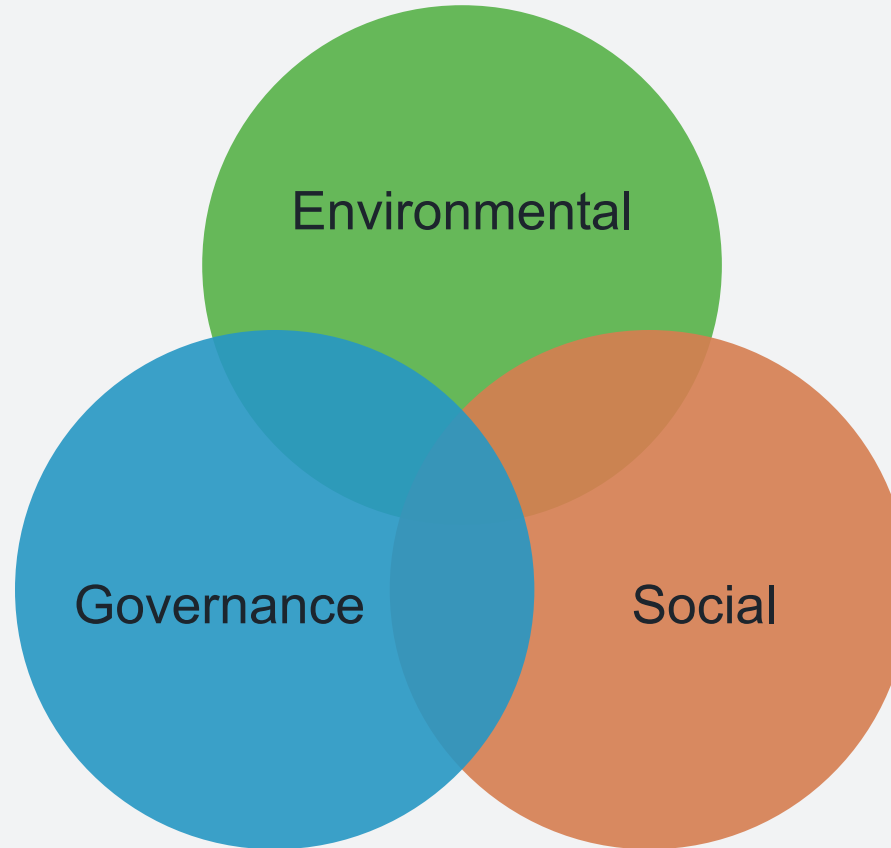
# Climate Change



# Environmental Social Governance (ESG)

## Environmental

- Conserve Natural Resources (Energy, Water, Waste)
- **Decarbonization**
- **Resilience**
- Biodiversity



## Governance

- Board-level Oversight of ESG
- Risk Management
- Governance Policies
- Ethical Business Practices
- ESG Disclosures and Transparency

## Social

- Health, Wellbeing, and Safety
- Diversity, Equity, and Inclusion
- Human Rights
- Stakeholder Engagement and Education

Source: VIBE ESG Reporting Frameworks

Verdani Partners; NAREIT Guide to ESG Reporting Frameworks

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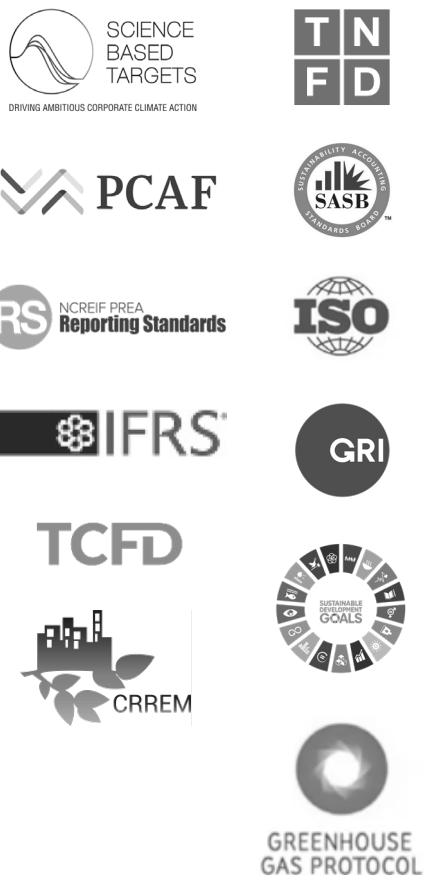
# ESG Trends

- Pressure builds to deliver on net zero commitments
- Preparing for climate change impacts
- Biodiversity joins climate to define ESG's environmental pillar
- Ensuring equity in the green transition
- Polarized attitudes on ESG
- Increasing complexity of ESG disclosure regulations
- Green Energy Transition will accelerate
- Assets need to decarbonize or become stranded
- The cost of inaction on climate risks will be high
- Evaluating human rights across the supply chain



# ESG Reporting Frameworks

## Standards & Guidance



## Voluntary Disclosure



## Involuntary Third-Party



## Net Zero Initiatives



# Top ESG Regulations

## New SEC Regulation

Enhance and standardize climate-related disclosures

- ✓ **Addressing physical and transition risks**
- ✓ Making **net zero commitments** and setting carbon reduction targets
- ✓ **Tracking** Scopes 1, 2, and relevant Scope 3 emissions
- ✓ Annual 3rd party **verification** of emissions data
- ✓ **Publicly disclosing** risks, targets, and progress in your annual ESG reports and from 10-k, etc.

Applies to public CREs — **ripple** effects expected for **private CREs**

## Anti-Greenwashing SEC Marketing Rule

- Required for **registered investment advisors**
- In effect **November 4, 2022**
- Impacts private companies too
- Advertisements must be:
  - Fair and balanced/  
Free from "materially misleading" content/  
Verifiable
  - **Will need to add new table on annual ESG Reports to back up ESG Claims.**

## EU SFDR for US Companies

- **Asset managers that raise money in the EU must comply**, even if they are based in the U.S.
- **Companies with over 500 employees**
- All the articles (in addition to articles 7, 8, 9, 10, and 11) are mandatory for 500+ employee companies
- Promoting environmental or social characteristics (mandatory disclosure for companies with >500 employees)

## Inflation Reduction Act

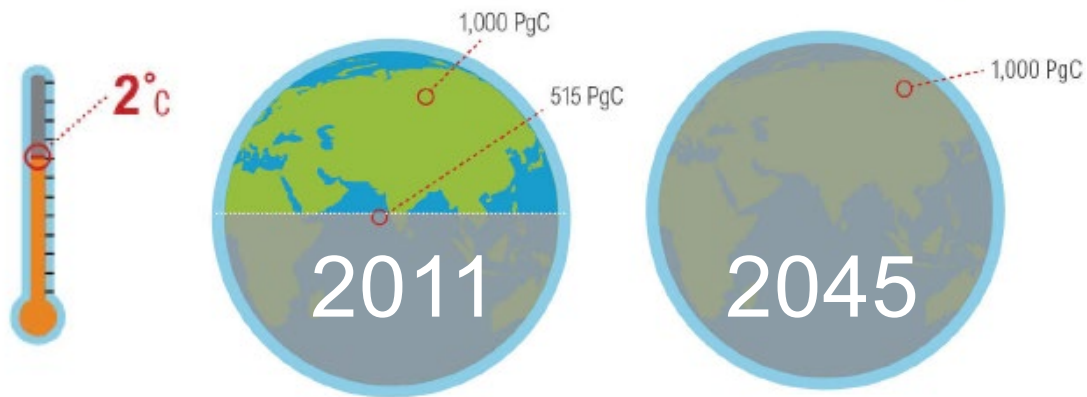
- Intended to **accelerate** the development and adoption of **green new technologies**
- **New and revived tax credits and deductions.**
- Incentivizes states to adopt **stringent energy codes with net zero stretch codes**
- *“Investments will help increase GHG emissions by about 40% by 2030...and reaching net zero by 2050.”*
  - *US White House*

# What is the Carbon Budget?

The carbon budget is the estimated amount of carbon dioxide the world can emit while still having a likely chance of limiting global temperature rise to 1.5°C above pre-industrial levels. The international scientific community estimates this budget to be 1 trillion tonnes of carbon (1,000PgC).

## Balancing Our Budget

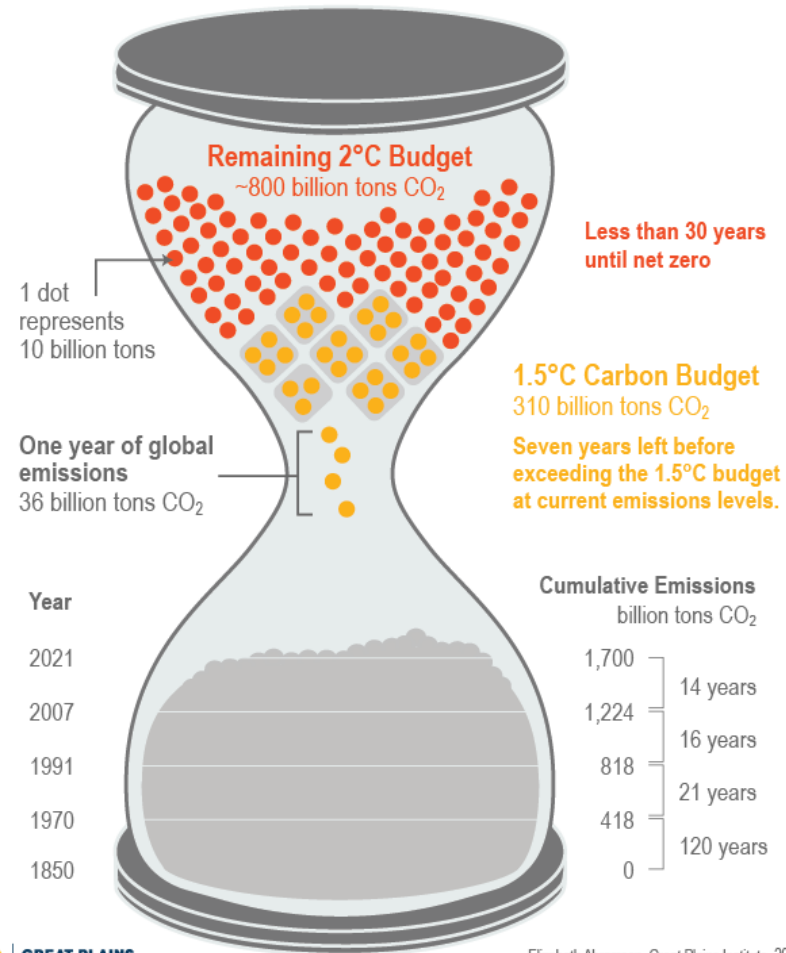
*By 2011, we had already emitted around half our allowance.*



Source: WRI & University of Cambridge

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## The Earth's Carbon Budget



Elizabeth Abramson, Great Plains Institute, 2021.  
Based on IPCC 2019 & Global Carbon Project 2020.





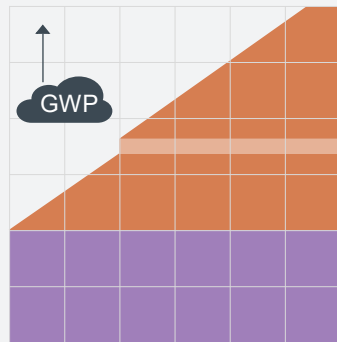
# Real Estate's Role in GHG Emissions

The real estate industry (including the construction industry) is responsible for more than a third of the world's energy consumption and for almost 40% of global CO2 emissions. The trend is increasing.

## Total Carbon Emissions Over Time

### Scenario A

- Upfront embodied carbon remains as is
- Energy grid remains as is

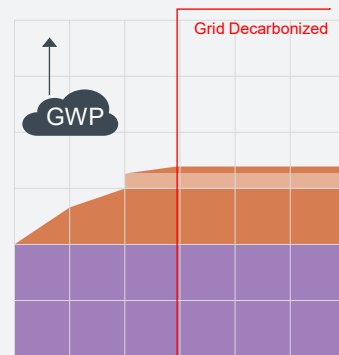


Building Life Span

■ Upfront Embodied Carbon

### Scenario B

- Upfront embodied carbon remains as is
- Energy grid increases in efficiency until it switches to renewable energy (is "decarbonized")

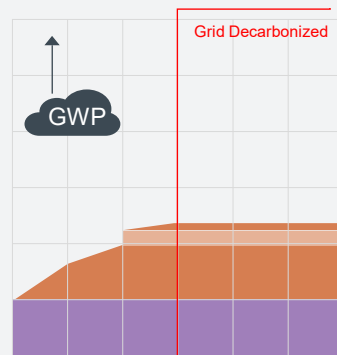


Building Life Span

■ Operational Carbon

### Scenario C

- Upfront embodied carbon is reduced
- Energy grid increases in efficiency until it is decarbonized



Building Life Span

■ Embodied Carbon Due to a Renovation

To keep to  
**1.5°C** CO<sub>2</sub>  
emissions must

↓ **50%**

by **2030** and

**Net Zero**

by **2050**

+

Renewable energy  
must supply

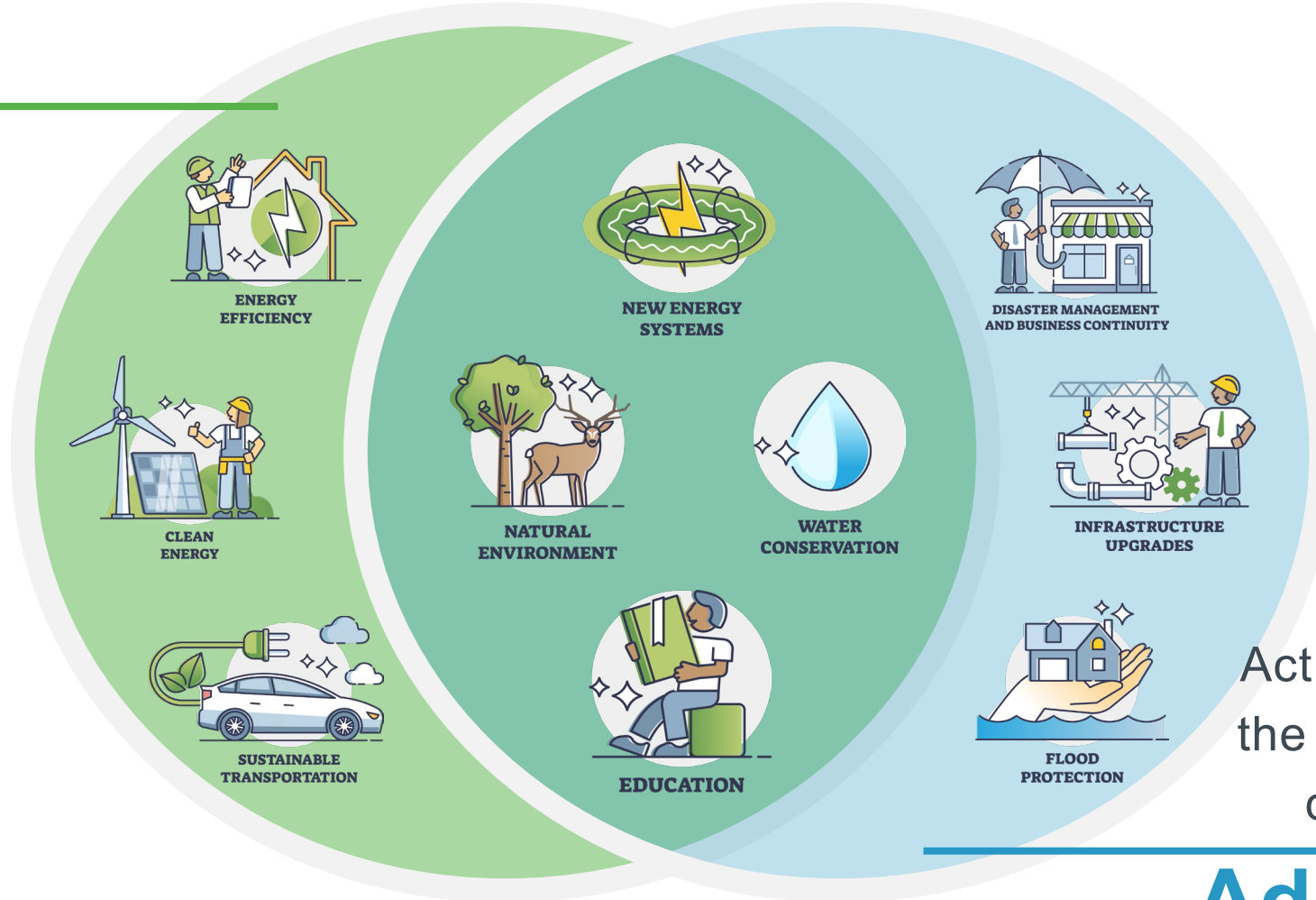
**70–80%**

of power by **2050**

# Climate Change Mitigation & Adaptation

## Mitigation

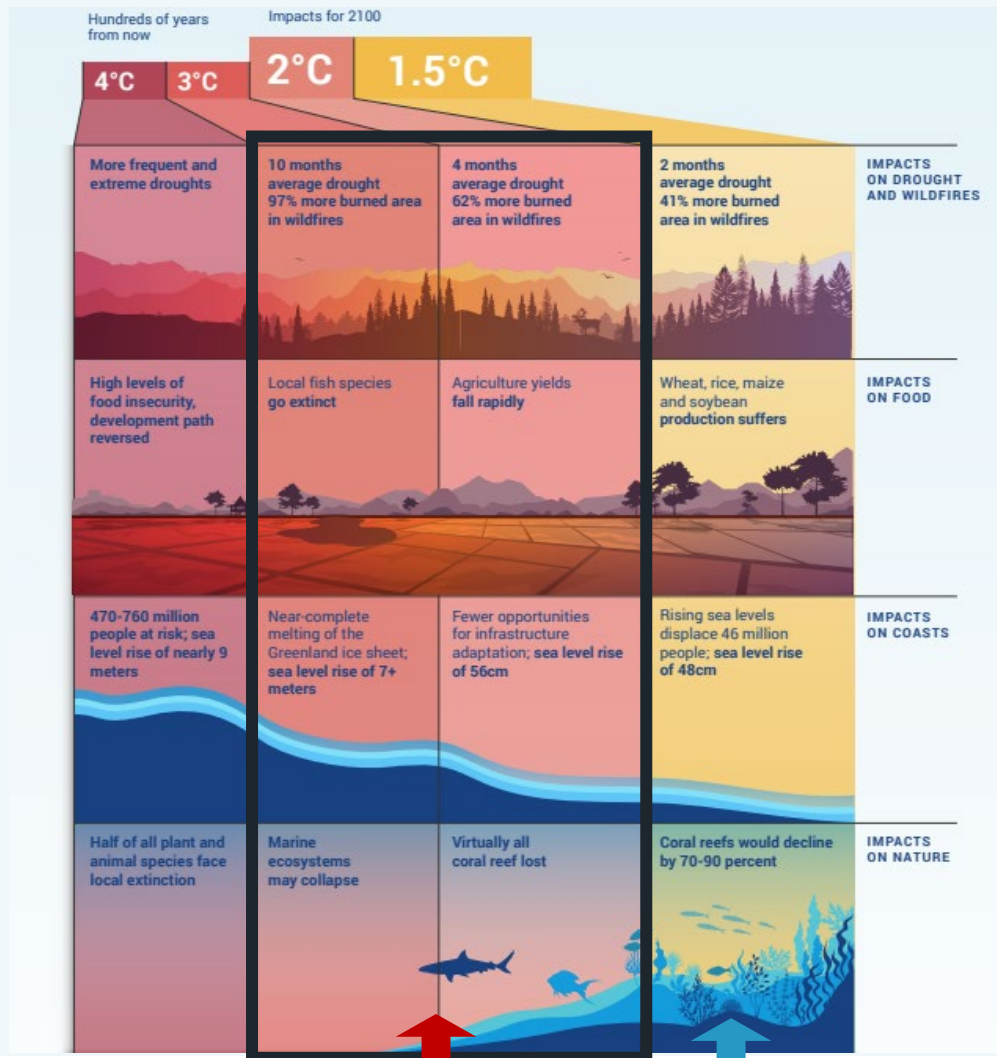
Actions to reduce emissions that cause climate change



Actions to manage the risks of climate change impacts

## Adaptation

# Emissions Gap for 2030



## Last Call For Climate Action

New pledges lower global greenhouse gas emissions in 2030 by 7.5% compared to prior pledges.

To get on track to 2°C, a 30% reduction is needed, whereas a 55% reduction is needed to get on track to 1.5°C.

According to the latest UN assessment report published, "*the world is on track for around 2.5 degrees Celsius of warming by the end of the century*".

Source: [UNEP](#)

Current trajectory is 2.5°C  Need to target 1.5°C

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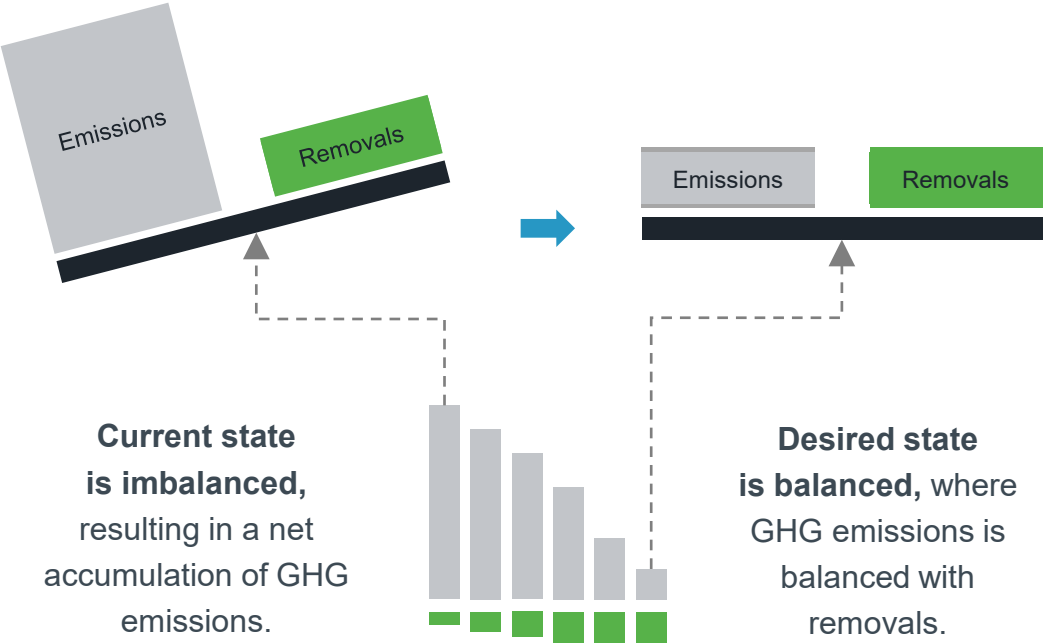
# Climate Change Mitigation



# Decarbonization & Net Zero

## Current and Desired States of “Anthropogenic” GHG

(GHG associated with human activity)



**Current state is imbalanced,** resulting in a net accumulation of GHG emissions.

**Desired state is balanced,** where GHG emissions is balanced with removals.

The IPCC defines net zero as that point when “anthropogenic (man made) emissions of greenhouse gases to the atmosphere are balanced by removals over a specified period”.

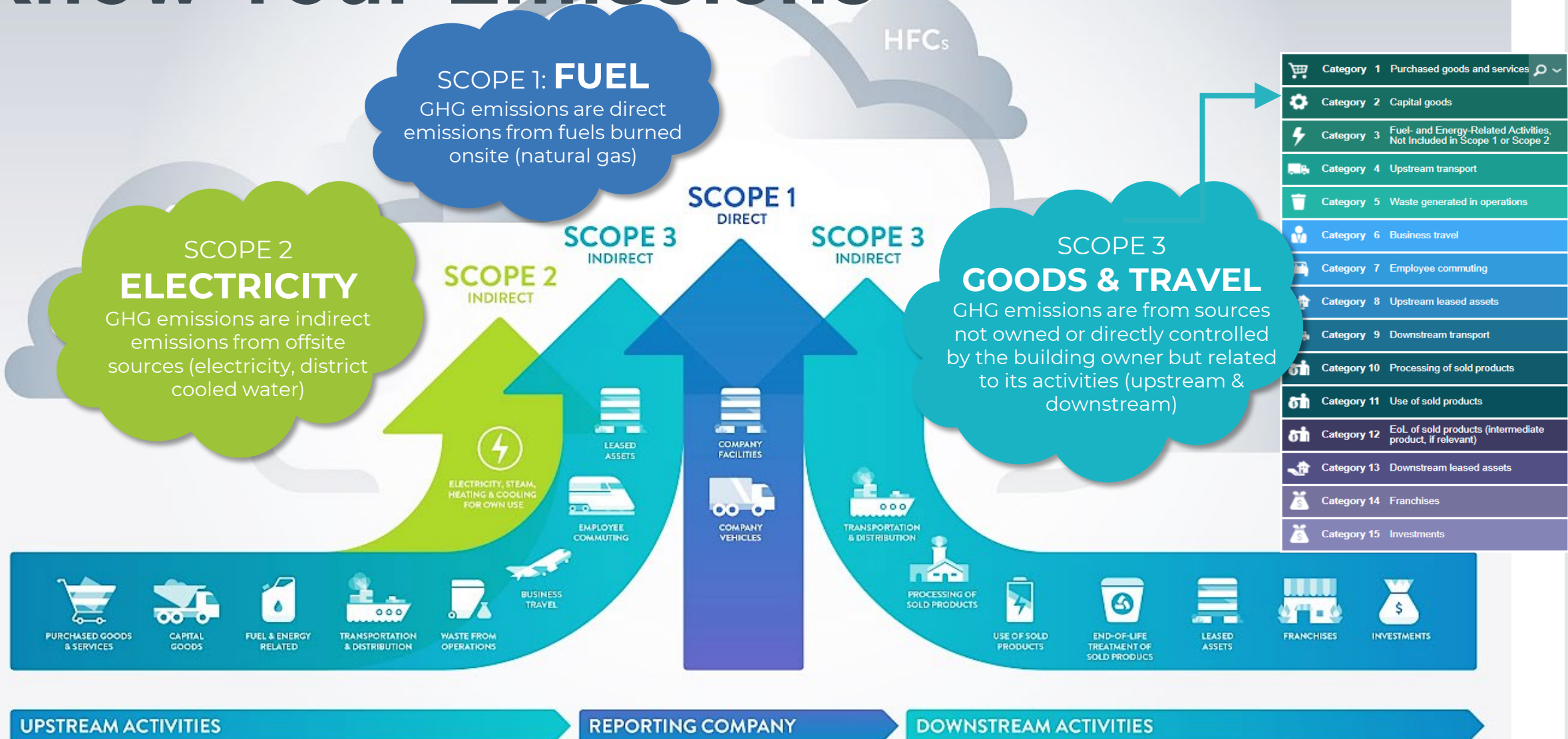
The Paris Agreement sets out the need to achieve this balance by the second half of this century.

## Net zero is a 2-part give-and-take approach:



Source: <https://sciencebasedtargets.org/wp-content/uploads/2020/09/foundations-for-net-zero-full-paper.pdf>

# Know Your Emissions



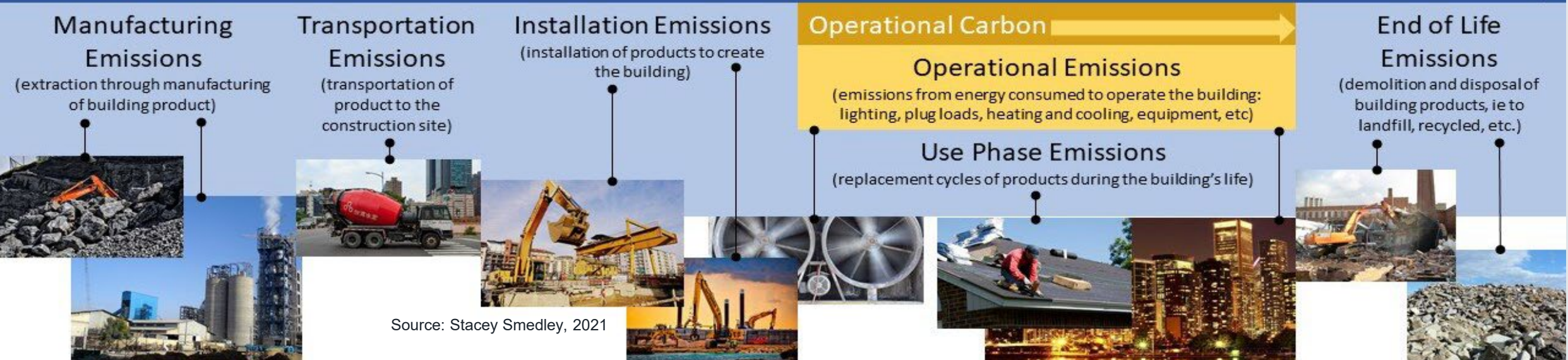
HFCs



# Understanding a Building's Carbon Footprint



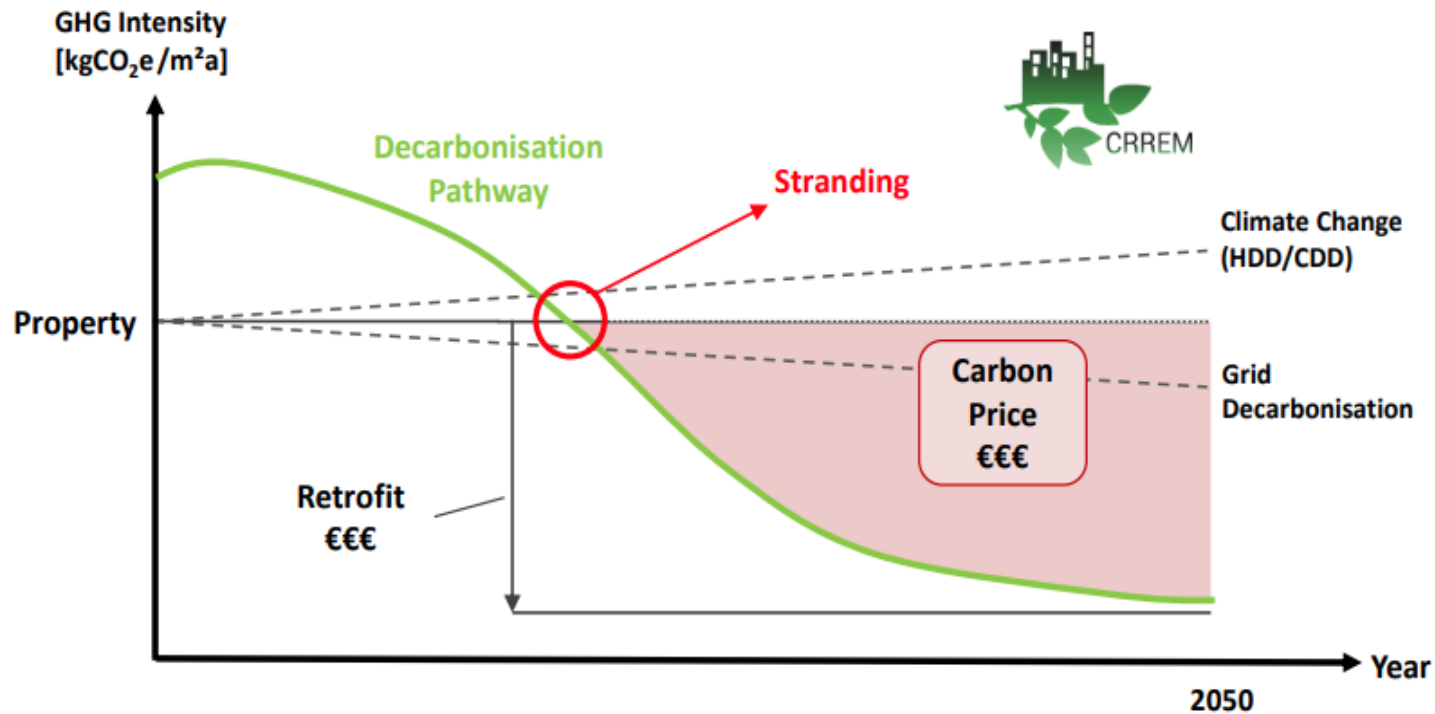
## Embodied Carbon



Source: Stacey Smedley, 2021

# Carbon Risk Analysis tool & CRREM

## Asset Level Stranding Diagram



CRREM is aligned with:



**Decarbonisation Pathways**  
Aligned with 1.5oC and 2oC global warming, country- and building type specific

+

**Buildings' Carbon Performance**  
Energy consumption, carbon emission factors, grid decarbonization, changed heating and cooling demand, normalization.

=

**Carbon Risk Analysis**  
Year of stranding, excess emissions, carbon costs, energy costs, benchmarking.



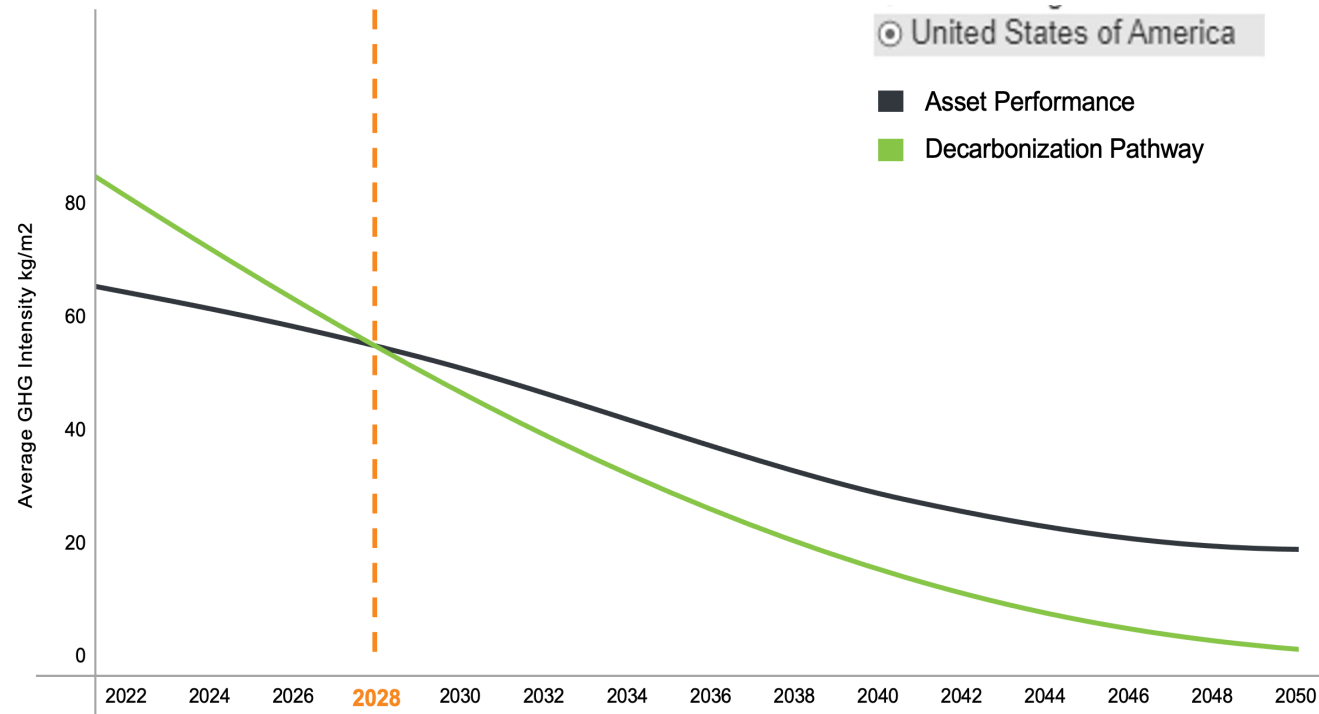
# U.S. CRE Market Stranded Asset Risks

Real estate assets not working to electrify, decarbonize and reduce their dependence on fossil fuels will become stranded and face increased financial risks.

## Top Financial Risks

- Asset write off/devaluation
- Climate adaptation Risks/Costs
- High operating expenses
- Investments needed to decarbonize
- Reputation and regulatory risks of non-compliance

## GRESB CRREM Pathway, United States



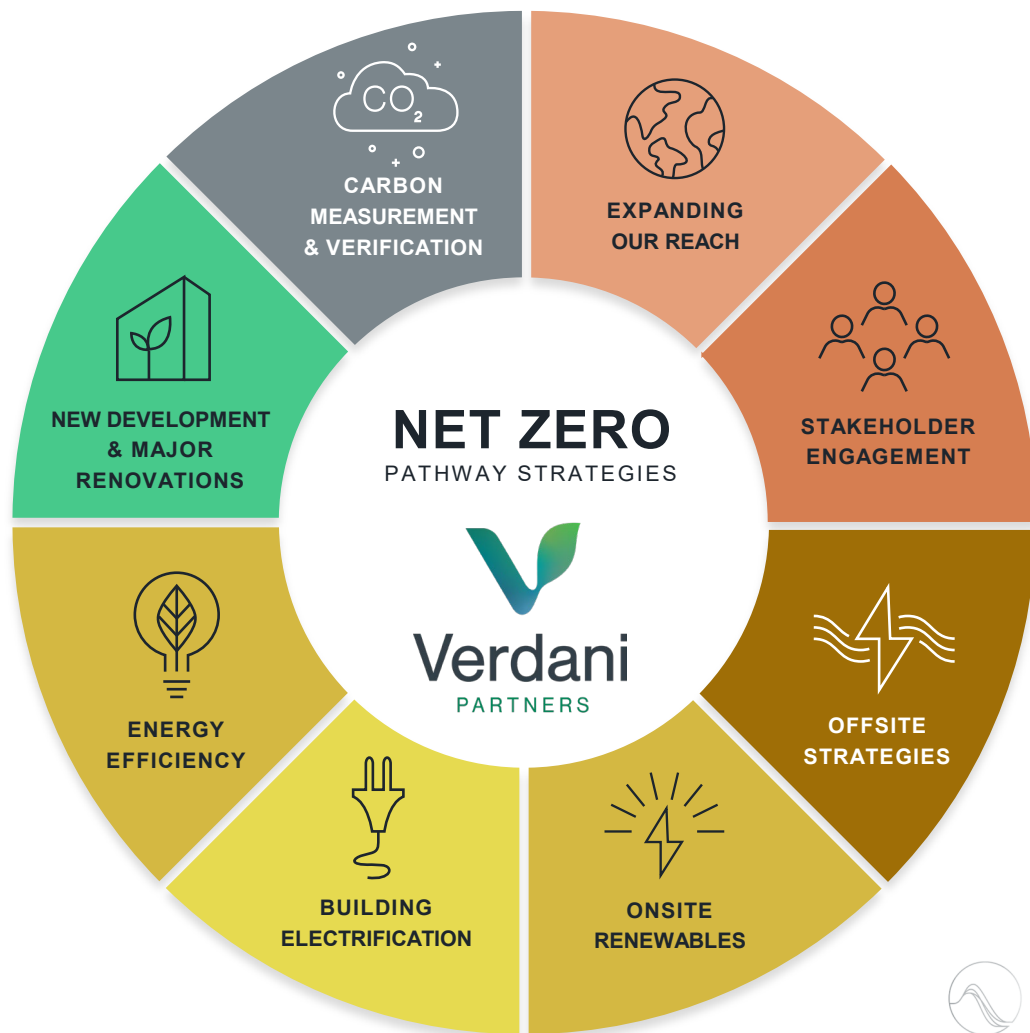
Source: <https://www.gresb.com/nl-en/2022-real-estate-results>

Recommend ordering GRESB's Transition Risk Report

## Stranded Asset

An asset for which GHG emissions are no longer tracking on a path to achieve a decarbonization performance target that aligns with limiting global warming to 1.5–2.0 degrees Celsius, per the Paris Agreement and IPCC.

# Net Zero Pathway Strategies



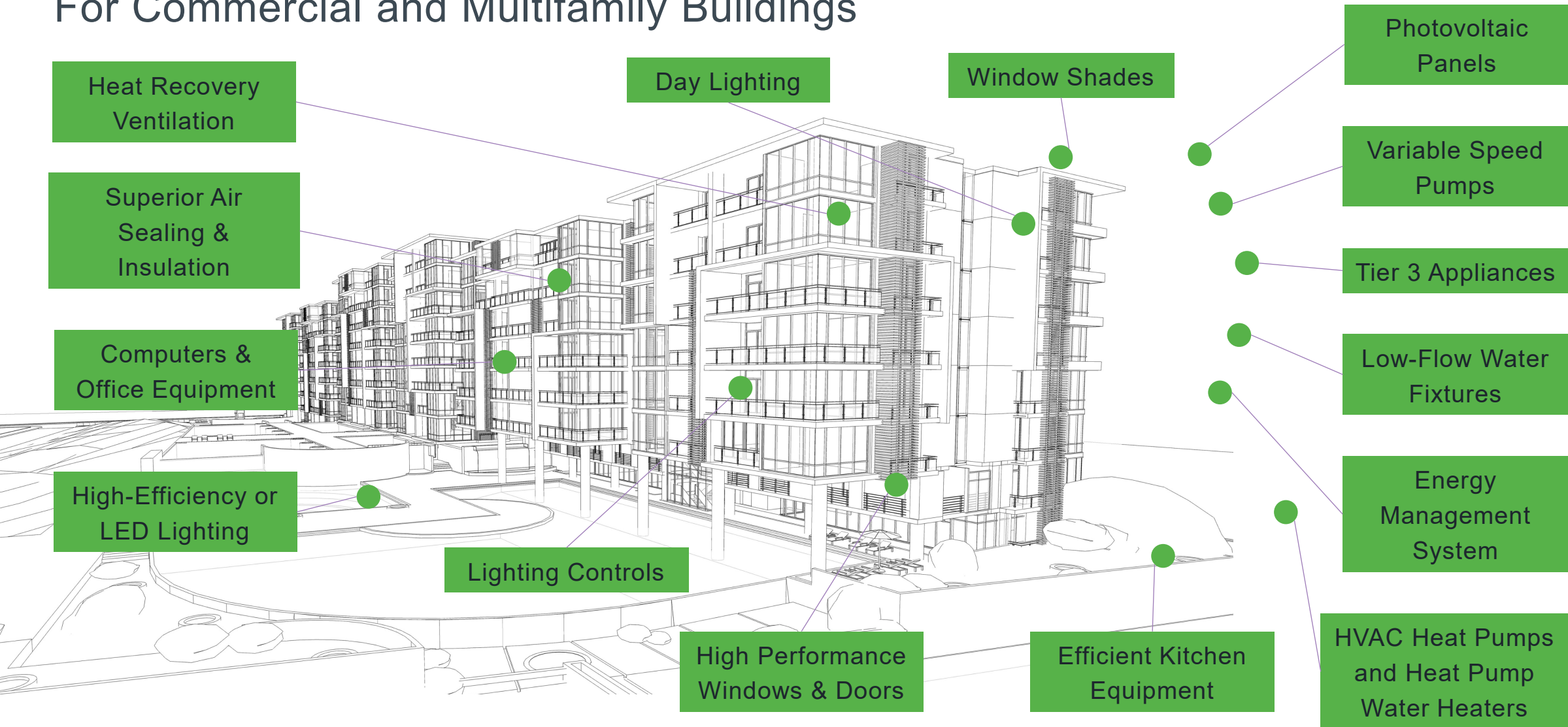
Investment industry at ‘tipping point’ as \$43tn in funds commit to net zero.

“The latest signatories mean \$57.5tn in assets, or almost half of the asset management sector globally, are committed to a net zero emissions target. The industry oversees \$100tn worth of assets, according to data from Willis Towers Watson. A total of 236 investors are now part of the Net Zero Asset Managers initiative.”



# Net Zero Building Strategies

## For Commercial and Multifamily Buildings



# Carbon Reduction Net Zero Frameworks

	BBP	CRREM	NZAM	ULI GREENPRINT	NZAOA	RE100	SBTI	WORLDGBC
<b>NET ZERO GOAL</b>	Portfolio-wide net zero carbon emissions by 2050	Paris Agreement-aligned 1.5°C/2°C net zero pathways	Support goal of net zero GHG emissions by 2050	Net zero carbon operations by 2050	Net zero emissions by 2050	100% renewable electricity by 2050	Net zero emissions by 2050; 50% emission reduction by 2030	Maximize operational and embodied carbon reductions by 2030
<b>REPORTING METHODOLOGY</b>	BBP Net Zero Carbon Pathway Framework	CRREM online tool	Must be science-based and Paris Agreement-aligned	To Greenprint directly	Alliance Target Setting Protocol	CDP Climate Change Questionnaire	Publicly disclosed	WorldGBC Commitment Reporting Form
<b>DISCLOSURE CONTENT</b>	Net Zero Carbon Pathway progress, energy performance, climate-related risks	Building characteristics, use, and energy data	% assets in commitment, interim targets, target methodology, TCFD disclosures, climate action plan (scope 1-3 emissions)	Net zero target progress: total carbon emissions, energy efficiency, renewable energy, offsets	Scope 1-3 emissions, decarbonization targets, GHG reduction strategies	Low-carbon energy use/production targets and energy initiatives, energy use performance	GHG emissions inventory and target progress	Operational and embodied carbon emissions
<b>REPORTING TIMELINE</b>	Annually	From 2018 onwards	Annually	Annually	1-year, annual, and 5-year requirements	Annually	Annually	Annually
<b>PARTICIPATION</b>	Voluntary	Voluntary <sup>1</sup>	Voluntary	Voluntary	Voluntary	Voluntary	Voluntary	Voluntary
<b>HOW TO COMPLY</b>	Publish a Net Zero Carbon Pathway and annually disclose on progress	—	Work with asset owners on goals, set interim targets, strengthen target every 5 years, annual disclosures	Make portfolio-wide commitment and annual reporting	Publicly report targets, portfolio baseline assessment, set interim targets every 5 years	Public commitment, annual reporting	Set Paris-aligned near- and long-term targets, decarbonize >90% scope 1-3 emissions before 2050	Commitment to 2030 operational and embodied carbon goals, reporting after two years
<b>FEE TO MAKE COMMITMENT OR JOIN INITIATIVE</b>	Free	Free	Free	Free for Greenprint members	Annual €5,000-€20,000 fee	\$5,000 annual fee	\$9,500 target submission	Free
<b>LOCATION</b>	United Kingdom	Global	Global	Global	Global	Global	Global	Global
<b>TIME COMMITMENT</b>	Medium	Low	High	Low	High	High	High	Medium
<b>INDUSTRY ADOPTION</b>	11,000+ properties, +£400 billion AUM	10,000+ assets, €1 trillion AUM	273 signatories, \$61.3 trillion AUM	1.79 billion square feet, \$1 trillion AUM	\$10.6 trillion AUM, 74 institutional investors	370+ members, 380+ TWh/yr of renewable energy	1,200+ commitments aligned with 1.5°C pathway	20,000 assets, 169 signatories

Source: Schoenleber, C. (2022). Navigating ESG reporting frameworks: A comprehensive guide. Verdani Institute for the Built Environment. [www.verdani-institute.org/whitepaper-esg-reporting-frameworks-guide](http://www.verdani-institute.org/whitepaper-esg-reporting-frameworks-guide)



# Climate Change Adaptation



# What is Resilience?

*“The capacity to prepare for disruptions, recover from shocks and stresses and adapt and grow from a disruptive experience.”*

— Judith Rodin

- Business Continuity
- Public Health
- Social Equity & Cohesion
- Emergency Preparedness
- Sustainability

## Adaptation



# Climate Related Resilience Risks



Aims to develop recommendations for voluntary climate-related financial disclosures that are consistent, comparable, reliable, clear, and efficient.

Voluntary disclosures useful for

Lenders	Insurers	Investors
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2 Types of Risks

Physical Risk	Transition Risk
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Sources: TCFD

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# Resilience Program Roadmap

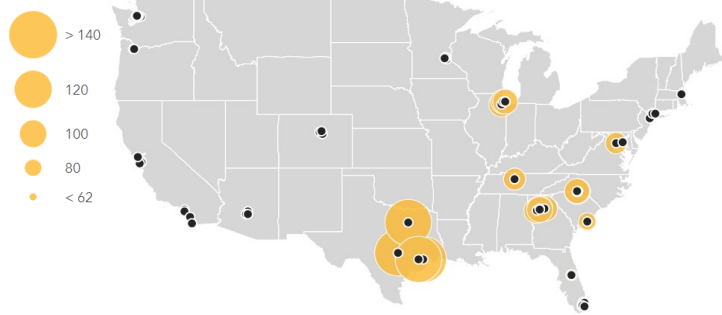




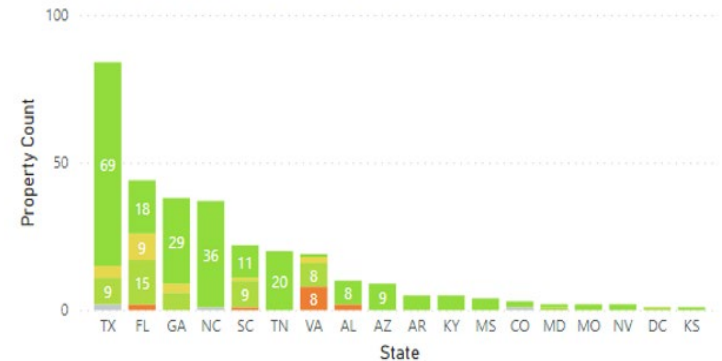
# Risk Assessment Phases

## High-level Desktop Risk Assessment

Billion-Dollar Weather and Climate Disasters (NOAA)



Risk level (Blank) High Low Medium None



## Detailed On-site Risk Assessment

*Nova anticipates the following:*

• Replace damaged landscaping	\$20,000
• Façade finishes/sheathing – Repair/replace	\$48,000
• Dry interior of rooms / Mold abatement	\$204,000
• Replace damaged interior drywall walls	\$24,000
• Interior furnishing replacement	\$85,000
• Replace interior flooring	\$180,000
• Replace fire pump and motor	\$6,000
<b>Total</b>	<b>\$567,000</b>

*Nova recommends the following:*

• Watertight storefront windows be installed	\$256,000
• Flood gates be installed at entry doors	\$10,000
• Temporary flood barriers	\$8,000
• Installation of sump pumps in elevator pits	\$19,000
• Portable pumps be kept at the Property	\$4,000
• Secure roof mounted HVAC equipment	\$6,000
• Electrical meters and switchgear relocated	\$80,000
• Installation of low-flow fixtures	\$101,600
<b>Total</b>	<b>\$484,600</b>



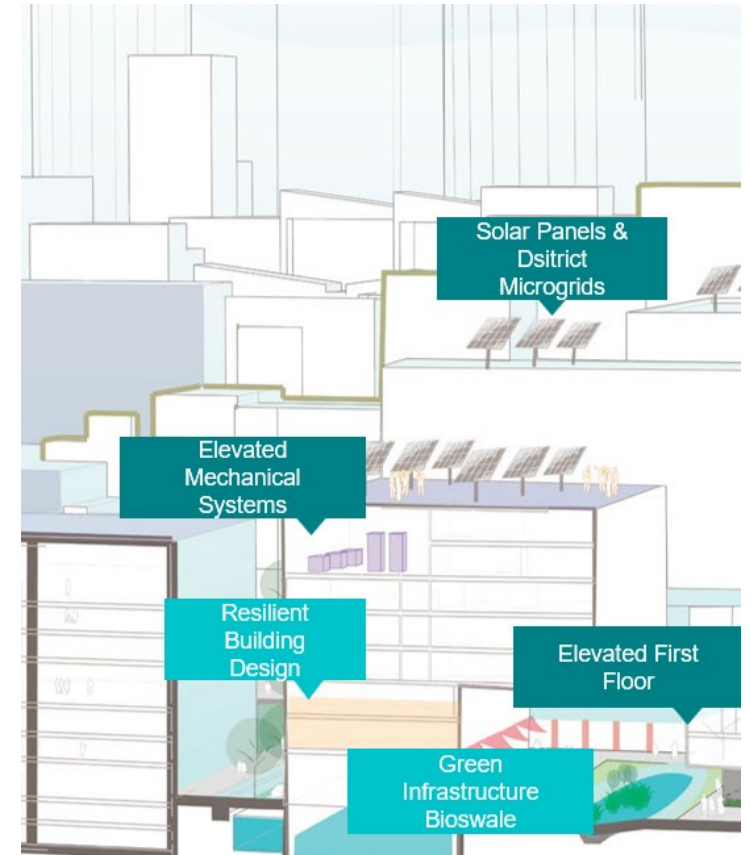
Electric equipment and switchgear located at the ground level will be flooded during a climatic or flood event.



Replacement of existing stick built storefront windows with a more water penetration resistant system (e.g. curtain wall) is recommended for consideration.

Gypsum wallboard, insulation, exterior sheathing, and exterior façade materials (Thin brick and fiber cement cladding) are likely to require replacement after a flood event.

## Resilience Retrofits



# Top Building level Resilience Solutions in CRE



**Backup Power** – solar, high ground generators, etc.



**Building electrification & Renewable Energy**



**Emergency Management** – Property team training on using emergency systems and available backup systems



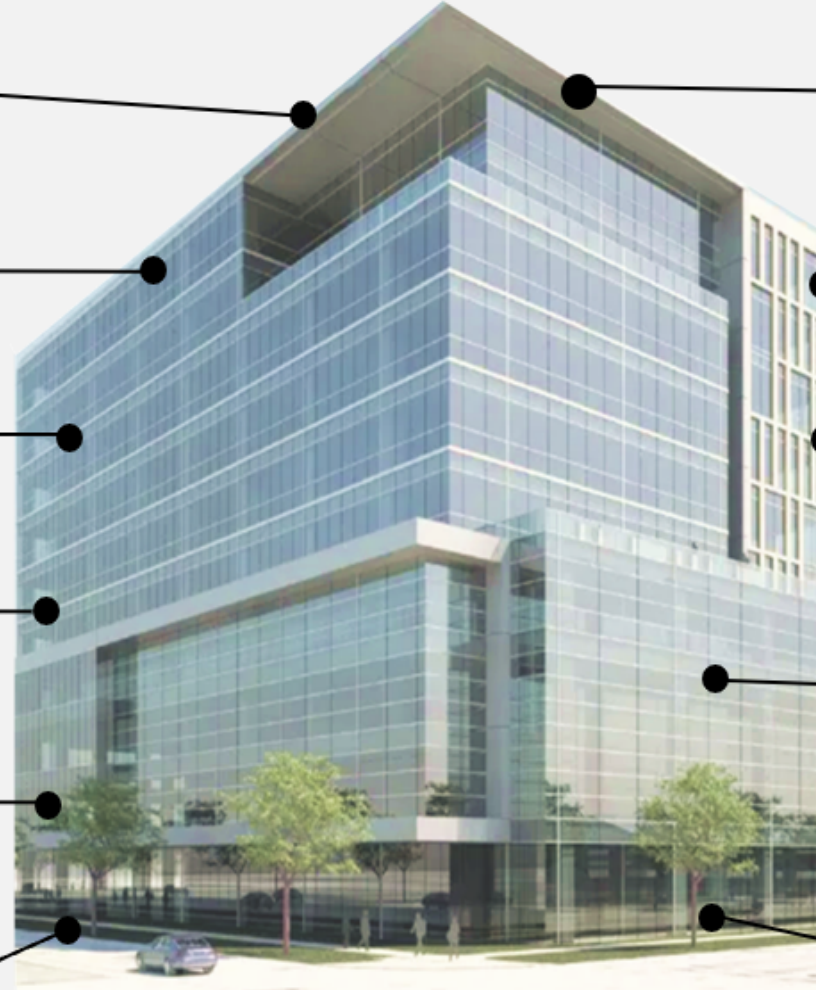
**Record Protection** – Protect records and inventory



**Backup** – Guarantee food & water availability



**Flood Proof** Protect building from flood including temporary flood barriers, sandbags & dewatering pumps



**Resilient Power Availability** – Maintain high ground/ protected from flooding



**Safety** – Ensure compliance with the latest structural/fire codes



**Emergency Command** – Establish emergency communications and command system



**Structure** – Enhance structural elements for extreme loads



**Transition Risks** – Consider future risks to asset value including reduction in capital availability and repricing of "brown" assets



**Landscape** – Integrate hazard resistant landscape design

# Key Climate Related Mitigation Strategies



## Floods

- Regular drainage improvement and maintenance
- Watertight closures and portable flood barriers, exterior flood protection.
- Raise vulnerable systems and equipment.



## Sea Level Rise

- Waterproof building materials and finishes.
- Resilient site, hardscape, and landscaping features.
- Stabilize slopes susceptible to erosion.
- Raise vulnerable systems and equipment.



## Hurricanes

- Printed and laminated hardcopies of emergency communications plans.
- Secure equipment and materials on the roof.
- Resilient back-up power and systems.
- Emergency supplies in the event of shelter-in-place.



## Heat Stress

- On-site renewable energy strategies.
- Building materials that are less energy intensive.
- Shading through tree plantings and other landscaping features.
- Passive design cooling strategies.

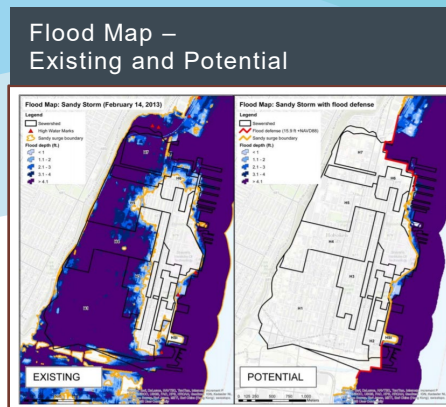


## Wildfires

- Clear dry and easily-ignitable vegetation.
- Keep areas under decks/balconies clear of debris and flammable materials.
- Back-up power generation.
- Fire-resistant roof materials and finishes.

# Public Private Partnerships

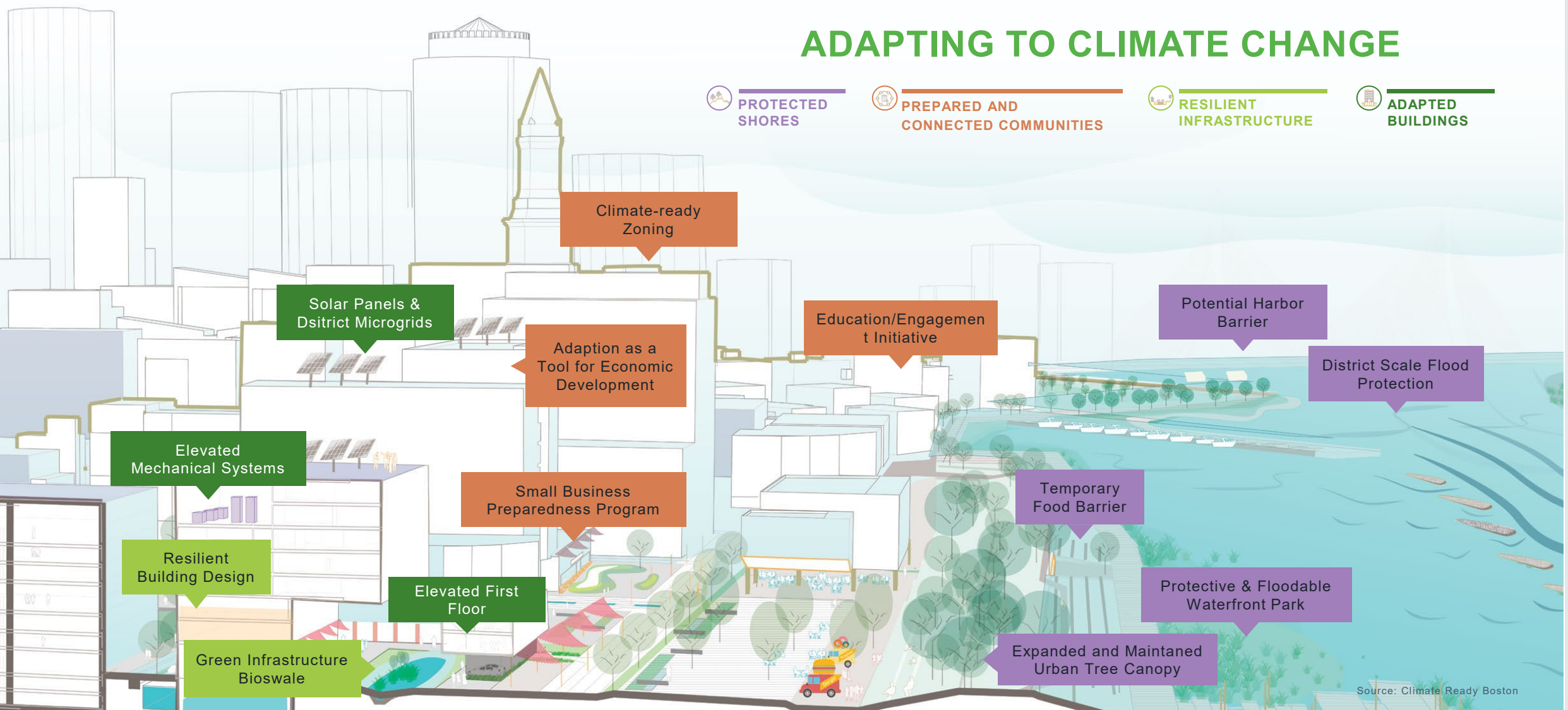
## To Protect Coastal Areas



# Regional & Building Level Resilience Solutions

## ADAPTING TO CLIMATE CHANGE

-  **PROTECTED SHORES**
-  **PREPARED AND CONNECTED COMMUNITIES**
-  **RESILIENT INFRASTRUCTURE**
-  **ADAPTED BUILDINGS**

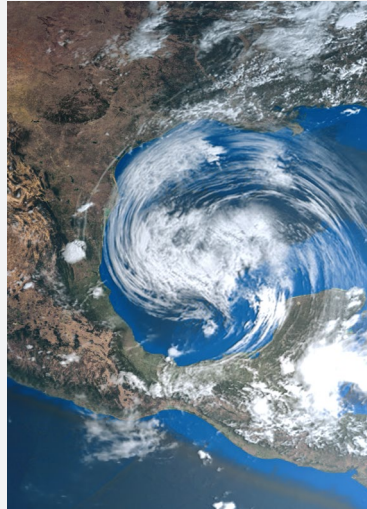


Source: Climate Ready Boston

# Parkway and Hurricane Harvey

Ranked 1st  
Globally –  
GRESB  
Resilience  
Module (2018  
and 2019)

## Cat 4 Hurricane Harvey



## On Site Teams



## Dewatering Pumps



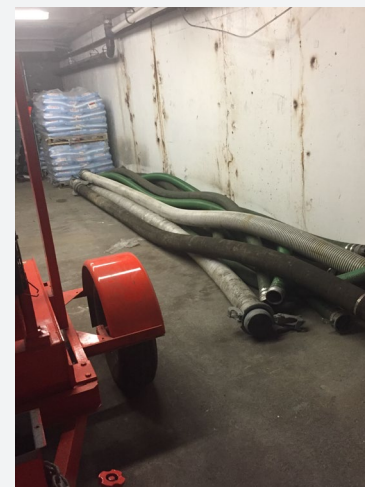
## Flood Gates



\$125 billion in damage  
No insurance claims  
for PKY



On site team prevented  
further damages  
during storm



Previously installed  
pumps ran full  
time as needed



Installed to protect  
underground spaces

# Flood Mitigation

**Sea-Level Rise and Flooding Mitigation** Developed in 2018, Pier 4 is a 13 story, LEED Gold, trophy asset in Boston's dynamic Seaport District.

- The building is surrounded by three sides of waterfront exposure, located in Special Flood Hazard Zone AE.
- Mitigation measures were studied and implemented. Critical building services are located on the roof or mezzanine level.
- The property deployable flood mitigation protection barrier called FloodWall by AquaFence®.
- The four-foot-tall wall is designed for rapid deployment around the building within eight hours of a pending flood event and can be packed and stored in a minimal amount of space.
- The FloodWall has a protective shield designed to withstand impact from moving debris. Through annual emergency training, this wall is assembled to ensure building staff can install it at the property.





# Development





# New Development ESG Strategies



## Sustainable Development

- Community gathering spaces (DEI)
- Green Building Standards and certifications
- Regulatory requirements
- Green bonds
- Reporting



## Resource Conservation

- Optimize performance of buildings, conserve natural resources; reduce operating expenses
- Master meters



## Energy, Water, and Waste

- Passive design and net positive renewable energy
- Conserve water
- Zero waste, recycle, up-cycle, compost



## Decarbonization Embodied Carbon and Electrification

- Net zero electrification solar and EV charging infrastructure
- Heat pumps and induction cooking



## Resilience Planning and Mitigation (TCFD)

- Flood proof
- Elevate building systems
- Resilient building design
- Green infrastructure



## Materials

- Sustainable and local materials
- Embodied carbon



## Health and Safety, Air Quality and Pandemic Readiness

- Clean air
- Update facilities with touchless technologies
- Redesign air filtration and ventilation systems



## Biodiversity and Food

- Biophilic design
- Edible landscapes

# Sustainability Due Diligence

## for New Development

Verdani Partners has developed an ESG Due Diligence Scorecard for New Developments.

**Purpose** – The intent is to improve environmental, social and governance performance of assets through rigorous due diligence at the commencement of the new development process.

**Goal** – To help development teams evaluate how best to incorporate ESG into projects, to develop buildings and properties that meet sustainability criteria and to influence design choices or potential improvements that can enhance the performance of assets. To appropriately evaluate potential capital investments to improve performance, value, and marketability of assets.

**Target** – Implement a sustainability screening for all New Development Projects.

## Due Diligence Checklist

### Environmental

- Green Building Certification and Ratings
- Sustainability Attributes
  - Net Zero
  - Electrification
  - Embodied Carbon
  - Energy, Water, Waste, IAQ
  - Biodiversity
  - Master Metering
  - Renewable Energy
- Building Materials

### Social

- Health and Wellness
- Affordability and Community
- Transportation Connectivity

### Governance

- Power Supply
- Regulatory Compliance
- Sustainable Development Goals
- Financing and Green Bonds
- Innovation
- Pandemic Preparedness
- Smart Building Technology
- **Resilience**
  - Flood Risk
  - Water Risks
  - Sea Level Rise Risks
  - Heat Stress
  - Fire Risks
  - Hurricanes

# New Development & Major Renovations Guide

## Identifying Investor Criteria

### ESG Goals (Owner Project Requirements)

### Integrated Design Process (IDP) - Eco-Charrette

#### Environmental

- Climate Change Adaptation & Net Zero – PPA, CPPA, Carbon Offsets, Circular Economy, etc..
- Energy Efficiency
- Water Efficiency
- Electrification and Fossil Fuel-Free
- Greenhouse Gas Emissions
- Embodied Carbon
- Energy Water Consumption (Data Management)
- Renewable Energy – Solar, Wind, Geothermal, Hydrogen, Biomass
- Indoor Air Quality (IAQ) - Healthy Buildings
- Sustainable Transportation
- Biodiversity and Habitat
- Stormwater Management & Permeable Materials
- Waste Management
- Pollution Prevention during Construction
- Resilience to Disaster
- Site Selection and Land Use
- Smart Building Infrastructure

#### Social

- Affordable Housing
- Health & Wellness
- Strategic Tenant Engagement
- Affordability, Community, and Transportation Connectivity

#### Governance

- Diversity, Equity, and Inclusion
- Material Sourcing
- Sustainable Procurement (Vendor Code of Conduct)
- ESG Financing Sources – Green Bonds
- Green Leases

#### Green Building Certifications

#### ESG Reporting Frameworks

- GRESB
- UN SDGs
- CDP
- EU Taxonomy
- SFDR
- TCFD
- SEC ESG Regulations
- U.S. Climate Action Plan & Net Zero





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