REALPAGE®
ENERGY SUMMIT
2023

Real Estate & Climate Resilience

Drivers | Impacts | Responses

Chris Pyke, Ph.D.
U.S. Green Building Council
Washington, DC

Real estate cannot run away from a changing climate. It can and should prepare to thrive under new shocks and stressors.

Drivers

Motivating Factors

Empirical Evidence	Investor Demand	Investor Pressure	Occupant Expectations	Disaster Losses
Evidence for the impacts of climate change and the urgency for climate action is now stronger than ever	Climate risk **disclosure** is a high priority for institutional investors	Climate risk disclosure **mandates** have begun to go into force in leading markets	Tenant **expectations** that facilities to be resilience to climate shocks	Climate-related **events** are driving broad and significant losses

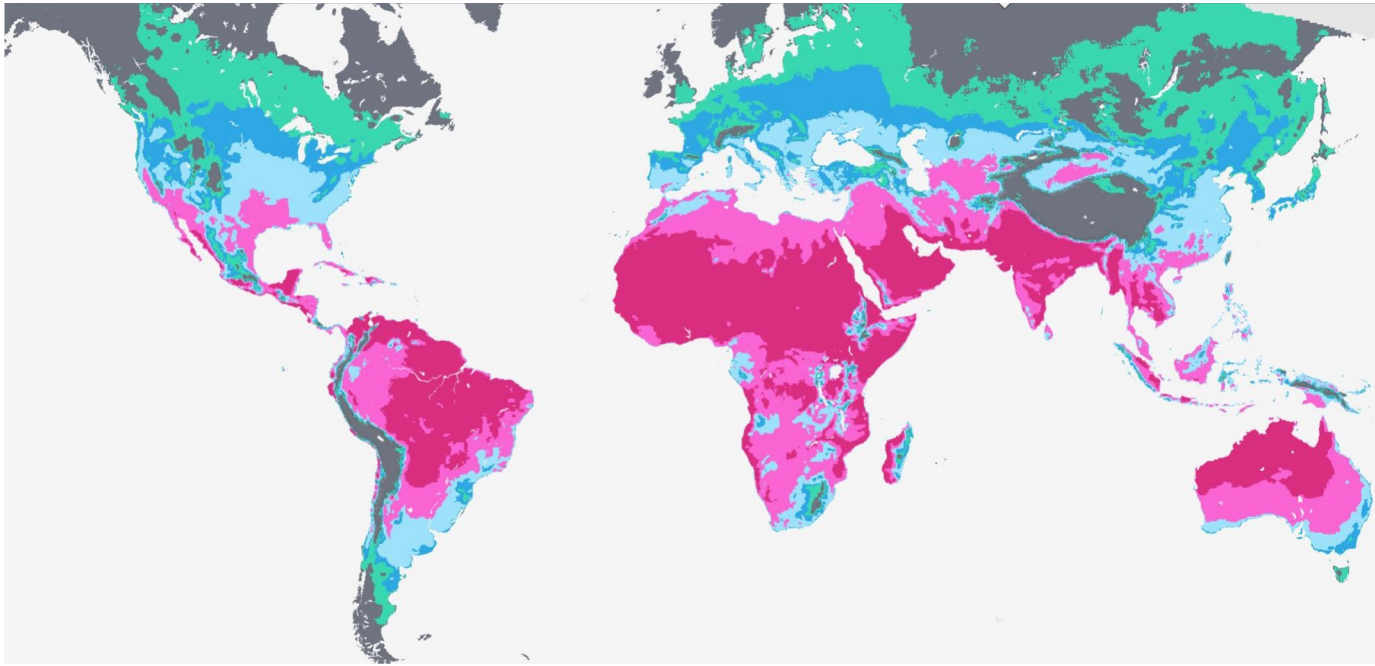
More Heat
Global

2°Celsius

At 2°C of global warming, regions that never experience temperatures above 32°C (90°F) will start to have them. Hot places become even hotter.

NUMBER DAYS PER YEAR

- 181-365
- 91-180
- 31-90
- 8-30
- 1-7
- 0

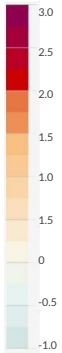


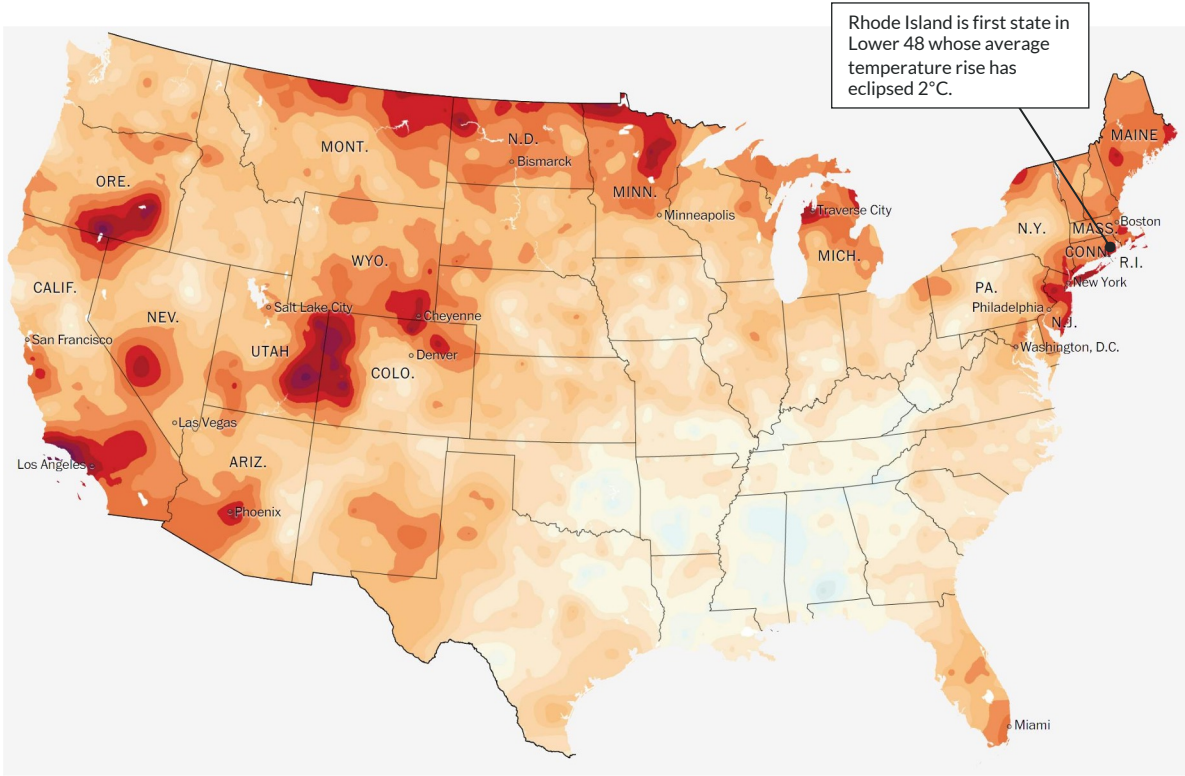
More Heat
U.S.

Heat Map

An analysis of National Oceanic and Atmospheric Administration temperature data across 3,107 counties found that major areas are nearing or have already crossed the 2°C mark.

1865-2018 (C˚)





More Fire

Death

Disruption

Dislocation

Damage

Pollution

More Floods

Death

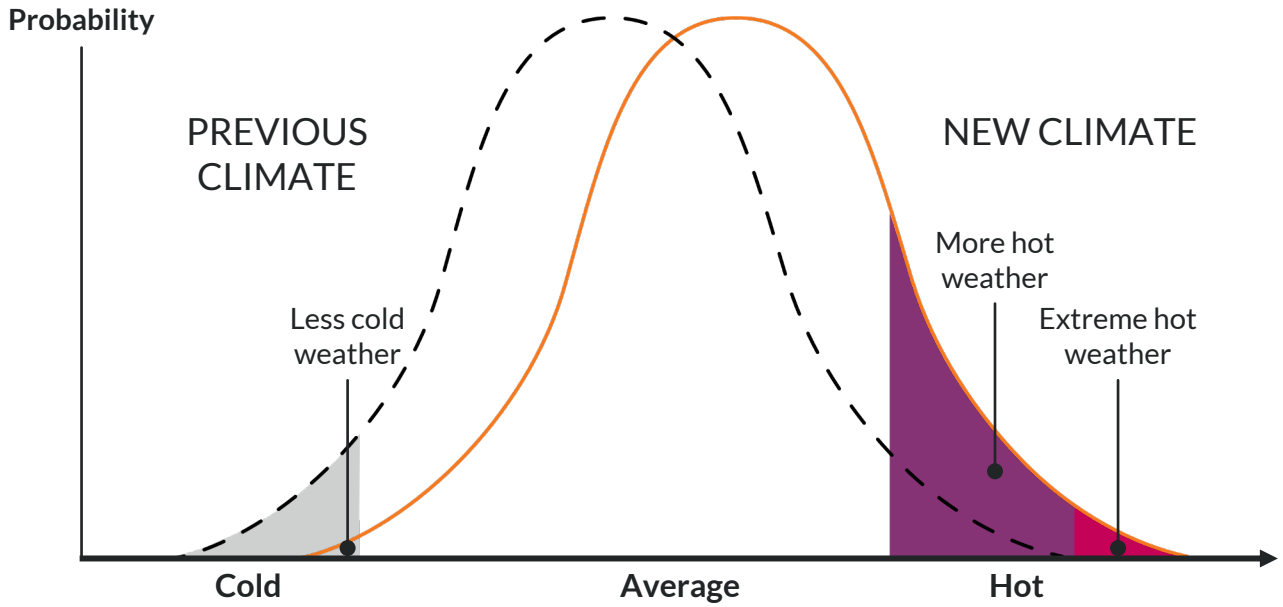
Disruption

Dislocation

Damage

Pollution

More Extreme Weather

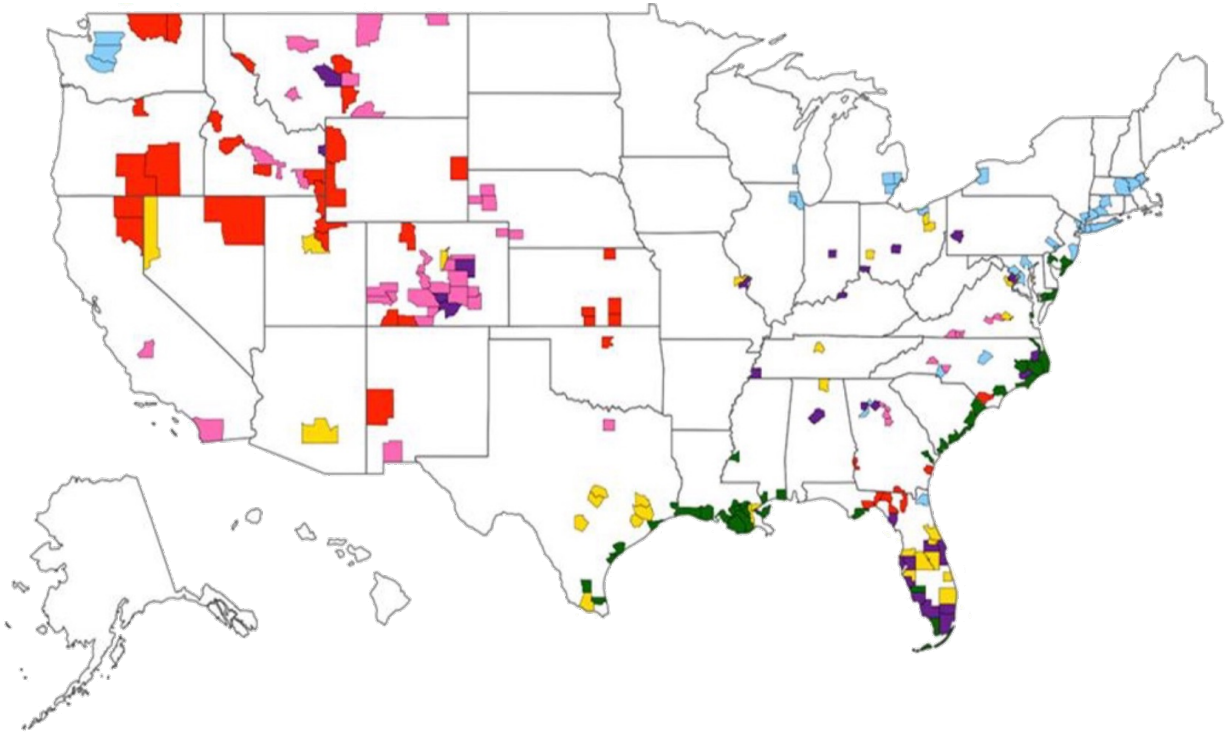


Source: BBC | U.S. EPA

More Places at Risk

U.S. Locations

- Heat
- Storm
- Fire
- Drought
- Flood
- More than one



More People at Risk
U.S. Counties

REDFIN

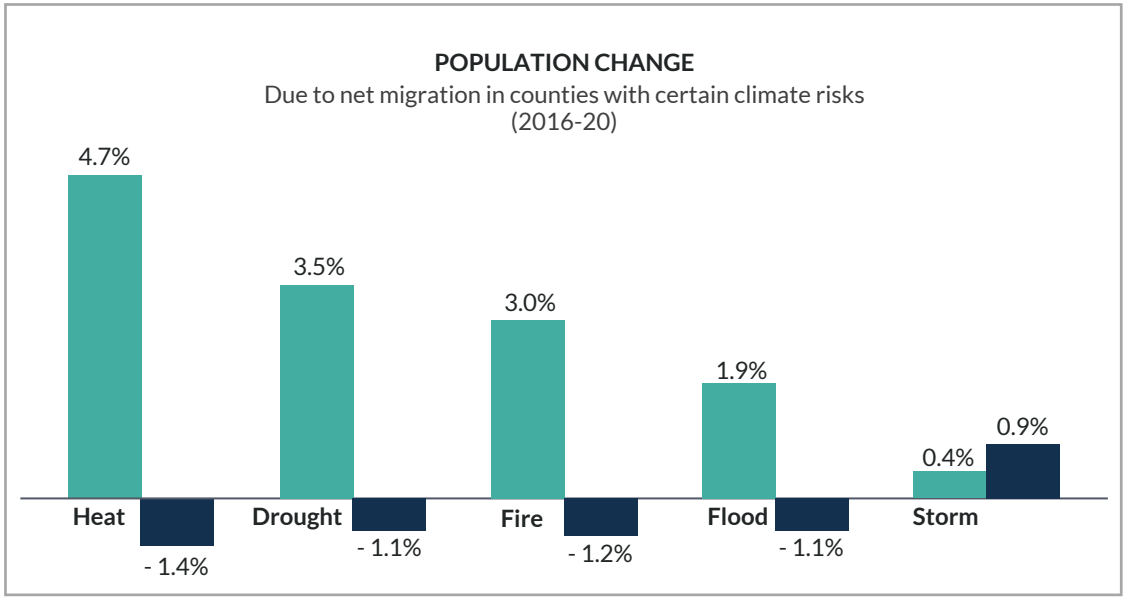
America's climate-endangered areas are becoming more populous.

Counties with smallest share of homes facing risk

Counties with largest share of homes facing risk

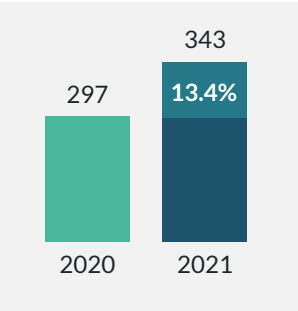
People are moving in and out of areas facing high risk of climate change.

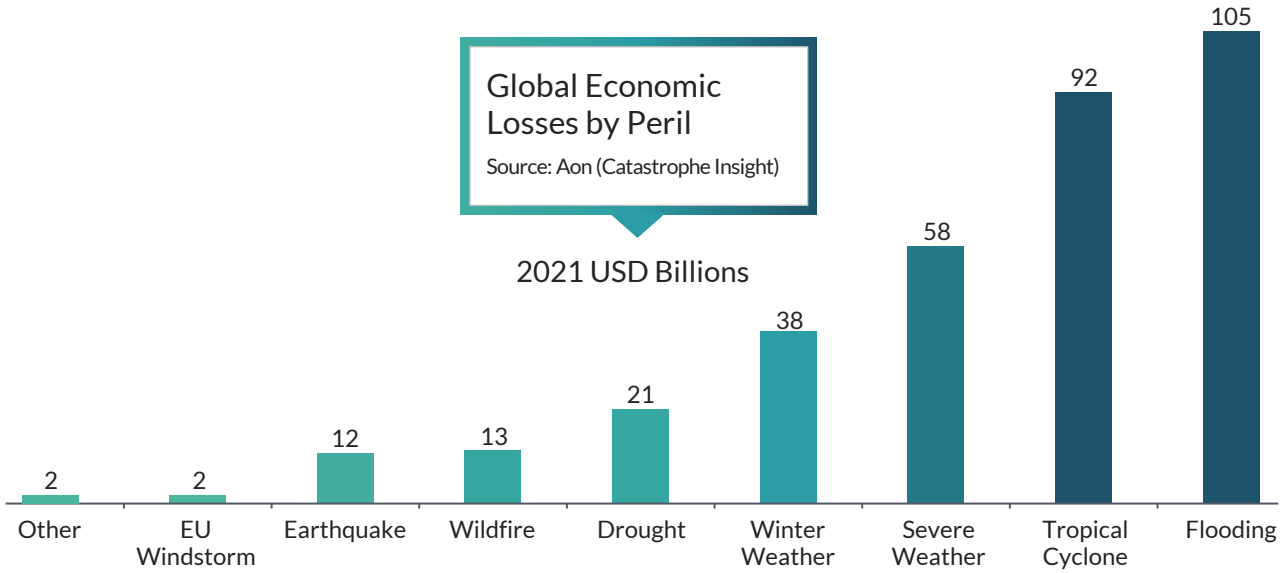
Lily Katz & Sebastian Sandoval-Olascoaga, 8/25/21; updated 9/8/21



More Money at Lost
2021

Increase in global weather- and catastrophic-related economic losses:



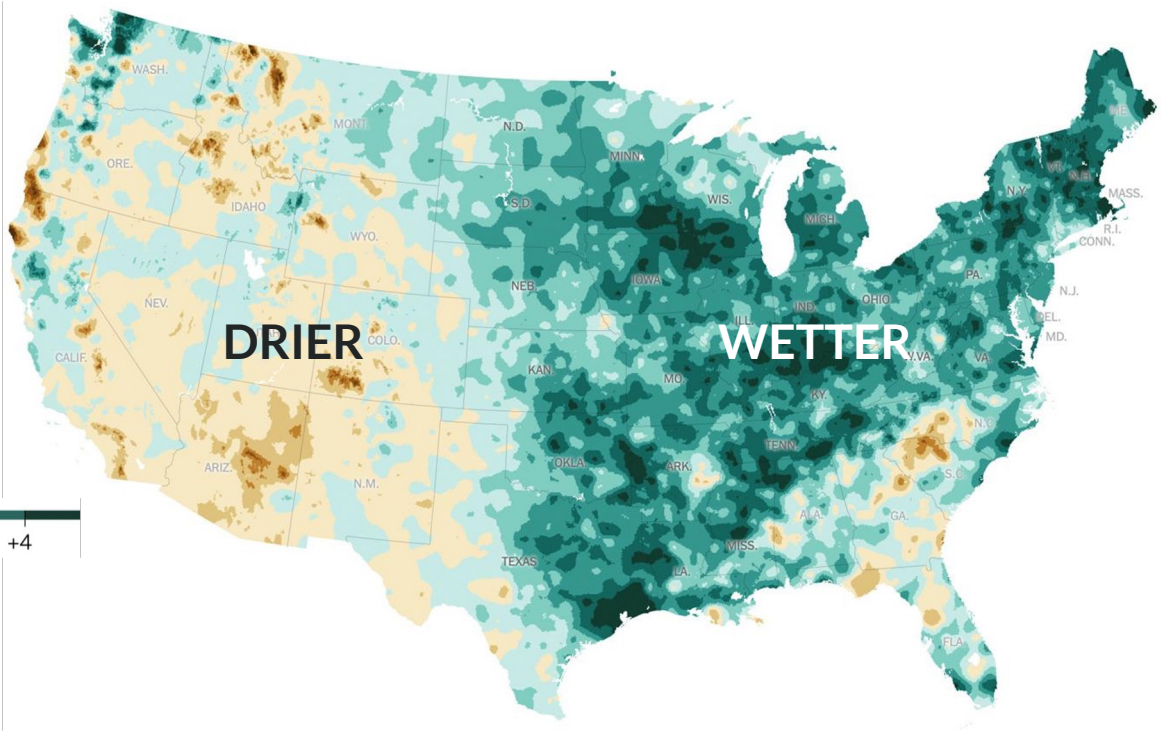


More Extreme Precipitation

Highs and Lows

U.S. is becoming both drier and wetter in era of climate change.

Change in annual average precipitation, in inches in past 30 years, compared to the 20th century.

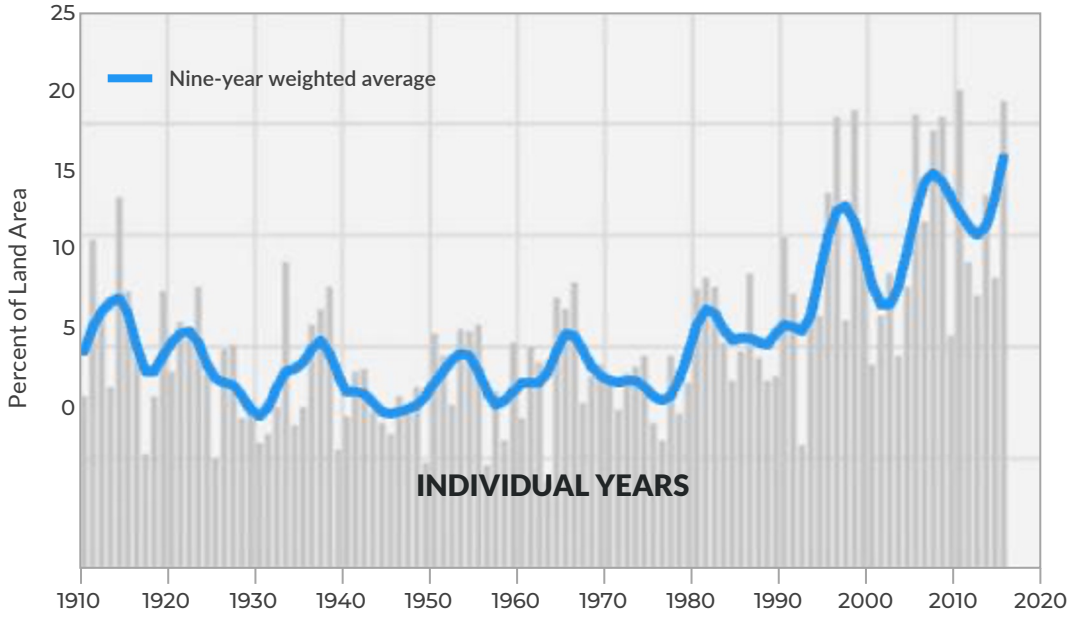


Source: NOAA | National Centers for Environmental Information

Changing Extremes
One-Day Events

Extreme Increases

Chart shows the percentage of land area in 48 contiguous states where much greater than normal total annual precipitation came from extreme one-day events:



Source: NOAA | National Centers for Environmental Information

Building for the Past
Infrastructure

Hurricane Harvey

Even before Harvey dropped 60' of rain, damaged 100,000 homes and cost $125 billion, city planners had realized infrastructure was not designed for even weaker storms.

Source: NOAA | National Centers for Environmental Information

Individual action

Everyone for themselves

Investor Response
Climate Leadership

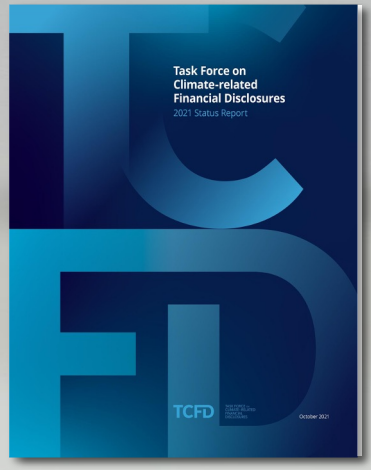
The New York Times

One of the World's Most Powerful Central Bankers Is Worried About Climate Change

A view of damage from Hurricane Sandy in New Jersey in 2012. Extreme weather events have always been a problem, but global insurers will face much greater challenges if there is a higher frequency of them. Doug Mills/The New York Times

By Neil Irwin

Sept. 30, 2015



TCFD recommendations are designed to help companies provide better information to support informed capital allocation.

Photo: Reuters / Getty Images

Source: NOAA | National Centers for Environmental Information

TCFD
Global Influence

Supporter Growth (2021)

Even before Harvey dropped 60' of rain, damaged 100,000 homes and cost $125 billion, city planners had realized infrastructure was not designed for even weaker storms.

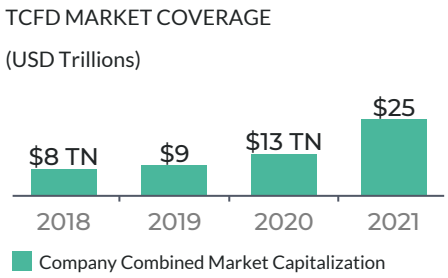
2,500+
Supporters globally

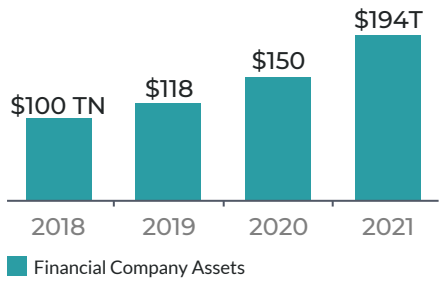
120+
Regulators & governmental entities

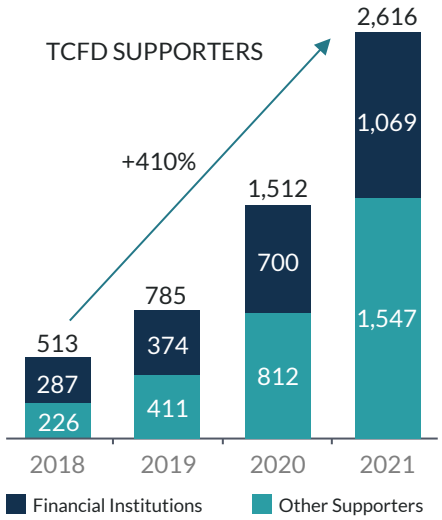
89
Countries & jurisdictions represented

25 TN
Combined company market capitalization

194 TN
Financial company assets



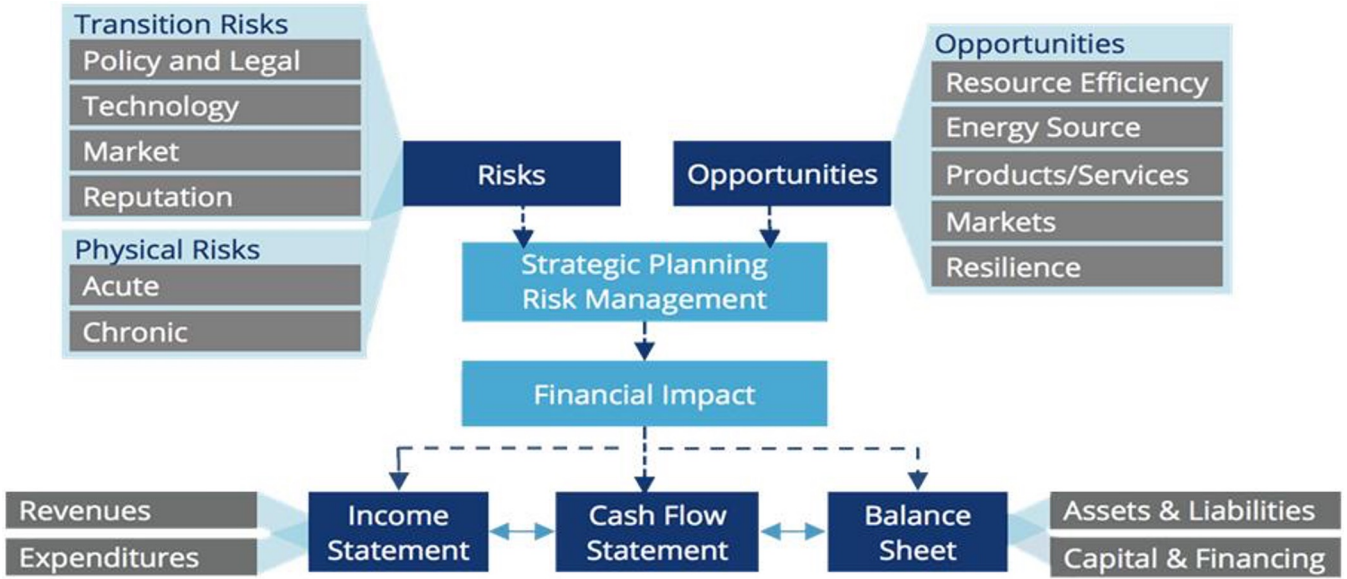




TCFD
Recommendations

Risk and Reward

Demand growing for information about bottom-line impact of transition and risks.



TCFD
Real Estate Implications

Property Parameters

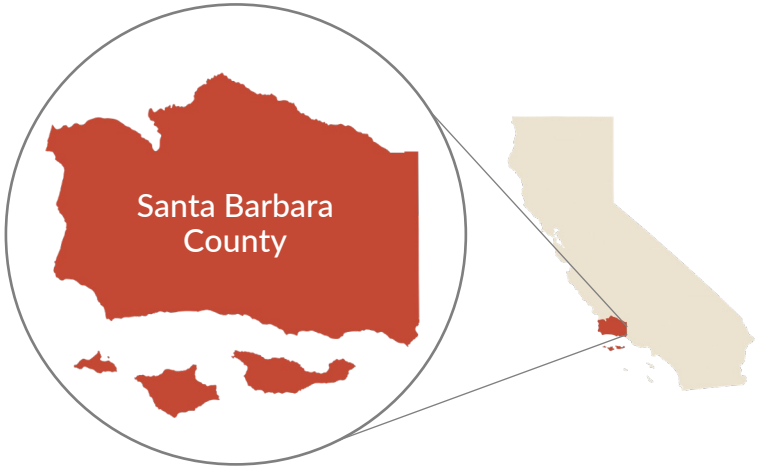
- Capital requirements
- Vacancy and retention rate
- Utility expenses
- Operating income
- Purchase price
- Sales price
- Market conditions

Analyzing Real Estate Risk

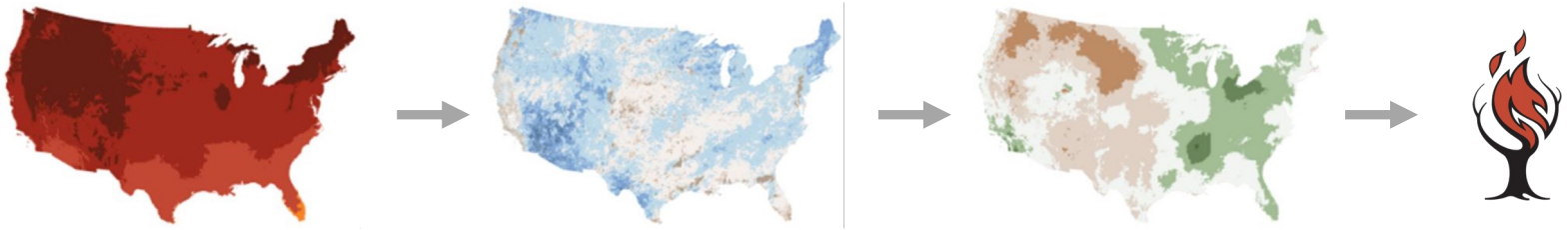
Market Impact

Moderate Wildfire Risk Ratios

Residential	99,008 of 110,222 homes
Commercial	4,594 of 6,700 commercial properties
Critical Infrastructure	482 of 543 infrastructure facilities
Social Facilities	407 of 514 social facilities



Birth of a Wildfire



Air Temperatures | Precipitation Change | Decreasing Humidity

Source: Risk Factor Pro™

Managing Investment Risks

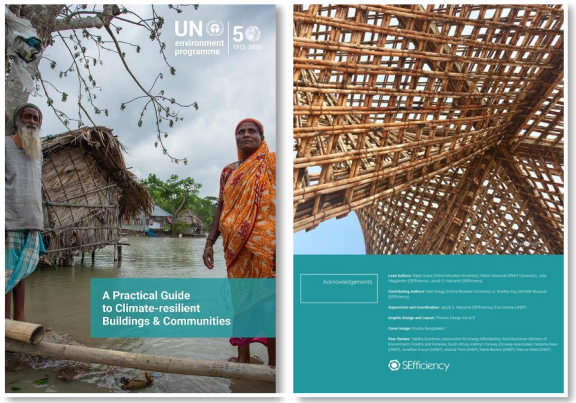
Investors & Stakeholders | Implications

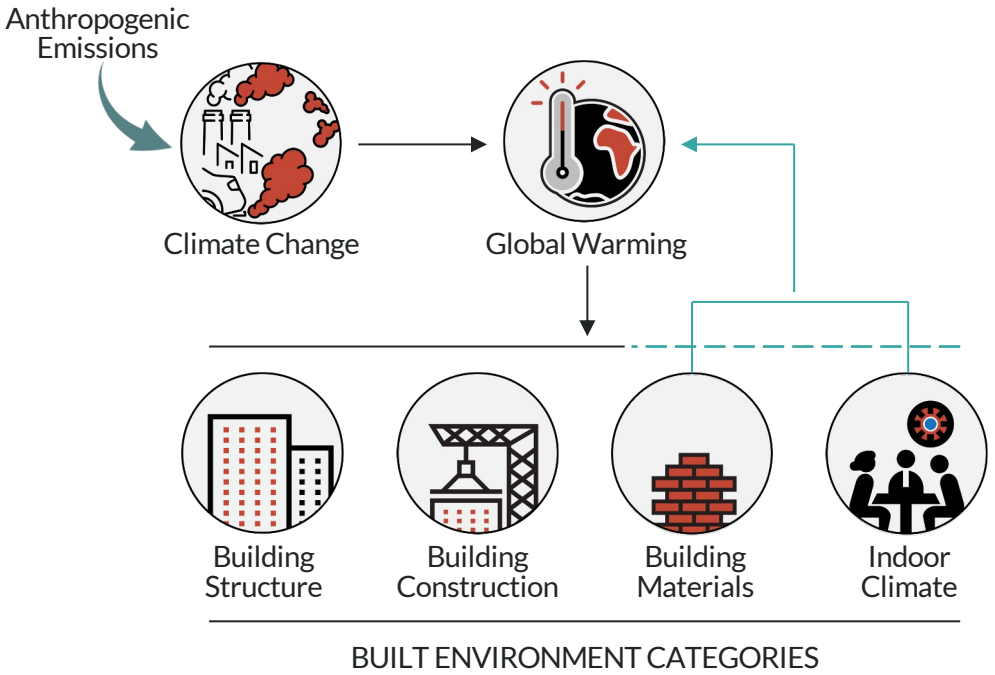
Heitman Real Estate Investment

"A growing number of firms have shifted operations to areas with lower physical risk exposure after experiencing disasters or near misses firsthand."

Facility Impacts
Site Specific

The vulnerability of housing and infrastructure depends on a number of factors, including their design (making them more or less resistant to storms) and location.

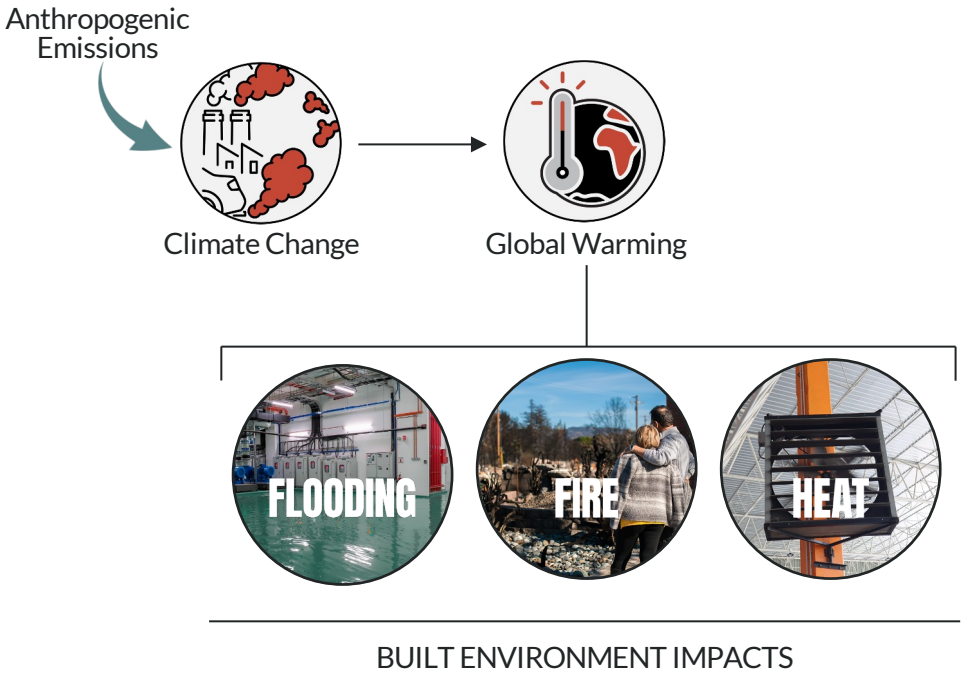




Source: UN Environment Programme

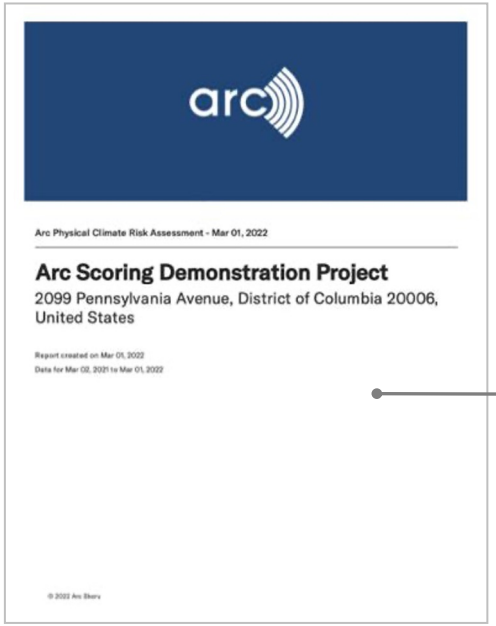
Hazards & Vulnerabilities

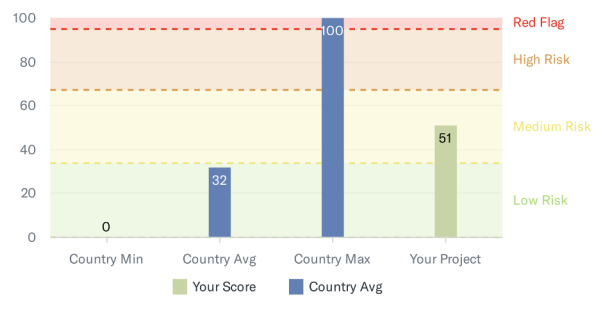
HAZARD	VULNERABILITY
Overheating	Cooling
Interface Fire	Power
Air Quality	Ventilation
Water Shortage	Water
Wind/Hail/Ice/Rain/ Lightning/Tornado	Structure/Enclosure Power Telecom Goods
Transportation Disruption	Goods
Flood	Structure/Enclosure Sewage



Analysis
Site Specific

1. Hazard Exposure
   RESEARCH climate risks and hazards to the site and community.
2. Risk Assessment
   UNDERSTAND and prioritize potential impacts with respect to facility management goals.
3. Resilience Strategies
   GATHER comprehensive market intelligence from knowledge experts and asset management teams.
4. Hazard Exposure
   CARRY OUT the strategies and evaluate results.





Building Resilience
Facility Managers | Strategies

Protection

Strategies to reduce a building's vulnerability to **extreme weather**:

1. Wet Floodproofing
2. Dry Floodproofing
3. Site Perimeter Floodproofing

- Resilient Elevators
- Backwater Valves
- Sump Pumps

Adaptation

Strategies that improve a facility's ability to adapt to **climate change**:

1 - 2 Window Shading

- Envelope Efficiency
- Elevated Equipment
- Elevated Living Space
- Surface Stormwater Management
- Contributing Heating and Cooling

Backup

Strategies that provide critical needs during **loss of power or services**:

- Maintenance of Backup Power to Critical Systems
- Emergency Lighting
- Access to Potable Water

Community

Strategies that encourage behaviors that enhance **communal resilience**:

- Building Community Ties
- Creating Community Resilience Spaces
- Developing Emergency Management Manual
- Organizing for Community Resilience

Facility Management
Examples

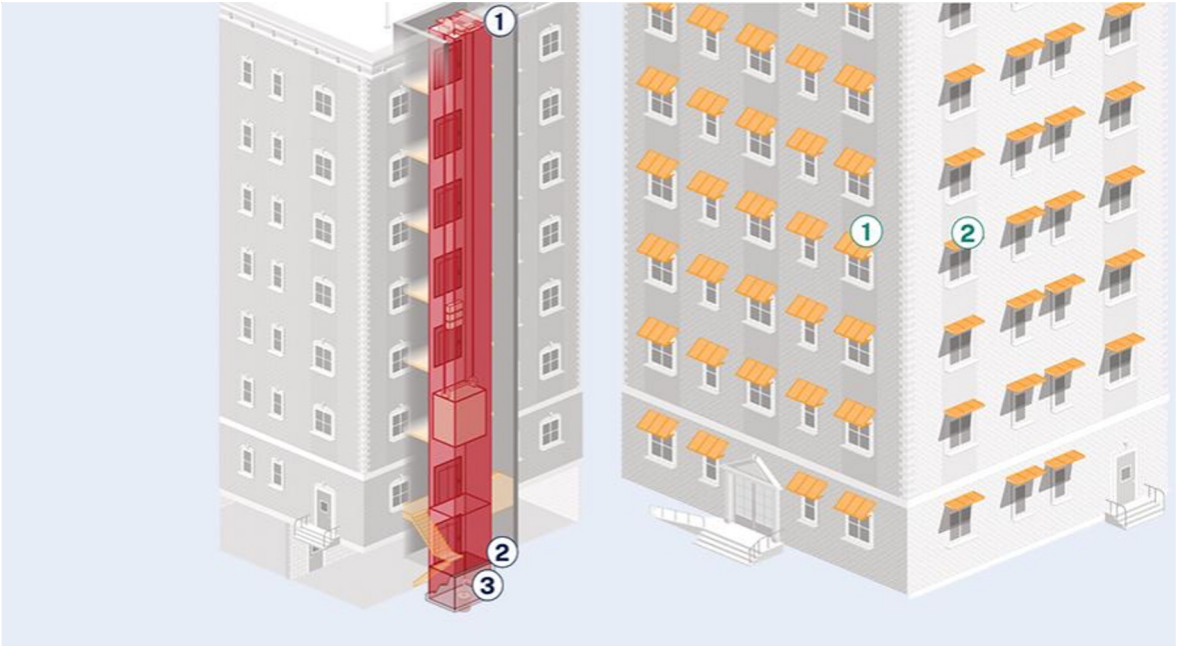
These demonstrate examples of action steps you can take:

Protection

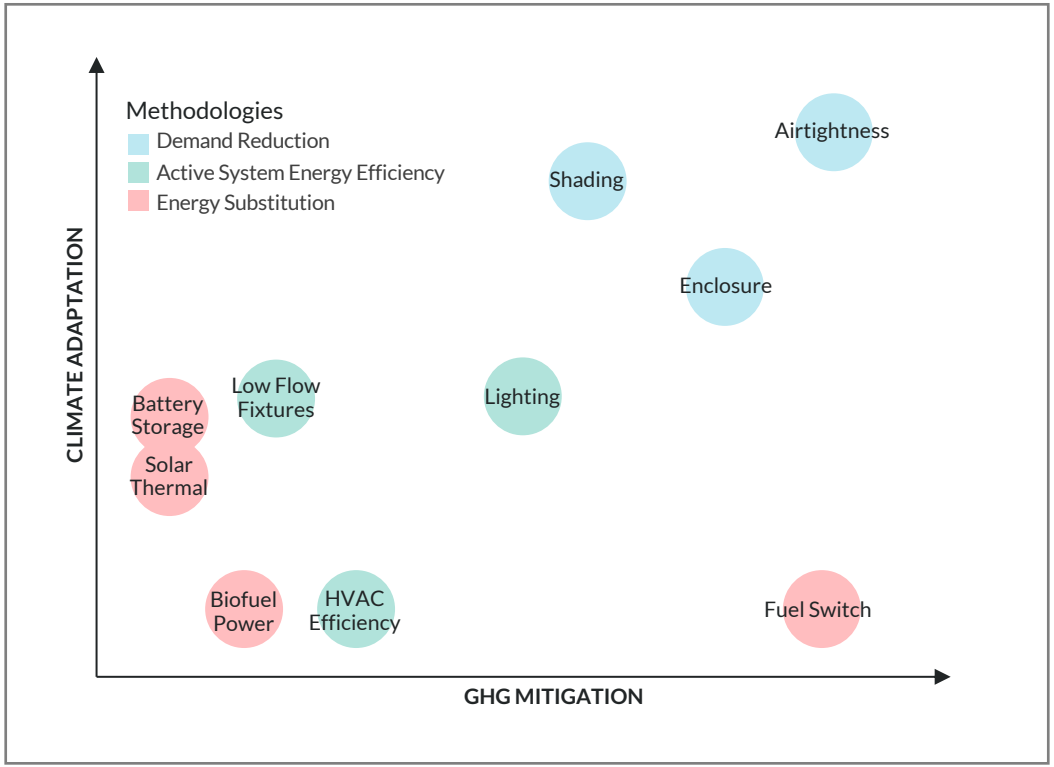
1. Wet Floodproofing
2. Dry Floodproofing
3. Site Perimeter

Adaption

1 – 2 Window Shading



Mitigating Impact
Property Design



Sources: RDH Building Science Inc. / BC Housing Research Centre

Corporate Management
GRESB indicators

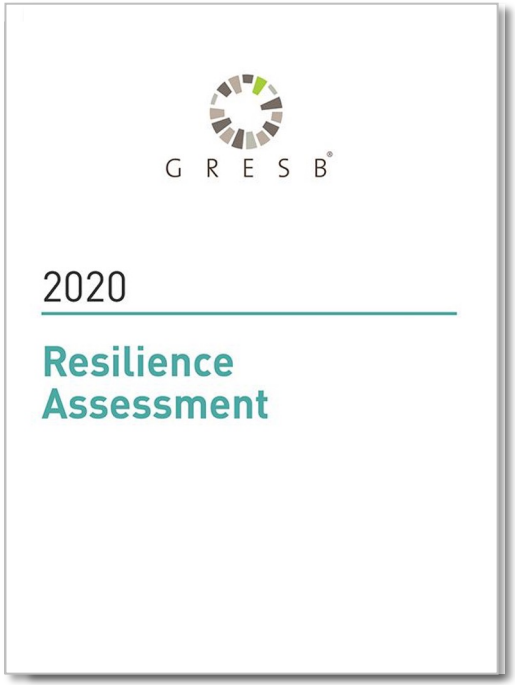
Distribution of Responses
(By TCFD Category)

Demonstration of a more comprehensive climate risk and resiliency program is a higher priority for those funds earning top-level GRESB scores.

Indicators

For climate-resilient management and operations:

- Leadership
- Accountability
- Governance
- Business Strategy
- Risk Assessment
- Implementation
- Evaluation



GRESB
ESG Performance

Key Findings

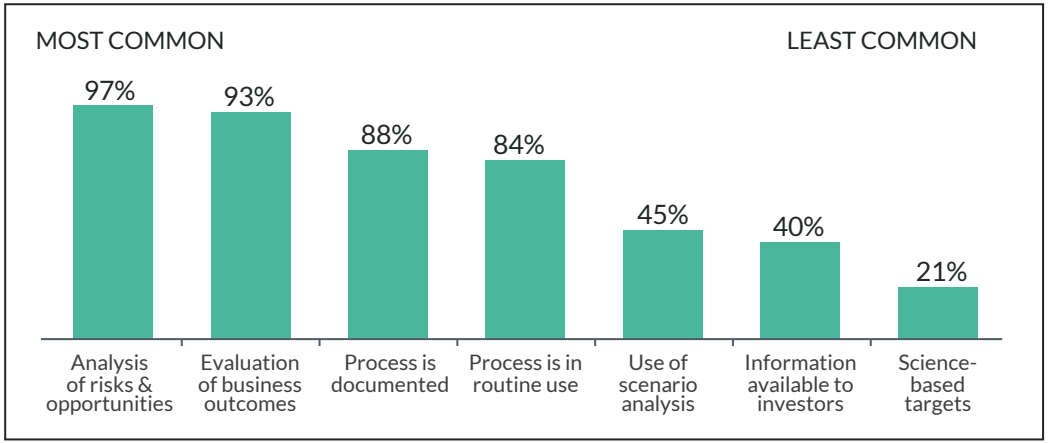
- Management actions and operations vary significantly
- Many practices are implemented inconsistently
- Leaders use more than 75% of practices - most use less than 50%.

GRESB = Provides validated ESG performance data and peer benchmarks for investors and managers to improve business intelligence, industry engagement and decision-making.

Benefit: Helps investors make better ESG-related decisions

TCFD = Increases the clarity, relevance and use of climate-related information in organizational disclosures so financial markets can have more sustainable and resilient investment options.

Benefit: Brings greater clarity to climate-based disclosures, helping to influence markets



Resilience for Investors

Engagement

1. Understand.
   Gain a clear understanding of asset, portfolio and market risks.

2. Consider.
   Consider impacts on operating income, expenses, purchase price, sales price and market conditions.

3. Plan.
   Plan for resilience across the plausible range of site, portfolio a nd market conditions.

4. Execute and Evaluate.
   Ensure accountable execution of the plan and manage for uncertainty – checking assumptions and outcomes.

This GRESB Special Report is an additional resource.

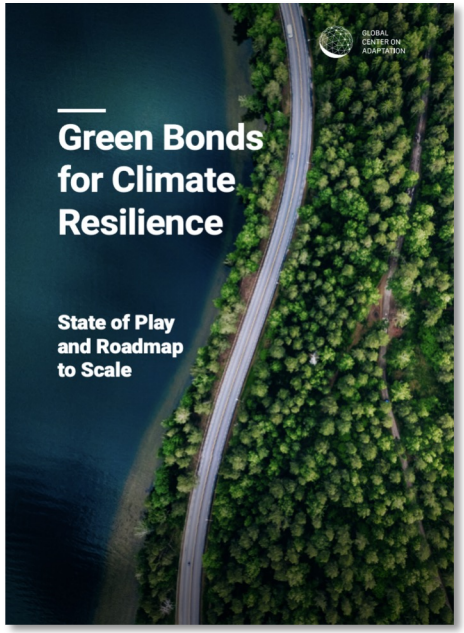
Climate change is the **highest** priority ESG issue facing investors.

Principles for Responsible Investment

Access to Capital
Green Bonds

1. Framework
   Establish a framework to guide the use of proceeds – usually supported by third-party review.
2. Execution
   Use proceeds to create or improve facilities – carefully tracking investments.
3. Monitor & Report
   Evaluate investment impacts and facility performance over time – report periodically to investors and stakeholders.

New guidance to access capital for resilient buildings



Access to Capital
Green Bonds

SWIRE PROPERTIES

Size	US$500 million
Tenor	10-year
Issue Date	10th January 2018
Coupon	3.5%
Issue Price	99.566%
Ranking	Senior Unsecured
Joint Lead Managers & Bookrunners / Joint Green Advisors	Bank of America Merrill Lynch HSBC
Ratings	A – Fitch A2 – Moody's
Certification	First Green Bond in Hong Kong to obtain Green Finance Certification from HKQAA
Second Party Opinion Provider	SUSTAINALYTICS
Inclusion in Green Bond Indices	Bloomberg Barclays MSCI Green Bond Index ICE BofAML Green Bond Index

Our Green Bond Framework is available online. Net proceeds will be used to fund green projects meeting one or more of the following categories of eligibility recognised in the Green Bond Principles.

- Renewable Energy
- Energy Efficiency
- Sustainable Water and Wastewater Management
- Climate Change Adaptation
- Green Buildings

> Proceeds of the green bonds will be used to finance or refinance expenditures related to investments in Swire Properties' real estate assets or properties with the view of improving their environmental performance...

1 USE OF PROCEEDS

Overall comment on section *(if applicable)*:
Proceeds of the green bonds will be used to finance or refinance expenditures related to investments in Swire Properties' real estate assets or properties with the view of improving their environmental performance, specifically projects relating to: (i) Renewable Energy; (ii) Energy Efficiency; (iii) Sustainable Water and Wastewater Management; (iv) Climate Change Adaptation; and (v) Green Buildings (LEED® Gold / Platinum and BEAM Plus Gold / Platinum).

Learn More
Best Practice Example

Understand risk and improve facilities.
Assess site-specific risks and prioritize risk mitigation strategies.

Communicate management and performance to investors.
Use proceeds to create or improve facilities – carefully tracking investments.

Considering pursuing new resources and capital.
Evaluate investment impacts and facility performance over time – report periodically to investors and stakeholders.

More inspiration