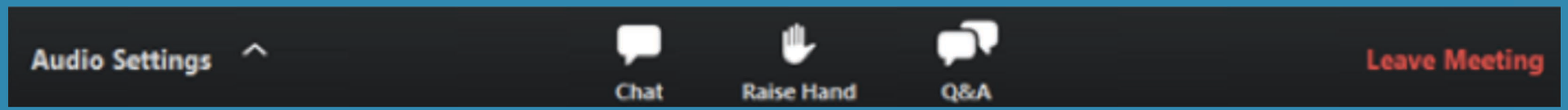
How Real Estate Can Adapt and Prepare for Climate Risks

December 10, 2020

measurabl.com

How to ask a question

Use the control panel's Q&A module to ask questions at any time!



Don't see it? Move your mouse toward the bottom of your screen

What is physical climate risk?

Shocks

- Floods
- Hurricanes
- Typhoons

What is physical climate risk?

Stressors

- Heat stress
- Rising sea levels
- Drought

Meet Our Speakers

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VP, Equity Business Group Lead
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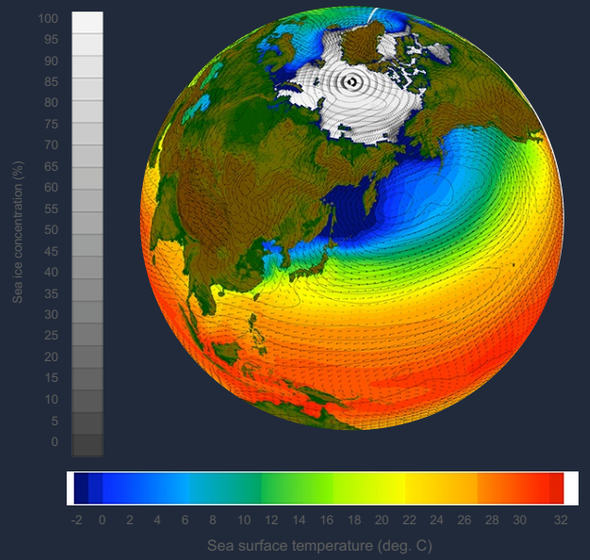
About Four Twenty Seven

- Four Twenty Seven, an affiliate of Moody's, is the leading provider of data and analytics on the physical risks associated with climate change.
- Established in 2012, we are headquartered in Berkeley, CA, with offices in Washington DC, Paris and Tokyo and representatives in London and Sydney.
- We translate climate models into actionable intelligence for our clients, which include some of the world's largest investors, asset managers, commercial banks, development finance institutions, corporations and government agencies.



- Floods
- Heat Stress
- Hurricanes & Typhoons
- Sea Level Rise
- Water Stress
- Wildfires

http://427mt.com/insights/

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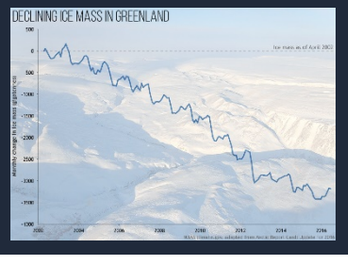
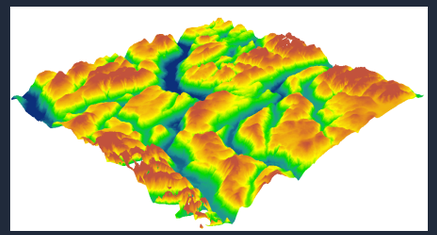
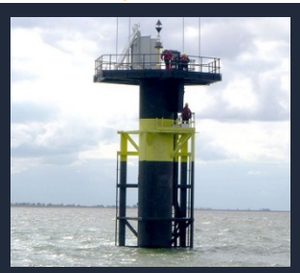
Using Climate Science for Investment Decisions



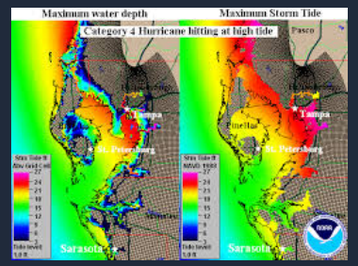
Air, ocean, and ice (including cliff) dynamics



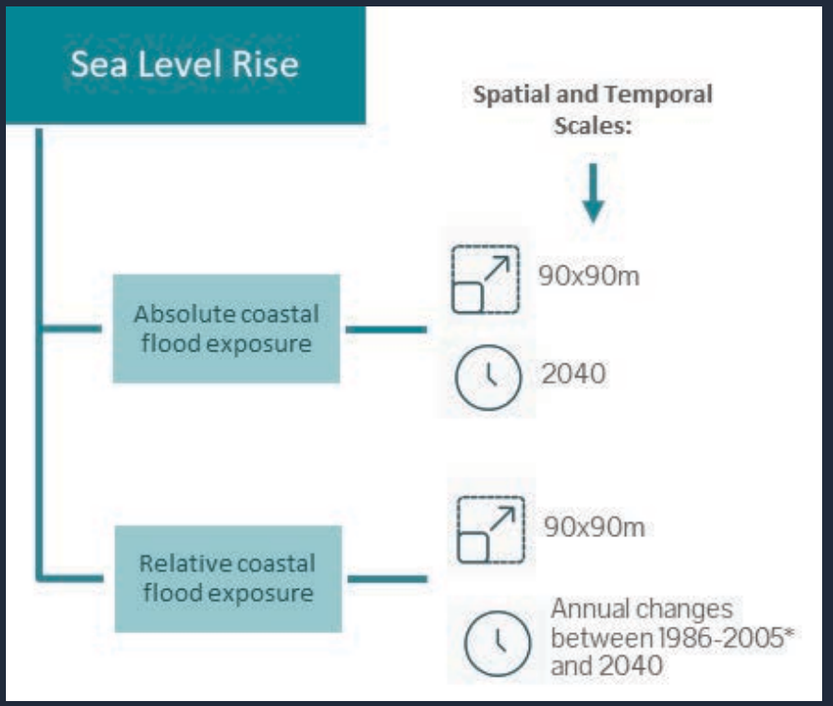
Elevation data (SRTM)



Historical sea levels and subsidence



Tidal gauge data for storm surge



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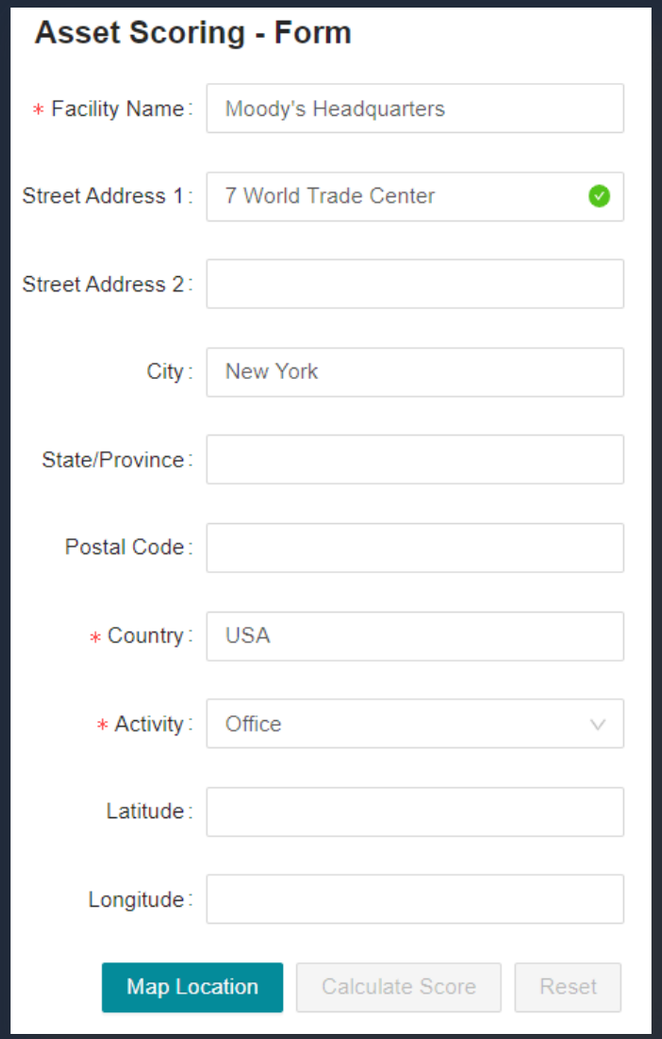
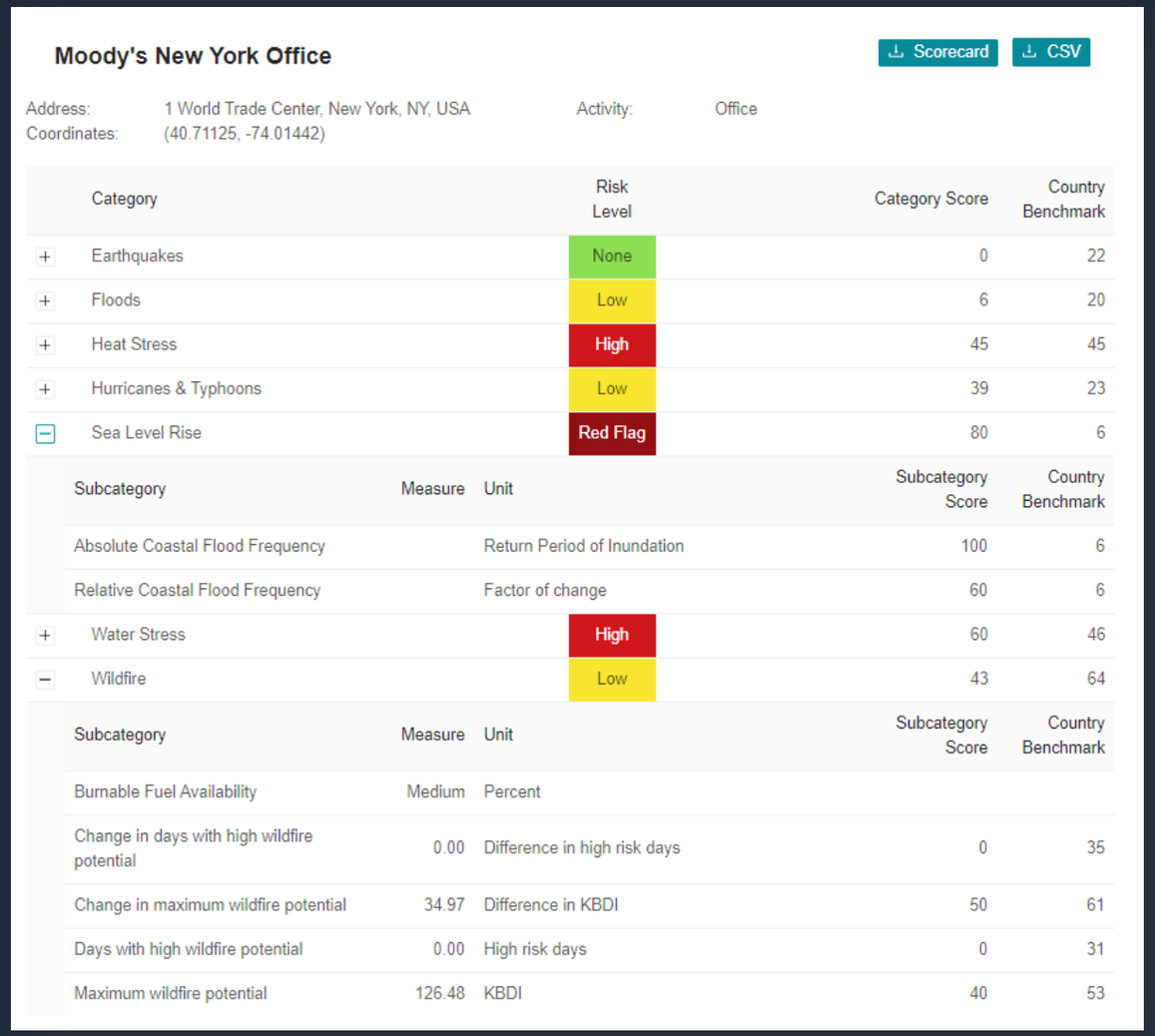
Assessing Climate Risk for a Property





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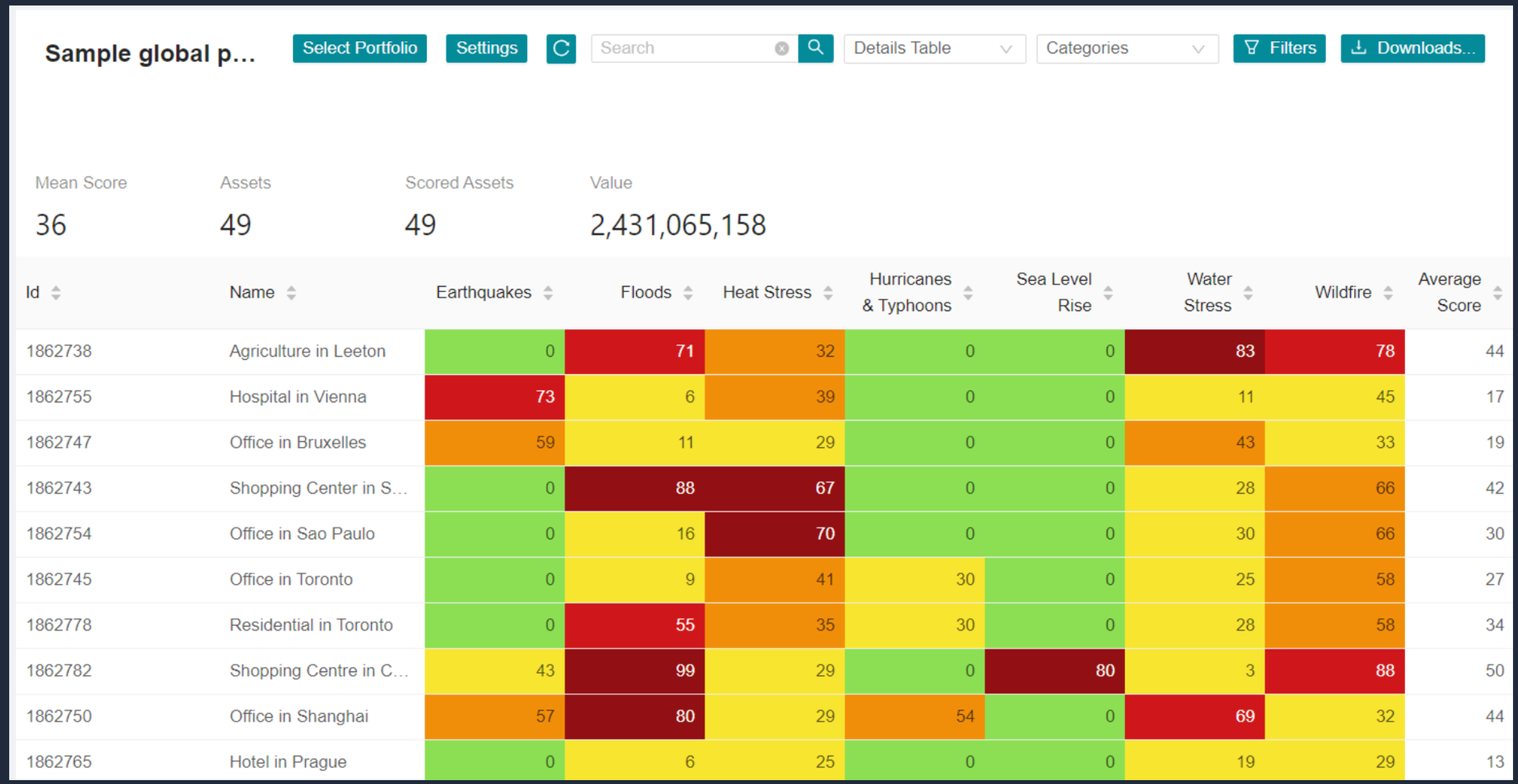
Assessing Climate Risk for a Portfolio



Sample global p… | Select Portfolio | Settings | Search | Details Table | Categories | Filters | Downloads...

Mean Score	Assets	Scored Assets	Value
36	49	49	2,431,065,158

Id	Name	Earthquakes	Floods	Heat Stress	Hurricanes & Typhoons	Sea Level Rise	Water Stress	Wildfire	Average Score
1862738	Agriculture in Leeton	0	71	32	0	0	83	78	44
1862755	Hospital in Vienna	73	6	39	0	0	11	45	17
1862747	Office in Bruxelles	59	11	29	0	0	43	33	19
1862743	Shopping Center in S…	0	88	67	0	0	28	66	42
1862754	Office in Sao Paulo	0	16	70	0	0	30	66	30
1862745	Office in Toronto	0	9	41	30	0	25	58	27
1862778	Residential in Toronto	0	55	35	30	0	28	58	34
1862782	Shopping Centre in C…	43	99	29	0	80	3	88	50
1862750	Office in Shanghai	57	80	29	54	0	69	32	44
1862765	Hotel in Prague	0	6	25	0	0	19	29	13

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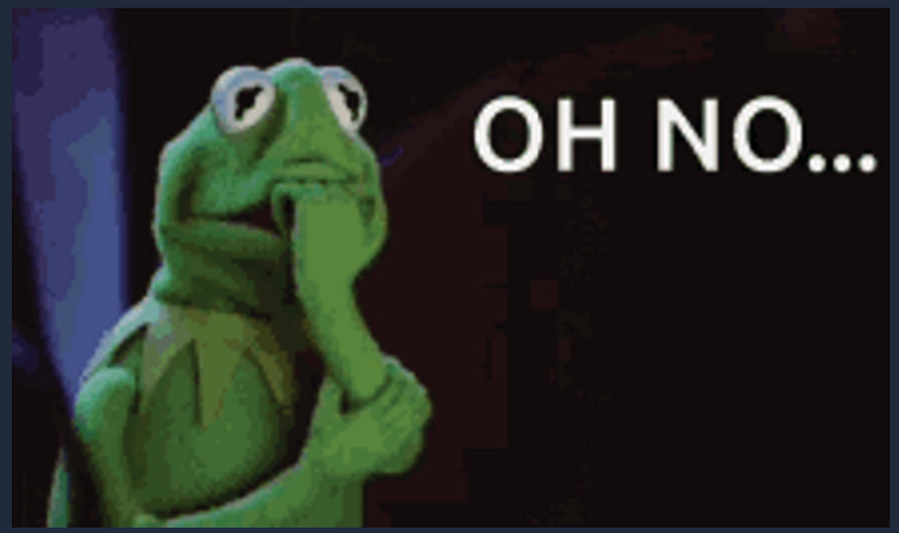
How does climate risk impact real estate?

- Increased Insurance Premiums ↑
- Higher Capital Expenditures ↑
- Higher Operational Costs ↑
- Decreased Asset Value ↓
- Potential Stranding of Asset ✖



How does climate risk impact real estate?

Investment Decisions

Mitigation Efforts

ESG Disclosure

What you need to do

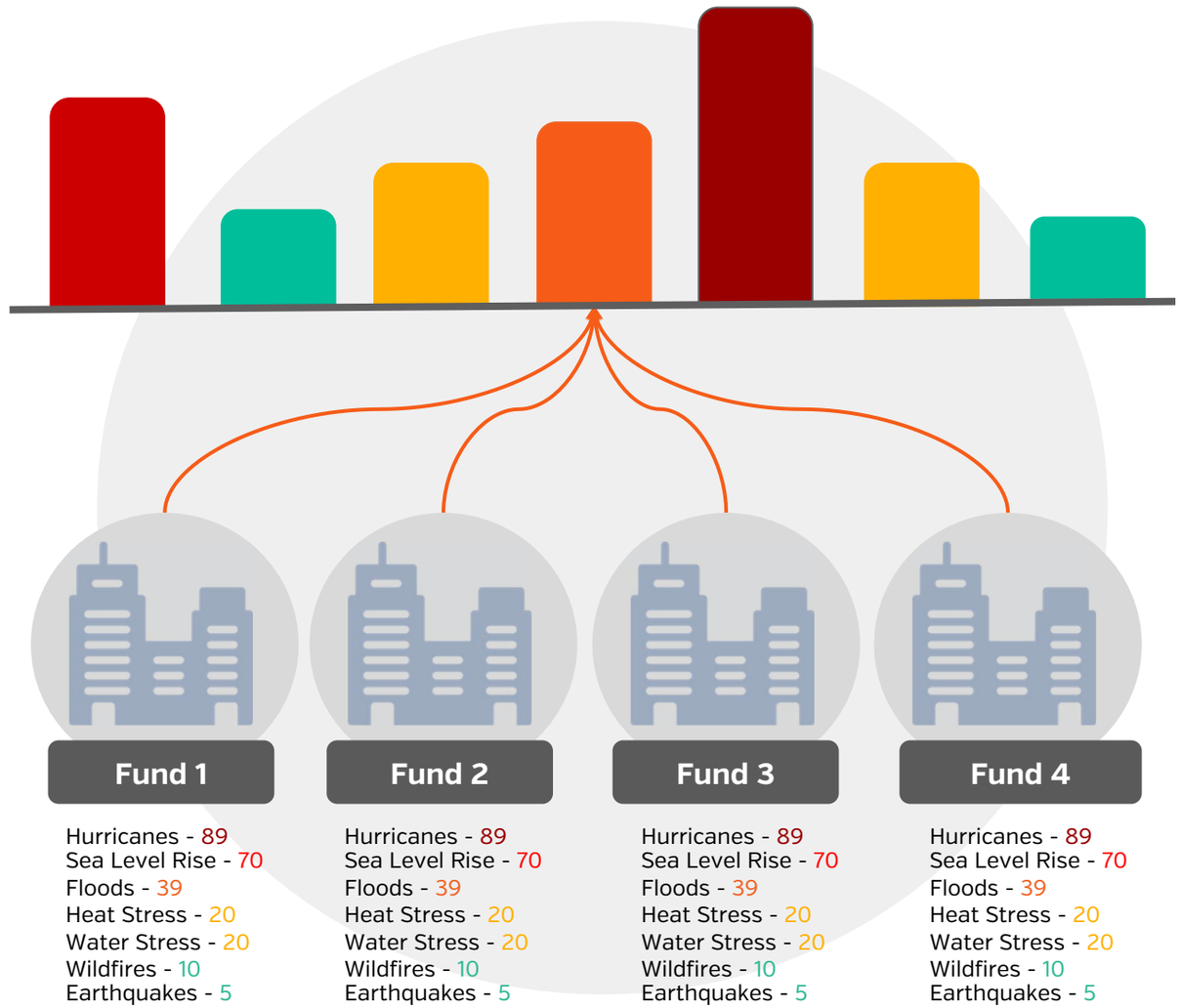
1. ~~Understand there's a problem to address~~
2. Establish a clear governance structure
3. Assess the types of risks your buildings face
4. Analyze how severe these threats are
5. Take action to mitigate climate risks
6. Disclose climate related risks and strategies

Internal Structure

Many departments within the organization will be involved in setting the appropriate climate risk approach, it all begins with **Governance**, as well as gathering **Metrics and Targets.**

Gather Baseline Data

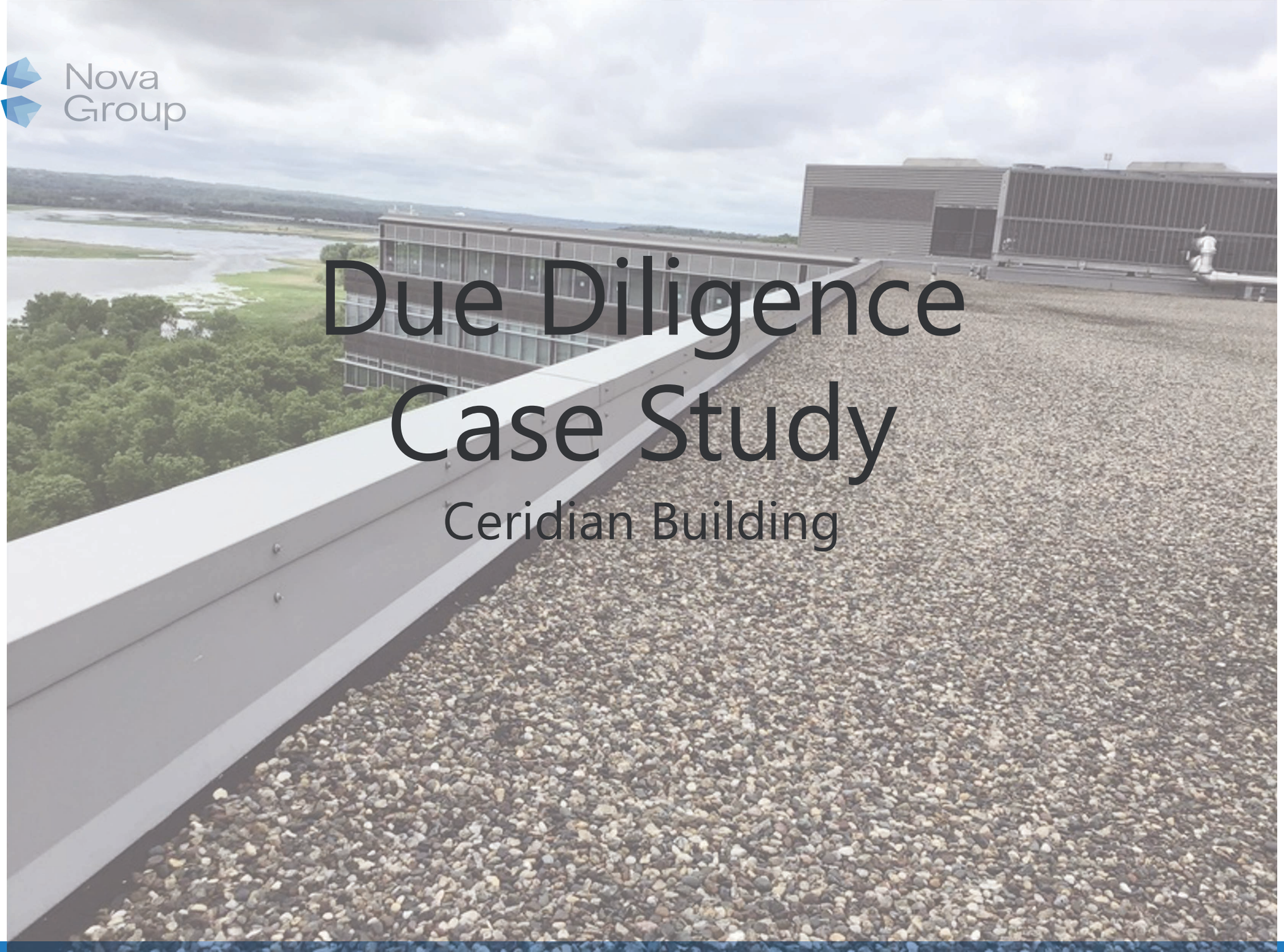
Assessing climate risks through a standardized and consolidated approach will create **transparency** and establish a **common denominator** for your climate risk efforts.



How Measurabl Helps You

- Delivery and consolidation of ESG and climate risk data in one, central platform
- On-demand access of data
- Create transparency for stakeholders

Nova Group



Due Diligence Case Study

Ceridian Building

Dec 2020

Property Details

- 4 Story Office Building
- 182,280 ft²
- 1998 Construction

Green PCA

(PCA + Energy Audit)

Carbon Neutral Report

Greenhouse Gas Protocol Methodology

Climate Resiliency Report

ESG Assessment

Comprehensive Package of Recommendations

NOVA REPORT	SYSTEM OR COMPONENT	QUANTITY	UNIT	UNIT COST	IMMEDIATE TERM	SHORT TERM
	SITE			**SUBTOTAL**	**$2,000**	**$386,524**
EPCA	Repair Asphalt Pavement Cracks	300	LF	$7.00	$0	$2,100
EPCA	Repair Concrete Pavement	1	AL	$5,250.00	$0	$5,250
EPCA	Repair Stone Retaining Wall	1	LS	$2,500.00	$0	$2,500
EPCA	Repair Site Lighting Poles	18	EA	$400.00	$0	$7,200
EPCA	Replace Site Lighting Pole	1	EA	$2,000.00	$2,000	$0
EPCA, GREEN	Install Irrigation Leak Detection System	1	EA	$1,500.00	$0	$1,500
GREEN	Weather-Based Controls	1	EA	$950.00	$0	$950
CLIMATE, GREEN	Rainwater Catchment System	1	EA	$367,024.00	$0	$367,024
	STRUCTURAL FRAME & BUILDING ENVELOPE			**SUBTOTAL**	**$13,380**	**$1,969,665**
EPCA	Re-paint Rusted Egress Stair Landing Support Framing	1	AL	$5,000.00	$0	$5,000
EPCA	Replace Drywall in the Parking Garage Exit Stair	400	SF	$3.00	$0	$1,200
EPCA	Replace Metal Panel Column Cover at Front Entrance	400	SF	$25.00	$0	$10,000
EPCA	Further Inspection of Inaccessible Areas of the Facades	1	AL	$15,000.00	$0	$15,000
EPCA	Replace Sealant at Parapet Coping	800	LF	$4.00	$0	$3,200
EPCA	Repair Base Flashing Along Parapets	3,100	LF	$2.00	$0	$6,200
EPCA	Replenish Bare Areas of Built Up Roofing Gravel	900	SF	$2.00	$0	$1,800
GREEN	Window Films, Whole Building	25,186	SF	$5.00	$0	$125,930
EPCA, GREEN	Increase Roof Insulation from R8 to R30 with Roof Replacement	41,000	SF	$8.00	$0	$328,000
CLIMATE, GREEN	Install Vegetative Roof	38,320	SF	$28.50	$0	$1,092,120
	MECHANICAL, ELECTRICAL AND PLUMBING			**SUBTOTAL**	**$10,000**	**$1,989,873**
EPCA	Replace Parking Garage Storm Water Ejector Pumps	2	EA	$5,000.00	$10,000	$0
EPCA	Modify the Parking Garage HVAC System to add a Differential Enthalpy Sensor to the Make-up Air Unit and Exhaust Fans.	1	LS	$1,500.00	$0	$1,500
EPCA	Retrofit Space Heating Perimeter Radiant Panels with Fan-Powered Units	225	EA	$2,500.00	$0	$562,500
EPCA	Re-Paint Rusted Areas of Emergency Generator	1	AL	$1,000.00	$0	$1,000
GREEN	Reconfigure hot water heating, install condensing boilers	1	EA	$10,417.00	$0	$10,417
EPCA, GREEN	Replace existing boilers with condensing, modulating boilers with Thermal Efficiency of 95% or better.	2	EA	$6,500.00	$0	$13,000
GREEN	Retrocommissioning of HVAC System	1	EA	$36,456.00	$0	$36,456

Nova Group

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CLIMATE HAZARD	RISK LEVEL	SITE SCORE	COUNTRY BENCHMARK
Floods	**Low**	5	17
Heat Stress	**High**	47	45
Hurricanes & Typhoons	**None**	0	19
Sea Level Rise	**None**	0	6
Water Stress	**High**	52	46

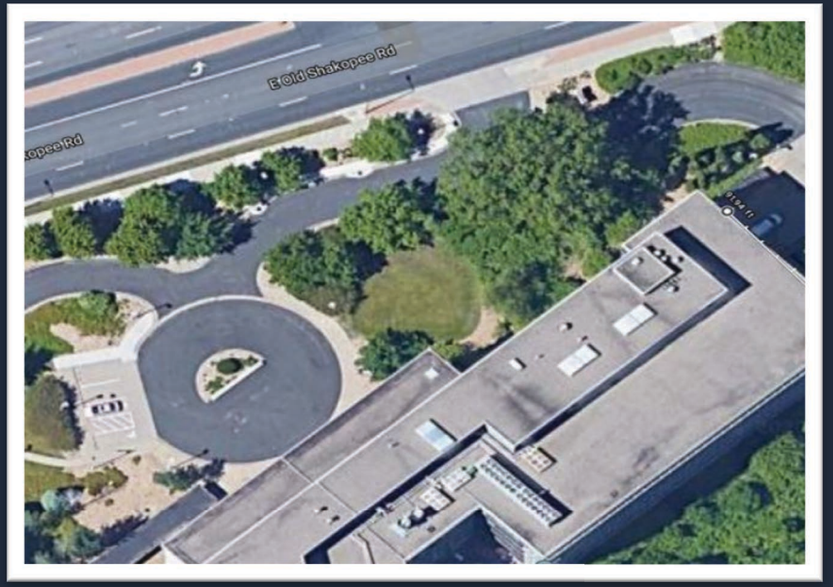
The building façade consists of stone veneer, metal panel and combination ribbon and curtain wall windows.

The roof has a steel-joist support deck covered with built-up tar and gravel roofing materials.

Nova recommends that a green roof system be installed on the main upper level roof decks encompassing approximately 38,320 square feet of roof area.

Numerous existing windows at each level of the building have small perforated sunshades at the top of the windows.

Nova recommended that the feasibility of a rainwater harvesting system be investigated to collect water from the elevated roof surfaces.



ROOF ECM ANALYSIS

Option	Description	Quantity	Incremental Cost	Total Cost	EUL	Annual Cost Savings	Incremental Simple Payback (Yrs)
Traditional	Replace existing roof with code minimum (R30) insulation	41,000 sqft	N/A	$328,000	25	$5,671	26.0
Green	Improve Roof Insulation to R41	41,000 sqft	$75,030	$403,030	25	$1,801	41.7
Comprehensive	Replace existing roof with Vegetated roof	38,280 sqft	$1,092,120	$1,283,720	25	$7,901	138.2

Heat Stress	
Vegetative Green Roof	$1,092,120
Roof Screens / Shades	$30,500
Water Stress	
Rainwater Capture System	$367,024
Total	**$1,489,644**

Nova Group

Dec 2020

Resilience Case Study

Hanover Cambridge Park

Nova Group

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CLIMATE HAZARD	RISK LEVEL	SITE SCORE	COUNTRY BENCHMARK
Floods	**Red Flag**	81	17
Heat Stress	**Low**	31	44
Hurricanes & Typhoons	**Medium**	43	18
Sea Level Rise	**None**	0	6
Water Stress	**Medium**	44	45

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.

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
Total	**$567,000**

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
Total	**$484,600**

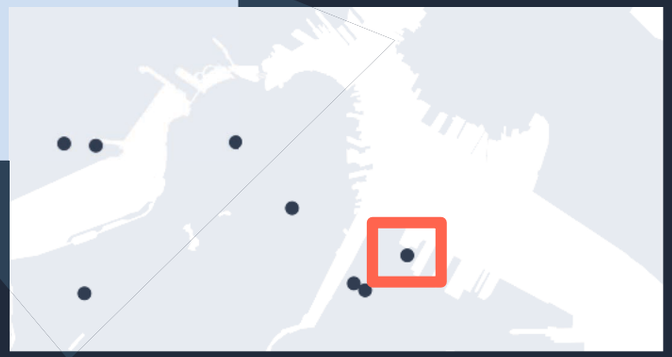
https://www.cbre.com/research-and-reports/Global-Resilience-and-Property-Management--May-2019

Defining Resilience

- Merging top-down portfolio screenings with asset-level physical assessments
- Risk Reviews

Office | 514,738 ft²

- Earthquakes Low Risk - 0
- Floods Low Risk - 8
- Heat Stress Medium Risk - 36
- Hurricanes & Typhoons Medium Risk - 40
- Sea Level Rise Red Flag - 80
- Water Stress Medium Risk - 35
- Wildfires Medium Risk - 52



80
Red Flag

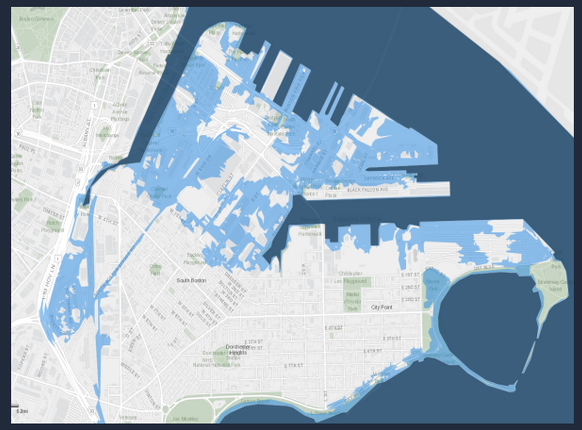
Sea Level Rise

Highly exposed to historical and/or projected risks, indicating high potential for negative impacts

Elements	Unit	Measure	Score
Absolute Coastal Flood Frequency	Return Period of Inundation	100	100
Relative Coastal Flood Frequency	Factor of Change	60	60

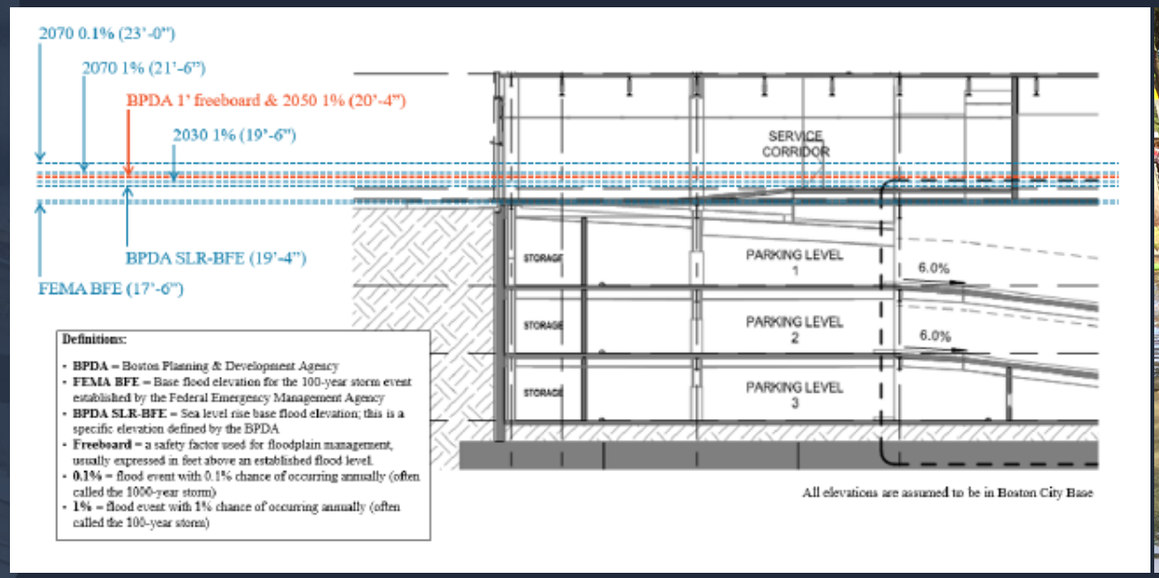
2030
10% Annual Flooding[1]

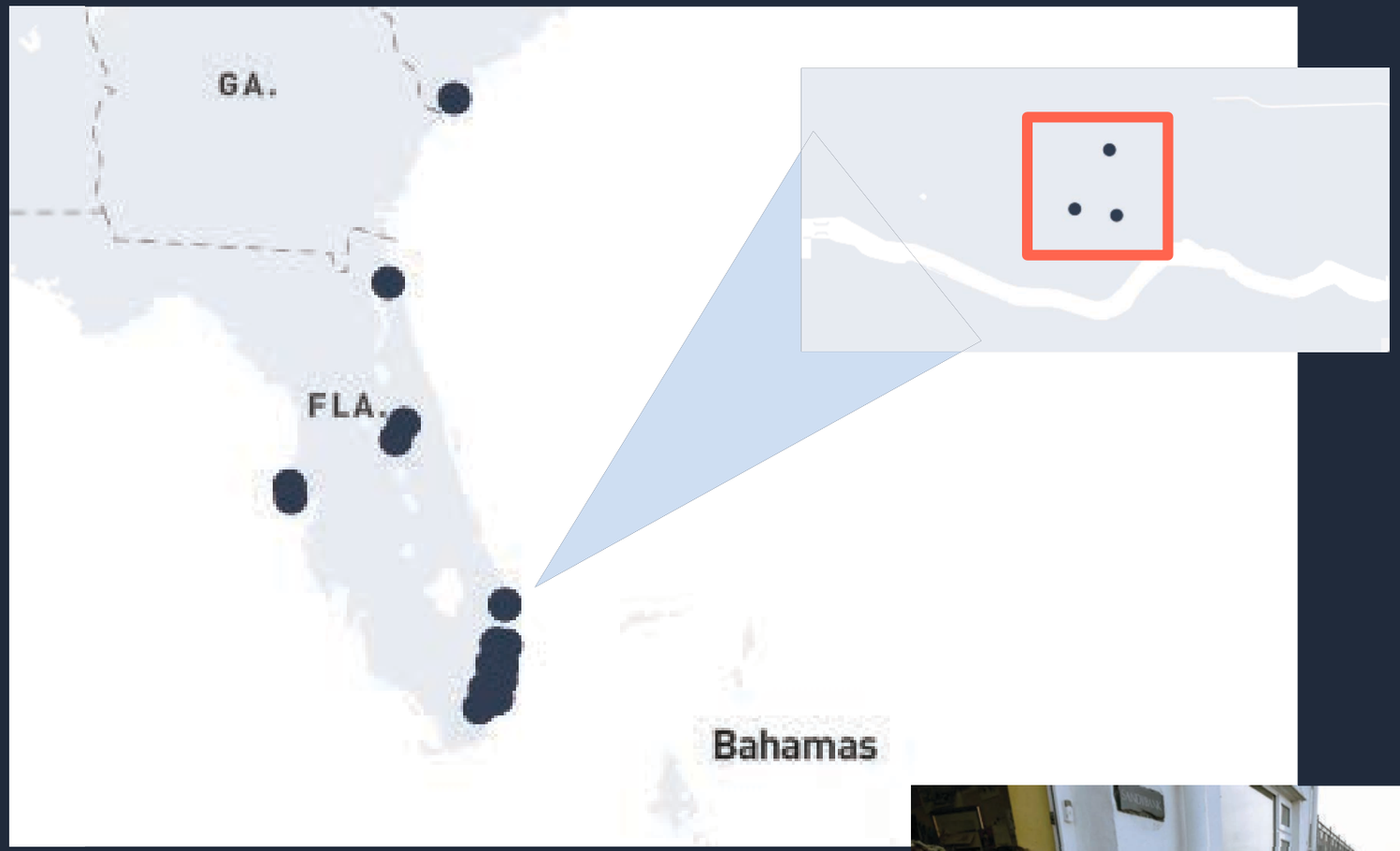
2050
10% Annual Flooding[1]



Physical Assessment Outcomes

- Assessed current and future risk scenarios
- Invested in hard and soft mitigation measures to protect critical equipment and allow for rapid recovery post event
- Improved operational and emergency procedures





Office | 750,888 ft²

- Earthquakes Low Risk - 0
- Floods Medium Risk - 46
- Heat Stress Medium Risk - 63
- Hurricanes & Typhoons Medium Risk - 57
- Sea Level Rise Red Flag - 76
- Water Stress Medium Risk - 47
- Wildfires High Risk - 67

Office | 259,069 ft²

- Earthquakes Low Risk - 0
- Floods Low Risk - 5
- Heat Stress Medium Risk - 63
- Hurricanes & Typhoons Medium Risk - 57
- Sea Level Rise Low Risk - 40
- Water Stress Medium Risk - 47
- Wildfires High Risk - 67

Office | 209,744 ft²

- Earthquakes Low Risk - 0
- Floods Low Risk - 5
- Heat Stress Medium Risk - 63
- Hurricanes & Typhoons Medium Risk - 57
- Sea Level Rise Low Risk - 40
- Water Stress Medium Risk - 47
- Wildfires High Risk - 67

Additional Resources and Tools

Resiliency					Costs Associated
16	PCRX Climate Risk Review (*water-related risk factor)	RED FLAG?	Risk Score (0-100)	Risk Level (factor dependent)	
	Floods*	No	2	Low Risk	
	Sea Level Rise*	No	0	No Risk	
	Hurricanes & Typhoons	No	36	Low Risk	
	Water Stress	No	40	Medium Risk	
	Heat Stress	No	44	Medium Risk	
	Earthquakes	No	65	Medium Risk	
	Wildfire	No	70	High Risk	
17	Is the asset located in a FEMA flood zone?	No	Located in Flood Zone X		

Site Visit Observations & Recommendations

Project:	
Address:	
Date:	
Weather:	
Inspected By:	

Consequence Rating			
Score	Acceptable Downtime	Potential Recovery Requirements*	Potential Cost*
5	None	Replacement; > 1 Month Lead Time	> $1,000,000
4	< 48 hrs	Replacement; > 1 Week Lead Time	$500,000 - $1,000,000
3	< 1 week	Replacement; < 1 Week Lead Time	$100,000 - $500,000
2	< 1 month	Maintenance/Cleaning/Treatment	$10,000 - $100,000
1	> 1 month	None	< $10,000

Asset Description						Consequence Rating (Based on Unmitigated Risk)				Potential Mitigation Strategies			
#	Name	Floor/Level	Room	Description (Elevation in NGVD 1929)	Below DFE?	Downtime	Recovery	Cost	Total	Raise above DFE?	Dry Floodproof?	Wet Floodproof?	Recommendations & Notes (Near-Term Recommendations in Bold)
1	STORM AND SANITARY BUILDING CONNECTIONS	BELOW GRADE	N/A	**Priority #2** SANITARY SEWERS, GREASE WASTE, STORM AND GARAGE DRAINS CONNECTIONS TO EXTERIOR SEWERS PROVIDE POTENTIAL FLOOD PATHWAY INTO THE BUILDING, IMPACTING NUMEROUS ASSETS	Y	5	5	5	125	N	N	Y	**(1) Install clay or concrete trench dam on service pipe utility trenches under sidewalk, and** **(2) Install backflow valves in manholes in street on building service pipe** **or** (3) Install backflow valves in building
2	FIRE COMMAND ROOM**	GROUND	FIRE COMMAND ROOM	**Priority #2** - FIRE ALARM CONTROL PANEL 5" ABOVE FLOOR - SMOKE CONTROL SYSTEMS CONTROL PANEL 5" ABOVE FLOOR - COMPUTER DESK 27" ABOVE FLOOR; COMPUTER ON FLOOR - FIREMAN'S OVERRIDE PANEL 28" ABOVE FLOOR - TRANE CONTROL PANEL 43" ABOVE FLOOR - NUMEROUS DUCTS RUN THROUGH FLOOR	Y	5	5	4	100	Y	Y	N	**(1) Raise all equipment above DFE, including installation of shelf above DFE to raise computer** **or** (2A) Assess structural capacity of walls against hydrostatic forces of water at DFE, and (2B) Replace interior door with flood door, and (2C) Seal all floor penetrations and wall penetrations below DFE
3	ELEVATOR EQUIPMENT	GROUND / BELOW GRADE	ELEVATOR EQUIPMENT ROOM	**Priority #1** ELEVATOR MOTORS LOCATED ON FLOOR CONTROL PANEL LOCATED 18" ABOVE FLOOR SWITCHES LOCATED 47" ABOVE FLOOR	Y	4	4	4	64	Y	Y	N	(1) Raise elevator motors and control panel above DFE and relocate overhead ductbanks as needed to raise motors or **(2A) Replace interior wall with reinforced concrete wall designed to accommodate hydrostatic forces to DFE, and** **(2B) Replace existing door with flood door, and** (2D) Investigate addition of cathodic protection for non stainless steel and aluminum metal parts, and (2E) Install permanent sump pump with discharge forcemain to building sanitary sewer piping

Thank You!

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Questions? Reach out to info@measurabl.com