NYC HEALTH+ HOSPITALS

Climate Resilience Plan

Developed in 2023

CONTENTS

PURPOSE

This executive deck summarizes key findings from a climate impact study conducted across 16 NYC Health + Hospitals facilities, identifies priority climate resilience projects, and outlines recommended next steps for NYC Health + Hospitals to become more climate resilient.

NYC Health + Hospitals is committed to providing safe environments and quality care to our communities. As we serve some of NYC's most climate-vulnerable populations, H+H has demonstrated our support by signing the Health and Human Services (HHS) Health Sector Climate Pledge in May of 2022.

This Plan is the first step in H+H's commitment to the Pledge, which is to "develop and release a climate resilience plan for continuous operations, anticipating the needs of groups in their community that experience disproportionate risk of climate-related harm."

NYC Health + Hospitals studied the climate impacts and vulnerabilities of 16 facilities – 11 Acute Care Hospitals and 5 Post Acute/Long-Term Care Centers. This report assesses these facilities' existing conditions, climate hazard exposure, and vulnerabilities, as well as informs projects to strengthen our infrastructure and enhance our system's resilience.

PROJECT TEAM

Over 65 NYC Health + Hospitals staff contributed to the plan, including team members from the Office of Facilities Development, Sustainability and Energy Management, Emergency Management, Engineering, and Facility Leads. The consultant team consisted of Gensler, Arup, GC Eng & Associates, Insight Civil Engineering and Hatfield Group to produce the Resilience plan from a resilience, architecture, MEP engineering, civil engineering and structural engineering standpoint.

NYC HEALTH + HOSPITALS

Gensler

ARUP

Hatfield Group

INSIGHT CIVIL
ENGINEERS | PLANNERS | CONSULTANTS

PROJECT APPROACH + KEY TAKEAWAYS

- Project Scope
- Research Approach
- Process
- Key Takeaways

1

PROJECT SCOPE

This assessment evaluates four climate hazards over three time horizons, considering two representative concentration pathways.

FACILITIES

11 Acute Care Hospitals and 5 Post-Acute/Long-Term Care Facilities were studied.

CLIMATE HAZARDS

The following climate hazards were studied:

- **Stormwater Flooding**
- **Coastal Flooding**
- **Extreme Heat**
- **Wind**

SCENARIOS

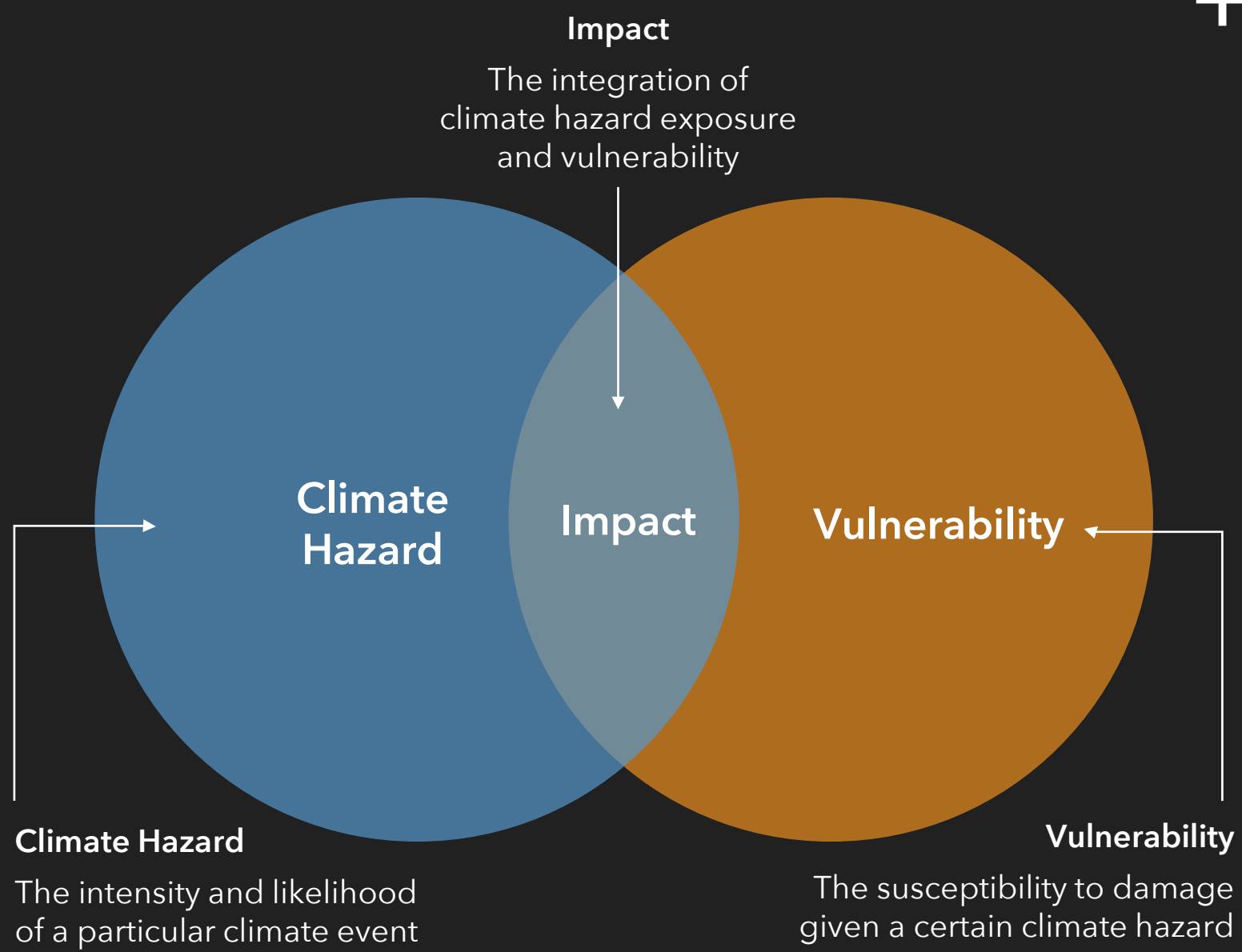
Impact of climate hazards were studied through the following scenarios: current, 2050, 2080, RCP4.5 and RCP8.5.

INFRASTRUCTURE

Systems studied at each facility included electrical power, natural gas, steam, telecommunication, potable water, wastewater, transportation, and logistics.

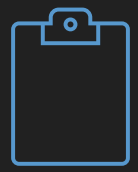
RESEARCH APPROACH

NYC Health + Hospitals' Climate Resilience study evaluated 16 facility's level of exposure to climate hazards and facility vulnerability to determine their total "impact."



PROCESS

The key findings from the facility impact assessment and workshop discussions were synthesized into NYC Health + Hospitals' Climate Resilience Plan. The following research engagements and activities were included in this study:



Impact Assessment + **Workshop** = **Resilience Plan**

Climate Hazard Exposure + **Facility Vulnerability**

- Assessed Facility's Climate Hazard Exposure
- Reviewed Existing Documents

- Assessed Facility Vulnerability
- Assessed Utility Vulnerability
- Assessed Transportation & Logistics Facility Vulnerability
- Facility Vulnerability Survey
- Conducted Facility Interviews

- Facilitated Workshop with NYC Health + Hospitals: Prioritization of Investments & Brainstorm of Possible Projects

- Priority Projects & Facilities
- Policy + Community Engagement
- Further Research + Assessments
- Climate Resilience
- How to prioritize future investments for climate projects

KEY TAKEAWAYS

Patient and staff safety is the #1 priority.

Climate hazards disproportionally impact different variables of healthcare operations; however, patient & staff safety was voted the highest priority.

Take a holistic, strategic planning approach.

NYC Health + Hospitals will prioritize projects that ensure patient & staff safety and can address multiple climate hazards. Resources will be allocated towards long-term, sustainable solutions.

Continue ongoing climate resilience projects.

There are emergency plans in place and ongoing climate resilience projects, such as flood mitigation efforts at Bellevue, Harlem, Metropolitan, South Brooklyn Health and Coler.

Stormwater flooding + extreme heat have the greatest impact.

44% of facilities were scored as High impact for stormwater flooding and 38% of facilities scored High impact for extreme heat.

Power is the most vulnerable utility.

Of the total 16 facilities assessed, 9 scored High vulnerability and 7 scored Medium-High vulnerability for power.

RESILIENCE PLAN

- Potential Projects & Facilities
- Recommended Next Steps
- Additional Research & Policy Projects

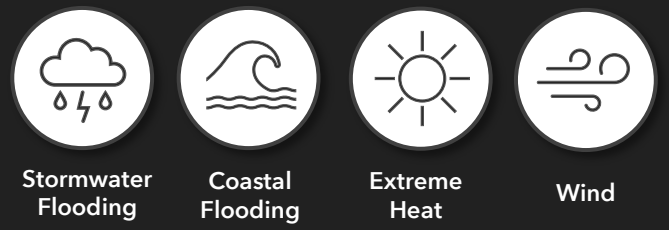
2

POTENTIAL CAPITAL PROJECTS + FACILITIES

Potential projects at 5 facilities were identified due to their vulnerability scores and having at least one priority consequence: maintains patient and staff safety, sustains community access to care, and building damage mitigation.

Climate hazards that scored High impact is noted under each facility to the right.

For full list of identified projects, please refer to the Impact Assessment Report.



QUEENS

- Elevate or floodproof critical equipment located below ground.
- Replace roof membranes and remove all ballast roof covering.
- Add both chillers to the emergency power circuit.

BELLEVUE

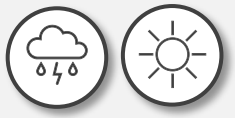
- Structurally reinforce and seal the penetration where steam enters the facility.
- Install backflow prevention devices.
- Seal windows, louvers, and envelope to protect against wind-driven rain.

METROPOLITAN

- Elevate and/or floodproof critical utility equipment located below ground.
- Add chillers, cooling towers, and chilled water distribution system to the emergency power supply.

SOUTH BROOKLYN HEALTH

- Improve envelope drainage capacity.
- Install impact protection shutters or glazing throughout the campus.



GOUVERNEUR

- Elevate the switchgear distribution rooms that are located below ground.
- Add an emergency generator quick connection at the street level.
- Repair roofs.

NEXT STEPS

As a result of this study, key projects have been identified at facilities with the most High and Medium-High impact scores. These projects can be used to guide next steps to directly improve the long-term sustainability of NYC Health + Hospitals' portfolio.

This study has also identified gaps in data and information where further research and assessments are needed in order to develop comprehensive resilient design guidelines to be integrated into master planning efforts.

For full list of identified and recommended projects, please refer to the Impact Assessment Report.

Priorities

For future climate resilience projects, ensure the following qualifications and considerations are met:

- ☑ **Maintains Patient & Staff Safety**
  Climate resilience projects that directly maintain, project, and improve patient & staff safety should be prioritized.
- ☑ **Sustains Community Access to Care**
  Climate resilience projects should ensure access to care by considering transportation options, system access, and site exits/entrances.
- ☑ **Mitigates Damage**
  Climate resilience projects that address climate hazards and building system improvements that add redundancy to better maintain building operations should be prioritized.

RESILIENT DESIGN INTEGRATION INTO MASTERPLAN

To integrate resilience into master planning efforts, the following steps are recommended:

SYSTEM-WIDE RESILIENCE MASTERPLAN

POLICY + COMMUNITY ENGAGEMENT

- Update Emergency Planning Policies & documentation to account for Transportation & Logistics Vulnerabilities.
- Create a Power Emergency Response Plan with Extreme Heat scenario.

RESEARCH + ASSESSMENTS

- Gather remaining Facility Record Documents, Emergency Power Data & updated VFA Reports.
- Conduct an MEP Assessment with focus on Electrical Power Assessment.
- Study Microgrid Scoping Study, Drainage Capacity Study, Transportation and Logistics Study, Patient Influx Study during Extreme Heat events and Generator Quick Connects Study.

PROJECT IDENTIFICATION + CAPITAL PLAN ALIGNMENT

- Create programs for possible Climate Resilience Projects for further assessment, pricing, design and implementation.
- Confirm projects address and meet upcoming local law requirements (LL41).
- Explore federal funding and grant opportunities.

APPENDIX

4

GLOSSARY

Impact: Measures the cumulative influence of exposure and vulnerability on facilities.

Exposure: The presence of people; livelihoods; environmental services and resources; infrastructure; or economic, social, or cultural assets in places that could be adversely affected.

Vulnerability: The propensity or predisposition to be adversely affected.

Climate Resilience: The ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions.

Climate Scenario: A plausible representation of the future climate, based on an internally consistent set of climatological relationships that has been constructed for explicit use in investigating the potential consequences of anthropogenic climate change, often serving as input to impact models.

FACILITY VULNERABILITY SURVEY

Tailored Questionnaire

HHS Survey was tailored specifically to Health + Hospitals facilities to collect data on existing site conditions and policies. The distributed survey included 50 questions that gathered information regarding site historical events, transportation & site access, site & building construction, utility infrastructure, and essential clinical care service planning.

Survey Yielded 100% Response Rate

The survey was hosted and distributed through Qualtrics to the 11 participating facility managers. Within one month, there was a 100% response rate with total survey completion.

Data Given Weighted Impact Score

The survey results were then input into a model that translated responses into a weighted impact score.

Results Used to Inform Total Impact

The weighted scores were then used to inform the total facility impact assessment.

Snapshot of Scoring Summary

Element	Component	Question #	Question	Hazard	Score	Possible Points	BELLEVUE	CONEY ISLAND	ELMHURST	HARLEM	JACOBI	KING'S COUNTY	LINCOLN	METROPOLITAN	NCB	QUEENS	WOODHULL	CARTER	COLER	GOUVERNEUR	MCKINNEY	SEA VIEW
I. Transportation and Site Access	Evacuation Routes	Q11	Do you have an evacuation plan?	All	Yes	2	2	0	0	0	0	0	2	0	0	0	2	2	2	2	0	0
		Q112	Does your evacuation plan provide alternative routes if normal egress routes are impassable?	All	Yes	1	0	0	0	1	1	1	1	1	0	0	0	1	1	1	1	1
	Waste Transportation	Q12	Does the facility have any contingency plans in place should a climate hazard event prohibit pickup of solid waste, recycling, biohazard and hazardous waste?	All	Yes	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
			Total			4	2	0	0	1	1	1	4	2	1	1	3	4	4	4	2	2
			% total				50%	0%	0%	25%	25%	25%	100%	50%	25%	25%	75%	100%	100%	100%	50%	50%
II. Site & Building Construction	Site	Q17	Does the facility currently have any green infrastructure strategies in place to manage stormwater or heat? Please describe.	Flood, Heat	Yes	1	0	0	0	1	1	1	1	1	0	0	0	1	1	1	1	1
	Roof	Q18	Is there any potential for rooftop mechanical rooms to flood? If yes, please elaborate on any floodproofing measures.	Flood	Yes	3	1	2	3	3	3	3	3	3	3	3	2	2	2	2	2	0
		Q19	Are the following rooftop systems anchored? Check all that apply.	Flood, Wind	Yes	3	2	2	2	2	3	3	3	3	3	3	3	1	1	1	1	1
	Openings	Q20	Which of the following service areas have operable or unlockable windows to provide air ventilation and cooling? Check all that apply.	Heat	Yes	3	0	2	2	2	2	2	2	0	0	0	0	0	1	1	1	1
		Q21	Does the facility have any windows or skylights that are double or triple paned? Check all areas that apply.	Wind	Yes	3	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3
	Interior	Q22	What percentage of structures have water-resistant interior construction materials throughout the basement and ground floor? Please elaborate.	Flood	Yes	3	0	0	2	1	1	1	3	1	1	3	3	3	3	3	3	1
	Vertical Transportation	Q23	Are all elevators programmed to stop above the ground floor to prevent entering into flood water?	Flood	Yes	3	3	3	2	1	3	0	3	2	2	3	0	0	0	0	0	0
		Q24	Are all elevators outfitted with water sensors in the elevator cabs?	Flood	Yes	2	1	1	0	2	2	2	2	2	0	3	2	2	2	1	1	1
		Q25	Are vertical transportation systems dispersed to allow for partial use if some infrastructure is damaged or disabled? If no, please elaborate in open space for text.	Flood	Yes	2	0	0	1	2	2	2	2	2	2	3	2	2	1	1	1	1
			Total			23	9	12	14	16	19	16	21	16	13	20	14	16	14	13	13	9
			% total				39%	52%	61%	70%	83%	70%	91%	70%	57%	87%	61%	70%	61%	57%	57%	39%

HAZARD EXPOSURE REPORT

The Hazard Exposure Report examined the exposure of 16 Health + Hospitals facilities to the following climate hazards:

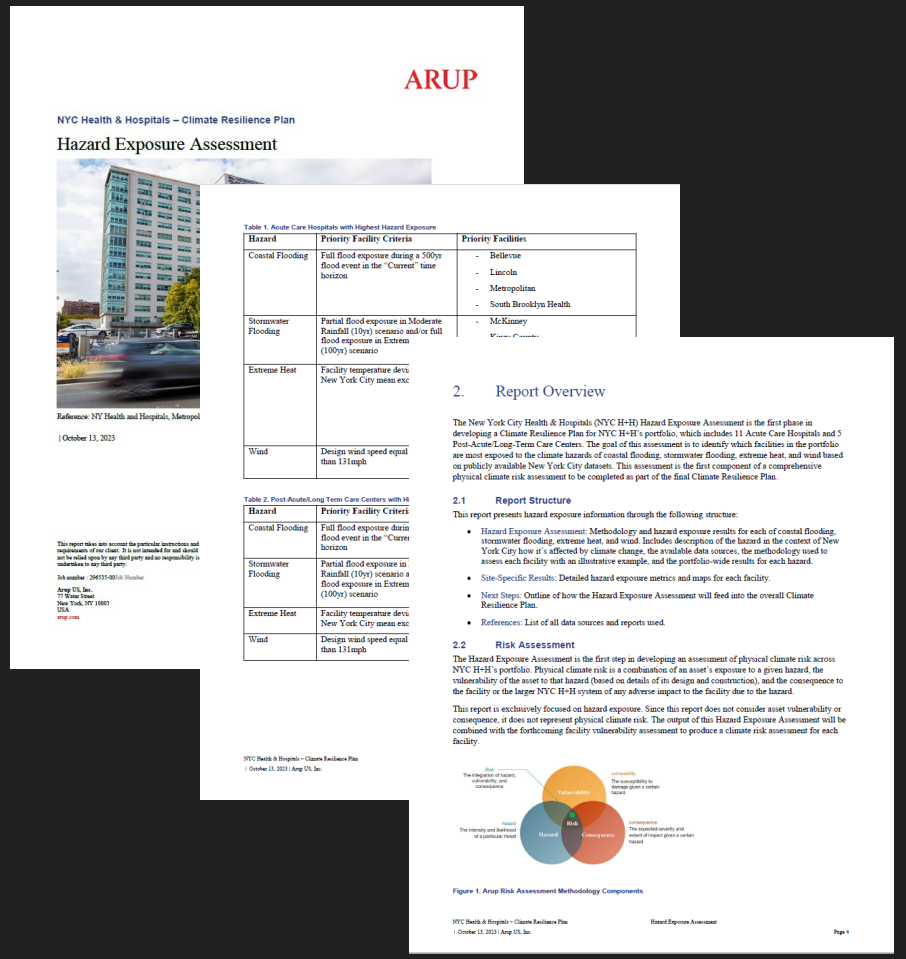
- Coastal Flooding
- Stormwater Flooding
- Extreme Heat
- Wind

Hazard exposure was studied through 3 timeframes – current, 2050, and 2080 using publicly available sources.

Please note that ranking cannot be cross compared and hazard exposure does not equate the level of risk at the facilities.

*Chance of scenario occurrences:

- 500-yr Scenario: Event that has a 0.2% chance of occurrence each year.
- 10 yr Scenario: Event has a 10% chance of occurrence each year.
- 100-yr Scenario: Event that has a 1% chance of occurrence each year.


ARUP

NYC Health & Hospitals – Climate Resilience Plan

Hazard Exposure Assessment

Table 1. Acute Care Hospitals with Highest Hazard Exposure

Hazard	Priority Facility Criteria	Priority Facilities
Coastal Flooding	Full flood exposure during a 500yr flood event in the "Current" time horizon	- Bellevue - Lincoln - Metropolitan - South Brooklyn Health
Stormwater Flooding	Partial flood exposure in Moderate Rainfall (10yr) scenario and/or full flood exposure in Extrem (100yr) scenario	- McKinney
Extreme Heat	Facility temperature devi New York City mean exc	
Wind	Design wind speed equal than 131mph	

Table 2. Post-Acute/Long Term Care Centers with H

Hazard	Priority Facility Criteri
Coastal Flooding	Full flood exposure durin flood event in the "Curre horizon
Stormwater Flooding	Partial flood exposure in Rainfall (10yr) scenario a flood exposure in Extrem (100yr) scenario
Extreme Heat	Facility temperature devi New York City mean exc
Wind	Design wind speed equal than 131mph

2. Report Overview

The New York City Health & Hospitals (NYC H+H) Hazard Exposure Assessment is the first phase in developing a Climate Resilience Plan for NYC H+H's portfolio, which includes 11 Acute Care Hospitals and 5 Post-Acute/Long-Term Care Centers. The goal of this assessment is to identify which facilities in the portfolio are most exposed to the climate hazards of coastal flooding, stormwater flooding, extreme heat, and wind based on publicly available New York City datasets. This assessment is the first component of a comprehensive physical climate risk assessment to be completed as part of the final Climate Resilience Plan.

2.1 Report Structure

This report presents hazard exposure information through the following structure:

- Hazard Exposure Assessment: Methodology and hazard exposure results for each of coastal flooding, stormwater flooding, extreme heat, and wind. Includes description of the hazard in the context of New York City how it's affected by climate change, the available data sources, the methodology used to assess each facility with an illustrative example, and the portfolio-wide results for each hazard.
- Site-Specific Results: Detailed hazard exposure metrics and maps for each facility.
- Next Steps: Outline of how the Hazard Exposure Assessment will feed into the overall Climate Resilience Plan.
- References: List of all data sources and reports used.

2.2 Risk Assessment

The Hazard Exposure Assessment is the first step in developing an assessment of physical climate risk across NYC H+H's portfolio. Physical climate risk is a combination of an asset's exposure to a given hazard, the vulnerability of the asset to that hazard (based on details of its design and construction), and the consequence to the facility or the larger NYC H+H system of any adverse impact to the facility due to the hazard.

This report is exclusively focused on hazard exposure. Since this report does not consider asset vulnerability or consequence, it does not represent physical climate risk. The output of this Hazard Exposure Assessment will be combined with the forthcoming facility vulnerability assessment to produce a climate risk assessment for each facility.

Figure 1. Arup Risk Assessment Methodology Components

IMPACT ASSESSMENT REPORT

This report includes the following assessments:

Utility Vulnerability Assessment: Describes both systemwide and facility-specific, building-scale vulnerabilities of the primary utilities or "lifelines" critical to the operations of NYC H+H's portfolio: electric power (referred to as "power" throughout), natural gas, district steam, telecommunications, potable water (referred to as "water" throughout), and wastewater.

Transportation and Logistics Assessment: Describes the vulnerability of transportation and logistics assets and operations for the 16 assessed facilities across four categories: transportation vulnerability, logistics vulnerability, exposure to coastal flooding, and exposure to stormwater flooding (coastal and stormwater flooding includes both transportation and logistics assets/infrastructure).

Facility Impact Assessment: Describes the projected impact to each of the 16 individual NYC H+H facilities, including exposure and vulnerabilities, from coastal flooding, stormwater flooding, heat, and wind.

Facility Results: These three assessments are summarized for each of the 16 facilities in the appendix. Each one page facility summary presents utility, transportation, and logistics vulnerability and facility impact results for each location.


NYC
HEALTH+
HOSPITALS