
Introduction

Industrial businesses are intricately tied to New York City's history and development and continue to be an important component of the city's economy. From maritime businesses supporting the largest port on the East Coast to the network of food distribution businesses supplying groceries to millions of New Yorkers, the city relies on and benefits from a healthy industrial sector. Mayor de Blasio's **10 Point Industrial Action Plan**, released in November 2015, affirms the importance of supporting industrial businesses that provide a range of critical services to the city and jobs for hundreds of thousands of New Yorkers.

However, due in large part to historic development patterns and the transportation benefits of locating near the water, a large proportion of industrial businesses are located along or near the city's 520-mile coastline and are particularly vulnerable to the effects of flooding, coastal storms, and sea level rise. In fact, approximately 24 percent of the city's floodplain falls within districts zoned for manufacturing and industrial uses. These areas contain 3,600 businesses that employ 87,000 workers. The need to store and use hazardous materials as part of many industrial processes and operations adds another layer of risk for workers, neighboring businesses and the surrounding community, and poses potential environmental hazards.

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Hurricane Sandy's landfall on October 29th 2012, highlighted many of these vulnerabilities across the city's industrial sector, damaging buildings, equipment, inventory, and vehicles. The average depth of flooding within the 5,500 industrial buildings located in the Sandy inundation area was 2.6 feet. Many of these businesses were uninsured or underinsured for flood damage, forcing them to cover repairs and lost revenue out-of-pocket or through additional financing.

Despite the damage caused by Hurricane Sandy, few industrial buildings were damaged beyond repair, and most businesses were able to make the necessary investments to resume operations fairly quickly. Some businesses

took steps prior to Sandy to limit their losses. Others learned from their experience and developed operational plans or made physical investments to lessen damage in the future.

The experience responding to and recovering from Sandy revealed a number of lessons to help better prepare the city's industrial sector for future storms and mitigate losses. The Resilient Industry study is designed to address this need by identifying strategies to reduce vulnerability to flooding that are applicable across a broad spectrum of businesses active in industrial areas in New York City.

The study is guided by four overarching goals:



1 Reduce flood hazards for businesses and residents in the city's industrial areas located within the floodplain.



2 Identify emergency preparedness guidelines for businesses in industrial areas located within the floodplain.



3 Promote cost-effective physical and operational strategies to protect businesses and the environment.



4 Identify financial and insurance challenges unique to businesses in industrial areas located within the floodplain.



Industrial facility site visit by NYC Department of City Planning staff to document resiliency challenges.

Resiliency Planning in New York City

Hurricane Sandy inundated New York City's five boroughs with extreme levels of coastal flooding and storm surge. While this was not the first major hurricane to cause flooding in the city, it resulted in a record \$19 billion in damages and economic loss for the city, claimed 44 lives, and prompted residents, businesses, and city government to more thoroughly consider strategies to reduce future flood risk. Following Sandy, the City developed a detailed action plan for rebuilding, called, "[A Stronger, More Resilient New York](#)" that focused on both post-disaster recovery and long-term resiliency for the city's coastal communities, buildings, and infrastructure. The City has made significant progress in implementing

the plan, funding a \$20 billion climate resiliency program and advancing rebuilding through initiatives such as Build it Back, as well as long-term resiliency through infrastructure investments and upgrades.

Drawing on this work and earlier planning efforts, in Spring 2015 the City released, "[OneNYC: The Plan for a Strong and Just City](#)" a long-term strategic plan to address the city's most pressing challenges, including a rapidly growing population, rising inequality, aging infrastructure, and climate change. During the following months and years, the New York City Department of City Planning and other agencies have conducted planning studies and initiatives to improve the resiliency of vulnerable communities, many of which are described in Chapter 2 of this report.



Presentation of industrial resiliency strategies to business owners in Long Island City, Queens.

Process

The Resilient Industry study was guided by a Technical Advisory Committee (TAC) consisting of more than 60 stakeholders, comprised of business owners, state and local government agency representatives, environmental and community justice advocates, architects and engineers, and academics. The TAC met four times during the course of the study and meaningfully informed the scope, approach, and findings.

The Resilient Industry study began with an analysis of industrial vulnerability, including an assessment of Hurricane Sandy's impacts and the recovery process during the subsequent months and years. The study team developed a criterion to select case studies that cumulatively address a range of typical building features, site characteristics, and industrial uses central to New York City's

economy. Working in partnership with **Industrial Business Service Providers**, the team identified seven businesses to serve as case studies in which to evaluate specific resiliency challenges and best practices.

During the winter of 2015, city planners and urban designers visited the case study sites and interviewed business owners and operators to learn about physical and operational strategies they are pursuing to manage flood risk and barriers they are facing in becoming more resilient to flooding and coastal storms. Research about industrial mitigation and preparedness measures implemented in other cities in the U.S. and internationally further informed the analysis.



**Erie Basin in
Red Hook,
Brooklyn.**

Using this Report

The Resilient Industry report is primarily designed as a resource for industrial businesses to help them consider both the risks that future flooding poses to their facilities and steps that can be taken to prevent or reduce damage. The seven case studies explored in the study describe physical retrofit options applicable at industrial sites with different challenges. The case studies also point to operational strategies that may be replicated to effectively prepare facilities when the potential for flooding exists. Although they were selected because they are broadly representative of the types of businesses and site conditions present in industrial areas, the types of interventions, including their cost and effectiveness, will vary based on unique site conditions and business operations. For this reason, the case studies are intended to be used as a guide to help businesses think through

their own vulnerability and prioritize investments that may be most effective on their sites. In addition to local businesses and property owners, the report is intended to be used by organizations supporting and advocating for a more resilient industrial sector in New York City. Many best practices described in Chapter 4 include cost estimates. Tables in the appendix provide additional detail about the cost of various resiliency measures.

The report also acknowledges opportunities for city, state, and federal programs and policies to more effectively support a vibrant and resilient industrial sector. Recommendations are geared toward policy-makers at multiple levels of government to provide targeted investments, incentives, and flexibility to allow new and existing industrial businesses to operate safely and effectively in the face of future flooding and coastal storms.



Newtown Creek,
Greenpoint, Brooklyn