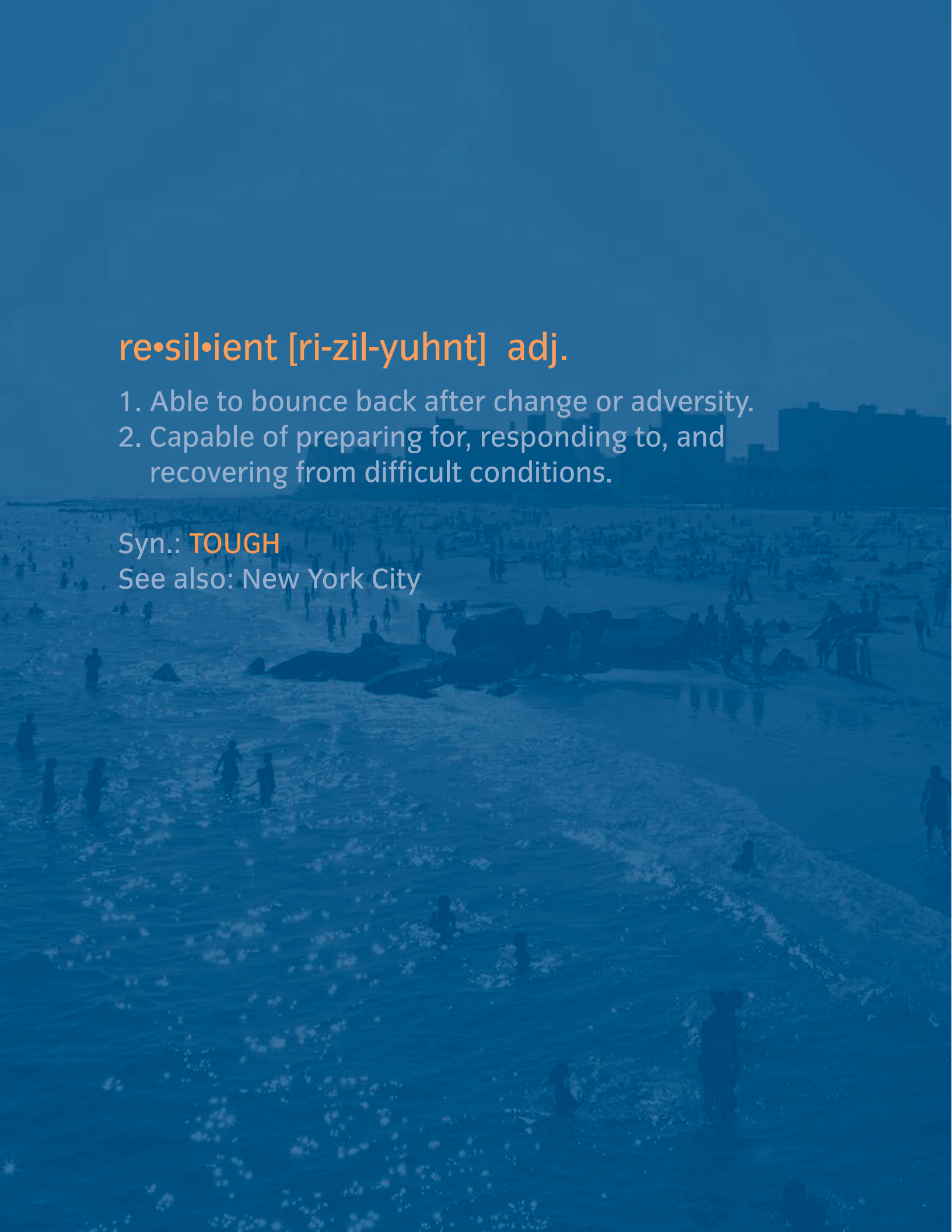


re•sil•ient [ri-zil-yuhnt] adj.

1. Able to bounce back after change or adversity.
2. Capable of preparing for, responding to, and recovering from difficult conditions.

Syn.: TOUGH
See also: New York City

This report is dedicated to the 43 New Yorkers who lost their lives during Sandy, and to the loved ones they left behind. It is also offered in recognition of those whose homes, businesses, and communities were damaged during the storm and who are working to rebuild. The City stands in solidarity with all of them as it makes plans to strengthen New York so that future climate events do not have the same devastating effects.

Foreword from the Mayor

June 11, 2013

CITY OF NEW YORK

Hurricane Sandy was the worst natural disaster ever to hit New York City. Forty-three New Yorkers lost their lives, many more lost homes or businesses, and entire communities were sent reeling by the storm's devastating impact.

Seven months later, we still have a lot of work to do to help the hardest-hit communities get back on their feet—but there's no question we've come a long way. During tough times, our city always pulls together, and our post-Sandy recovery has been an unprecedented team effort. Thousands of City workers and NYC Service volunteers have put in countless hours cleaning and rebuilding neighborhoods and helping families impacted by the storm, and our Administration has launched innovative new programs to expedite that work. We've also received tremendous help from partners in Federal and State government, from local community leaders, and from nonprofit groups. Private citizens and corporations, from both here in the five boroughs and across the world, have donated nearly $60 million to the Mayor's Fund to Advance New York City in support of hurricane relief and recovery. Together, we are doing everything possible to help communities rebound and rebuild for the long term.

As our recovery from Sandy continues, we must also look to the future—and prepare for it. The long-term sustainability plan we launched in 2007—PlaNYC—included forward-looking resiliency initiatives that provided important protections during Sandy. But the storm set the bar higher—and as the possibility of more severe weather increases with climate change, we must rise to the occasion.

In December 2012, we announced the formation of the Special Initiative for Rebuilding and Resiliency and charged it with producing a plan to provide additional protection for New York's infrastructure, buildings, and communities from the impacts of climate change. *A Stronger, More Resilient New York*—a roadmap for producing a truly sustainable 21st century New York—is the result of that effort.

It is impossible to know what the future holds for New York. But if this plan is brought to life in the years and decades ahead, a major storm that hits New York will find a much stronger, better protected city.

In our vision of a stronger, more resilient city, many vulnerable neighborhoods will sit behind an array of coastal defenses. Waves rushing toward the coastline will, in some places, be weakened by offshore breakwaters or wetlands, while waves that do reach the shore will find more nourished beaches and dunes that will shield inland communities. In other areas, permanent and temporary floodwalls will hold back rising waters, and storm surge will meet raised and reinforced bulkheads, tide gates, and other coastal protections.

Water that makes its way inland will find hardened and, in some cases, elevated homes, making it more difficult to knock buildings off their foundations or knock out mechanical and electrical systems. And it

will be absorbed by expanded green infrastructure, or diverted into new high-level sewers. Meanwhile, power, liquid fuels, telecommunications, transportation, water and wastewater, healthcare, and other networks will operate largely without interruption, or will return to service quickly when preventative shutdowns or localized interruptions occur.

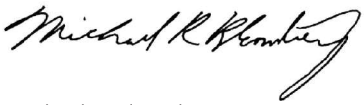
Of course, if this plan is implemented, New York City will not be "climate-change proof"—an impossible goal—but it will be far safer and more resilient than it is today. While no one can say with certainty exactly how much safer, the climate analysis in Chapter 2 shows that the investments recommended in this plan certainly will be worthwhile. Lives will be saved and many catastrophic losses avoided. For example, while Sandy caused about $19 billion in losses for our city, rising sea levels and ocean temperatures mean that by the 2050s, a storm like Sandy could cause an estimated $90 billion in losses (in current dollars)—almost five times as much.

However, if the first phase of coastal protection measures and major power and building protections recommended in this plan are taken into account, the economic outlook changes dramatically. Pursuing just these measures could reduce expected losses in the 2050s by up to 25 percent, or more than $22 billion. Implementing all of the measures in this plan would result in an even larger reduction, and smart investments by State-led transportation authorities and others could reduce losses further still.

This economic analysis only quantifies the value of losses avoided due to future coastal storms. Our plan will also help avoid losses as a result of other extreme weather events, such as the heavy downpours and heat waves that can cause damage and threaten public health, and which are predicted to grow in intensity as the climate changes.

Over time, implementation of this plan would address many of the risks that a coastal city like New York faces. By hardening our coastline, by making our building stock stronger, by creating a more durable power network and better stormwater infrastructure, and so much more, we can be better prepared for anything the future holds.

We are a coastal city—and we cannot, and will not, abandon our waterfront. Instead, we must build a stronger, more resilient city—and this plan puts us on a path to do just that. It will not be easy, and it will take time; but as New Yorkers we are more than up to the task.



Michael R. Bloomberg
Mayor

Credit: Alan Wu

A STRONGER, MORE RESILIENT NEW YORK

Preface

The first PlaNYC report, released in 2007

Well in advance of Sandy, the 2007 edition of *A Greener, Greater New York* raised the possibility of a catastrophic storm that might flood the Holland Tunnel, as shown in this illustrative depiction

When Michael R. Bloomberg launched PlaNYC back in 2007, combating climate change was not on the agenda of most municipal governments. Although scientists had shown that human activities were increasing the concentration of greenhouse gases in the earth's atmosphere—and those gases were raising temperatures and sea levels—many people still questioned the very idea of climate change. Besides, what could a single city do about such a global problem?

However, Mayor Bloomberg recognized that this global problem was also a local one. Sea levels around the city already had risen more than a foot during the previous century. Higher sea levels meant coastal storms were more likely to cause flooding, and as a waterfront city with low-lying areas, New York was especially vulnerable to the storms that climate change was expected to bring. Mayor Bloomberg also knew that because of New York City's prominence in the world, it was positioned to take a leadership role on these pressing matters.

The result was PlaNYC, Mayor Bloomberg's pioneering effort to accommodate a growing population, enhance the quality of life for all New Yorkers—and address climate change. A 2007 report entitled *A Greener, Greater New York* laid out PlaNYC's ambitious goals. These included reducing the city's greenhouse gas emissions by more than 30 percent by 2030, and 126 other initiatives that City agencies would undertake to reach these goals, including the establishment of a new Mayor's Office of Long-Term Planning and Sustainability (OLTPS) to lead the effort.

As part of PlaNYC, the Bloomberg Administration sought to understand New York's climate risks. For example, it established the New York City Panel on Climate Change (NPCC), a body of leading climate and social scientists charged with making climate projections for the city—the first group of its kind in the country. OLTPS began working with the Federal Emergency Management Agency to help produce updated Federal flood maps that would provide more accurate information about New York's risks from coastal storms. In 2011, the City updated *A Greener, Greater New York*, with new initiatives that placed an even greater emphasis on climate resiliency in response to changes in weather that already were taking place.

In ways good and bad, PlaNYC was prescient: Six years on, New York's population is growing rapidly, as is the demand for housing and City services. But PlaNYC also hypothesized storm surges that could overtop the Battery and flood critical infrastructure like the Holland Tunnel. Sandy did that and, tragically for many New Yorkers, much more.

By the time Sandy was forming in distant waters, progress on PlaNYC's resiliency efforts had advanced substantially. Greenhouse gas emissions in New York City were down 16 percent. The City was updating its Building Code to make new buildings more flood-resistant. The Department of Environmental Protection and the Department of Parks & Recreation were restoring and enhancing wetlands. These and many other efforts to prepare our city for a future with climate change were well underway.

On October 29, Sandy hit the city with a force that made two things devastatingly clear. First, New York City had been right to invest in protections against extreme weather. Our resiliency investments performed well during Sandy: recently restored wetlands helped to soak up floodwaters like sponges; new, elevated buildings in inundated areas emerged with significantly less damage; much of the sewer system continued to operate and was restored almost completely within five days of the storm. But Sandy's magnitude, its effects on so many parts of the city, and the threat of ever greater risks from climate change also taught a second lesson: we needed to redouble our efforts.

For this reason, even as the City organized unprecedented relief operations following Sandy, Mayor Bloomberg convened the Special Initiative for Rebuilding and Resiliency (SIRR) and charged it with analyzing the impacts of the

Mayor Michael R. Bloomberg announcing *A Greener, Greater New York* in 2007

storm on the city's buildings, infrastructure, and people; assessing the risks the city faces from climate change in the medium term (2020s) and long term (2050s); and outlining ambitious, comprehensive, but achievable strategies for increasing resiliency citywide. The Mayor also asked SIRR to develop proposals for rebuilding the areas hardest hit by Sandy—the Brooklyn-Queens Waterfront, the East and South Shores of Staten Island, South Queens, Southern Brooklyn, and Southern Manhattan—to help them to emerge safer, stronger, and better than before.

The result of this effort—and the latest incarnation of PlaNYC—is *A Stronger, More Resilient New York*. Let others endlessly debate the causes (or even the existence) of climate change. New York City has chosen, once again, to act—by continuing to reduce its contribution to climate change and, at the same time, taking decisive and comprehensive steps to prepare and adapt.