

the
**RESILIENCE
DIVIDEND**

**Managing disruption, avoiding disaster,
and growing stronger in an
unpredictable world**

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INTRODUCTION

Why Resilience Matters

I was in Beijing speaking at a conference on global health when Superstorm Sandy struck New York City with incredible force on October 29, 2012. When I understood just how catastrophic the storm was, I frantically tried to reach my chief of staff, who lives in Brooklyn, but the phone lines were completely jammed. I was worried. Our headquarters are in Manhattan. Many of my colleagues and staff members live in the New York area. I had no idea whether they were OK or what the status of our work was. As I watched the flood waters surging through Wall Street on TV, I urgently kept texting my executive assistant, who lives in New Jersey. No response. As I learned later, communication channels throughout the region had either been taken down or were overwhelmed. Not even emergency personnel could get through. People and places I cared about were in danger, and there was nothing I could do.

In the end, we were lucky. None of our staff members suffered injury, although several had to abandon their flooded homes, and many could not return to them for months. I managed to get a flight back, but only days later. Our New York offices were closed for a week

because the area of Manhattan where we are located was without power, but we were able to keep some operations going and to help one another by communicating via our personal e-mail addresses. We were disrupted, for sure, but we continued to function, and the foundation was back to almost normal within a week.

That was not the case for many throughout the region. Superstorm Sandy brought damage beyond what we had ever seen in this area and even greater than we had imagined, though I was well aware of the devastation that a storm of this magnitude could wreak on New York City. Indeed, The Rockefeller Foundation had helped to support the development of a report by the New York City Panel on Climate Change that explored the potential effects of intense hurricanes, extreme wind, coastal flooding, and storm surge on the city's infrastructure. We had also funded groups of architects, engineers, and planners to collaborate on innovative design solutions for the city's response to rising sea levels, which were exhibited at the Museum of Modern Art.

In other words, our region knew a great deal about the worst-case scenarios related to storms and sea rise, but until Superstorm Sandy hit, it had all been hypothetical. Now the nightmare had been realized, and we could see that New York should have been better prepared and could have responded more effectively than it did. It was a wake-up call we could not ignore.

Only weeks after the storm, Andrew Cuomo, governor of New York, convened the NYS2100 Commission, a group of skilled and knowledgeable people whose task was to study the effects of the storm and make recommendations for what we should do to better prepare and rebound more quickly when the next shock hit. The commission had a broad and sweeping charge to make New York more resilient. Governor Cuomo asked me to act as cochair of the commission, and I jumped at the opportunity because I knew The Rockefeller Foundation had a lot to offer. For years, we had been working on issues of resilience, many of them related to climate change and weather disruptions, through our offices, partners, grantees, projects, and endeavors in countries throughout the developed and developing world. Participants in our 100 Resilient Cities initiative include places as

diverse as Rome and Mandalay, Glasgow and Medellin, Melbourne and Rotterdam, Da Nang and Vejle.

I knew, therefore, that we had a lot to contribute, and I knew the work of the commission was vitally important, but when I visited some of the areas most devastated by Sandy, I realized how truly essential it was. I saw homes destroyed, neighborhoods disrupted, people's lives in disarray. In Breezy Point, where more than a hundred houses had burned to the ground, we talked with a firefighter who was digging through the rubble of what had been his home. He was trying to find his father's World War II medals.

In Bay Ridge, I walked to the end of a pier and looked across New York Harbor. From that vantage point, the vulnerabilities of the area were dramatically obvious. There were the low-lying neighborhoods of Staten Island exposed to sea rise, flooding, and storm surge, where people had died in the storm. I saw damaged dunes and other soft, natural infrastructure that had been washed away, leaving neighborhoods completely unprotected. Sited at the margin of the upper bay was Owl's Head Wastewater Treatment Plant, which had failed during the storm, allowing raw sewage to flow into the waters. In other words, I was looking at threats to the three interconnected elements that make up our world: human beings and their communities, the natural systems we share and depend upon, and the built environment that reflects our shelter, our commerce, and our aspirations.

Although I had always believed our resilience work at The Rockefeller Foundation was critical, it was in that moment I realized it was the most important work that we could do. Since then, my conviction has only grown stronger. In a time as turbulent as ours, we have no choice: we must all work to build greater resilience.

WHAT IS RESILIENCE? Resilience is the capacity of any entity—an individual, a community, an organization, or a natural system—to prepare for disruptions, to recover from shocks and stresses, and to adapt and grow from a disruptive experience. As you build resilience, therefore, you become more able to prevent or mitigate stresses and shocks you can identify and better able to respond to those you can't

predict or avoid. You also develop greater capacity to bounce back from a crisis, learn from it, and achieve revitalization. Ideally, as you become more adept at managing disruption and skilled at resilience building, you are able to create and take advantage of new opportunities in good times and bad. That is the resilience dividend. It means more than effectively returning to normal functioning after a disruption, although that is critical. It is about achieving significant transformation that yields benefits even when disruptions are not occurring.

In the twenty-first century, building resilience is one of our most urgent social and economic issues because we live in a world that is defined by disruption. Not a month goes by that we don't see some kind of disturbance to the normal flow of life somewhere: a cyber-attack, a new strain of virus, a structural failure, a violent storm, a civil disturbance, an economic blow, a natural system threatened. Yes, the world has always known disruption, but there are three disruptive phenomena that are distinctly modern: urbanization, climate change, and globalization.

The world's population is more rapidly urbanizing than at any time in human history, forming into highly concentrated urban and metropolitan areas, some of truly astonishing proportion both in terms of population and geographic size. Cities are extraordinary and wonderful places, yet their growing populations and increased density make them newly vulnerable to disruption, crisis, and disaster in many ways. They are more susceptible to weather and climate-change threats, because, as they grow, buildings and structures are often developed in areas that are more vulnerable to hazards. They are more in danger of systems dysfunction because infrastructure is inadequate, nonexistent, or poorly maintained. They are more likely to experience rapidly spreading disease outbreaks because of the close contact of shifting populations and insufficient health-care facilities. Economic systems are burdened, governance structures are strained, and social cohesion comes under stress. What's more, the expansion and further development of urban areas typically affect ecosystems, the natural systems that are fundamental to human resilience, so the impact of urbanization is almost always a social-ecological one.

The second twenty-first-century problem is climate change, which, in the last decade, has emerged as an undeniable contributor to the severity and extent of the disruptions we must deal with. We face threats from weather- and environment-related issues as never before: shifts in the carbon-nitrogen-oxygen cycle, global warming, sea-level rise, dramatic fluctuations in rainfall, increase in storm intensity, longer periods of more intense heat, land loss and subsidence (the subsiding, or sinking, of land), and the disturbance of natural ecosystems. Extreme weather events are increasing in frequency and severity. Many communities face flooding that destroys infrastructure, threatens economic activity, and tears at social cohesion. Other areas undergo constant stress due to lack of water and become so afflicted with chronic drought that people become “climate refugees,” leaving their homes to join the urbanizing waves.

The third factor of the twenty-first century is globalization. We are well aware of this phenomenon and have seen its effects in all aspects of our lives—from the sprawling supply chains of global business operations to the increasingly multicultural populations of our institutions to the extraordinary mobility we have across geographic borders, time zones, and social networks. Globalization has accelerated the pace of change, introduced new and unaccustomed risks, added complexity to our systems, and increased the amount of volatility we face—particularly economic volatility. Our globalized commerce is unpredictable and puts strains on individuals, families, enterprises, economies, and governments. In a globalized world, disruption is such a regular occurrence and fundamental feature that change management has become a recognized field of study and practice.

These three factors are intertwined and affect one another in a social-ecological-economic nexus. Because everything is interconnected—a massive system of systems—a single disruption often triggers another, which exacerbates the effects of the first, so that the original shock becomes a cascade of crises. A weather disturbance, for example, can cause infrastructural damage that leads to a public health problem that, in turn, disturbs livelihoods and creates widespread economic turmoil,

which can lead to a further degrading of basic services, additional health problems, and even political conflict or civil unrest. In this way, a discrete disruption can quickly devolve into a full-on disaster. People are injured and die, often in shocking numbers. Survivors suffer trauma and hardship. Livelihoods are threatened or destroyed. Institutions are crippled, businesses fail. Infrastructure is overwhelmed. Communities are weakened and sometimes wiped out. Precious assets—from life-giving forests to cherished works of art—are ruined. Financial resources are depleted.

The losses from disruption are so extensive they are impossible to accurately calculate. We can get a sense of their scope, however, from the World Bank's estimate that, between 1980 and 2012, nearly \$4 trillion has gone into relief and recovery efforts worldwide for natural disasters alone. But that figure includes only quantifiable damage, and only from one kind of disruption, and says nothing about the greater toll on people, the environment, and economies exacted by the interruption of activity, loss of opportunity, and all the rest. Disruption comes in much smaller increments, too: local shocks, organizational disturbances, individual setbacks. The damage done by these may not be as costly, but can be devastating.

There is no question that building resilience must become a priority for us all. As we learned during Superstorm Sandy, and as people and organizations throughout the world have learned from disturbances of many kinds, we need a keener awareness of the threats we face, greater ability to withstand and survive the disruptions we can't avoid, and a deeper commitment and broader capacity to resume functioning so we don't suffer debilitating loss or even collapse. We can no longer accept our vulnerabilities or ignore the threats we live with. Nor can we devote such great amounts of resources to recovering from disasters that could have been prevented or responded to more effectively. Nor can we continue to delude ourselves that things will get back to normal one of these days. They won't.

The good news is that resilience building is a concept that can be learned and a practice that can be developed; resilience is not an inborn

individual trait or an inherent characteristic of a company or community. Any entity can build resilience. Too often, however, resilience thinking does not really take hold until a galvanizing event or a major shock—such as Superstorm Sandy—brings the need into high relief. But we should not need things to go terribly wrong for us to work to make them more right. We need to take action, and we need to do so in anticipation of disruption, in advance of shocks, in preparation for stresses—not after they have started to wear us down.

The goal of this book is to help frame and contribute to the process of building resilience by providing a template for thinking about resilience and by describing methods for putting that thinking into practice. I begin by defining the five characteristics of resilience (aware, diverse, integrated, self-regulating, adaptive) and then step back for a look at the roots of resilience thinking in ecology, engineering, and psychology and describe how systems theory and the concept of the adaptive cycle have come to be relevant in many disciplines today. I then explore the three phases of resilience building—readiness, responsiveness, and revitalization—and conclude with a discussion of the fundamental concept that gives this book its title: the resilience dividend. Throughout, I tell stories and draw on examples of individuals, organizations, and communities around the world.

I stress that resilience building must move forward on three fronts: structural, social, and natural. In all three, we need to seek both “hard” and “soft” solutions. We need to develop technologies, systems, mechanisms, and products that will prevent or protect us from the threats we can identify or predict. Just as important, we need to strengthen and improve our approaches to governance and leadership, knowledge creation, communication, community development, and social cohesion. As we’ll see in almost every instance, resilience is increased where there is an optimal combination of hard and soft solutions. Superior infrastructure alone cannot ensure resilience, nor can resilience be maximized with only human effort.

If we build resilience as I know it can be built—because I have seen individuals, organizations, and communities around the world

do it successfully—we can not only survive whatever crises come our way and emerge from them stronger; we have the chance of realizing the higher benefit: the resilience dividend. We will have the capacity to create and take advantage of *new* personal, social, and economic opportunities: endeavors we might never have imagined possible and achievements that seemed out of reach. When we do that, we can create and lead lives less shadowed by threat, develop communities and organizations that are more productive and innovative, and strengthen societies such that they are brimming with greater opportunity and prosperity.

1



THE RESILIENCE FRAMEWORK

Five Characteristics

Let me begin our exploration of resilience in what might seem like an unlikely place: Medellín, Colombia. What happened in Medellín—and is still happening there—is a vivid illustration of the dynamic and constantly changing nature of resilience building and how it almost always involves structural, social, and natural factors. It also demonstrates two simple truths: that resilience is not (and never reaches) an end state and that building resilience brings with it benefits that are sometimes beyond what you can imagine. Medellín, although still struggling with vulnerabilities, has so built its resilience that it is now beginning to realize the resilience dividend—of opportunities and possibilities it had never before considered possible.

Depending on your age, where you live, and your global experience, you probably think of the city of Medellín, Colombia, in one of two ways. You may have a lingering impression of the place as it was in the 1980s—the drug and murder capital of South America, home to the infamous Pablo Escobar and his Medellín cartel. Or you may think of it in a very different way, as it has emerged in the last decade or so—a dynamic and exciting place, an emerging travel destination, a city chosen from among two hundred contenders around the world as Innovative City of the Year 2013¹ and host, in 2014, to the

seventh annual World Urban Forum, a global conference organized by UN-HABITAT. If, in 1985, you had said the city might be a good place to host a major international conference or that you were planning to vacation in Medellín, the response would have been disbelief.

In Medellín's worst days—the early 1990s—it was a city trapped in a downward spiral of violence, poverty, citizen flight, and drug crime. It was not unusual for there to be upward of 5,500 murders per year and more than 15 murders in the city per day. At its peak in 1991, there were 381 murders per 100,000 people.² In New York City that rate would translate to 32,000 homicides each year.³

When a bad thing happened—another murder, a gang fight over turf, a community dispute over sanitation or water, the failure of a business, the destruction of homes by a landslide on one of the steep slopes surrounding the downtown—the city took the punch and fell back on the ropes. Every disruption seemed to link to another disruption. People did not bounce back so much as hang on, cope as best they could, and absorb the blows that kept coming.

For people like Adriana Restrepo, who has lived for years in a hillside barrio called San Javier, Medellín was a scary place to be. When she was a teenager, there was often nothing to do but stay inside her family's small house for days on end until the shooting subsided. Neither she nor the city had the capacity to overcome the constant shocks, relieve the grinding stress, or find a path to something new. Restrepo says she was “ashamed” to live there.

With all its troubles, Medellín has always had plenty of assets, however, starting with its beautiful environment. It lies in the verdant Aburra Valley, with the pleasant Medellín River flowing through the heart of the city, and enjoys a spring-like climate with an average annual temperature of seventy-two degrees Fahrenheit, or about twenty-two degrees Celsius. It is surrounded by beautiful hills rising toward the snow-strewn Andes mountain range. Not everyone is ashamed to live there, and even those who rue its faults still want the city to succeed.

But for decades these assets were overshadowed by Medellín's vulnerabilities. Economically, the city was plagued by the suffocating

Cities have always had to contend with things like natural disaster, economic and infrastructure collapse, and widespread illness. But globalization, climate change and rapid urbanization are making this moment in history different, and the stresses facing cities all the more complex. So how can cities survive, adapt, and grow, no matter what shocks might lie ahead? The Resilience Dividend has two components. First, it refers to the difference between how disruptive a shock or stress might be to a city that has made investments in resilience versus one that has not. The Resilience Dividend. THE RESILIENCE DIVIDEND Today, humanity faces unprecedented risk Investment limits disaster | Investment spurs new growth Urban populations have never faced so many shocks and stressors. Without strategic investment, cities struggle to adapt, respond and recover from disaster. (2017) define the resilience dividend as 'the difference in net benefits from a project developed with a resilience lens versus one that is not'. More recently, Bond et al. (2017) introduce the Resilience Dividend Valuation Model (RDVM) and present six case studies in the developing country context to illustrate. Note that Bond et al. (2017) define the resilience dividend as 'the difference in net benefits from a project developed with a resilience lens versus one that is not'. SECTION 3 Elements of the Resilience Dividend Valuation Model and Case Archetypes. Capital Stocks Goods and Services Production Functions and the Allocation Mechanisms. Production Functions Allocation Mechanisms Social Welfare Function Shocks and Stressors Project Interventions Example Settings for Applying the Resilience Dividend