

CITIES IN THE AGE OF CRISIS

REALISING THE RESILIENCE DIVIDEND

Cities face multiple and interconnected challenges and stresses in the 21st century. To thrive in the age of crisis, **Judith Rodin**, president of the Rockefeller Foundation, urges cities to seek resilience dividends – the immediate and long-term benefits to individuals, communities and the environment from investments that improve a city’s capacity to recover, learn, adapt and revitalise.

29 August 2015 will mark 10 years since Hurricane Katrina made land-fall in New Orleans, Louisiana. The city was devastated: levees were breached or overtopped in 50 places; floodwalls bent and toppled. Pumps were overwhelmed, leaving half of New Orleans’ homes flooded. Over 850 billion litres of water had to be pumped out of the city, a process that took over two months.

The crisis was not only a failure of the levees, but a reflection of the city’s decades-long slide into social and economic disrepair. Before the hurricane, New Orleans’ school system was failing, its economy was dangerously reliant on oil and gas, and social cohesion was, at best, strained. The floods only exacerbated these realities, turning a disruption into one of the greatest humanitarian disasters in the United States.

In the aftermath, the recovery process took time to find its legs due to a failure of leadership. Communities disagreed with experts – and one another – over which neighbourhoods to rebuild, and how to do so. Federal funding was slow to arrive. But with support from The Rockefeller Foundation and others, the city finally developed a unified neighbourhood revitalisation plan that unlocked funding flows. Flood protection, including both natural and physical infrastructure, was revitalised and strengthened. Homes were rebuilt. As people returned to the city, further investments helped to improve social and economic conditions, rather than allow the city to slip back into its old ways.



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Today, New Orleans has been recognised as one of the most entrepreneurial cities in the world, boasting new startups, a growing population of young, optimistic workers, and a rising generation of responsible political and community leaders. The school system has been reformed, the economy diversified, and the city is more protected than ever from future storms.

New Orleans is just one of many cities facing dire challenges worldwide. Every week we see cities dealing with blizzards, flooding, fires, terrorism, or civil unrest. According to data compiled by Swiss Re, nearly 400 million urban dwellers are in peril of coastal and river flooding, and more than 200 million face the threat of earthquakes. Natural disasters are only part of the equation. London has listed cyberattacks as a key threat, and disease outbreaks like Ebola can easily spread to, and between, major cities.

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Then there are the slower-burning stresses that weaken a city over time, such as extreme poverty, crime and violence, changing macroeconomic trends and failing infrastructure. These are slow, insidious forces, rather than high impact but one-off events. These stresses greatly decrease a city's ability to respond to a shock, as we saw in New Orleans.

But not every disruption needs to become a disaster. By building resilient physical infrastructure and social and natural systems, we can prepare cities for a range of threats, and unleash greater opportunities with the same investments.

01 More than 80 per cent of the people in New Orleans evacuated after Hurricane Katrina.

Crisis as the New Normal

Disruption has always been a part of urban life. But the dramatic collision of three 21st century trends has made crisis the new normal.

The first is the rapid acceleration of urbanisation. The world's population is urbanising more rapidly than ever before. By 2050, three out of every four people will live in cities. Growing populations make cities vulnerable to disruptions in new ways, place new stresses on infrastructure and services, and strain social cohesion.

The second trend is globalisation, which has hastened the pace of change and added unprecedented complexity to increasingly interdependent systems. Vulnerabilities in one place can quickly spread. For example, the 2011 floods in Bangkok didn't just paralyse the local economy: they shut down a sizeable part of the global supply chain.

The third trend is climate change. As last year's Intergovernmental Panel on Climate Change reports showed, climate change is not a distant threat, but a current reality. Cities face growing climate-driven risks, including sea level rise, changing temperatures and flooding. But the same report shows some powerful

opportunities: urban planning and investment in the highest-risk cities might be the key to significantly cutting greenhouse gas emissions, while promoting climate adaptation on a global scale.

This concept of turning crisis into opportunity is not new. As Winston Churchill famously said, "A crisis is a terrible thing to waste." But because of globalisation, urbanisation, and climate change, the challenges are much bigger, and therefore the opportunities much greater, than before. This requires reframing our mindsets and our tool kits – to build resilience, and build resiliently.

The question facing every city today is whether it will take a crisis, be it in the form of a shock or a slower-burning stress, to galvanise people into preparing for the new realities of the 21st century.



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The Resilience Dividend

The Rockefeller Foundation has spent over half a billion dollars helping cities and communities of all kinds build resilience and the capacity to plan and prepare more effectively; and if a disruption does occur, to bounce back, learn from it, and revitalise because of it. Building resilience is more than just disaster mitigation. These upfront investments pay off in the long run, and not just during crises, but also in times of calm. We call these “resilience dividends” – and they include economic development, job creation, improved social services, more vibrant ecosystems, and greater community cohesion.

In Lima, Peru, engineers have found a creative approach to solving the city’s water shortages using an abundant resource: humid air. By attaching humidity collectors and water purifiers to a billboard, they can produce nearly 100 litres of clean drinking water daily. Beyond increasing the water supply, the project hopes to inspire young people to become engineers at the leading edge of innovative and resilient urban infrastructure.

Pune, India, invested in more resilient transportation systems and utilities, and better integration between government and citizen groups. As a result, Deutsche Bank selected Pune as the location for a large operations centre. In turn, these investments can fuel more inclusive economies.

These are just two examples of the resilience dividend. Both demonstrate a broader truth: cities don’t have to choose between doing well in the short run and doing what’s best over the long term, for our communities, our planet, and our shared future.

01 A special billboard in Lima, Peru, harvests water vapour and uses reverse osmosis to purify the condensed water collected in the storage tank at the base of the billboard.

The Five Characteristics of Resilience

How can cities create systems that yield benefits in the short term and help them withstand future crises? We have identified the five characteristics of resilient systems.

First, they are aware of their vulnerabilities and their assets. They are willing and able to assess, learn from, and adjust to that information using robust monitoring and feedback loops. New data aggregation and analytical tools are especially useful here.

Second, they can access a variety of alternative and fallback options, so that if one part of the system is challenged, it can rely on another. Incorporating sufficient diversity and redundancy in the planning phase is critical.

Third, they share information in an integrated way, ensuring coordinated action. The left hand knows what the right hand is doing, and they're working towards the same goals. This means integration across systems, sectors, and institutions, and between various branches of government.

Fourth, they are self-regulating. If one part of the system fails, the entity can contain the problem and keep it from spreading. This is the difference between safe failure, and failing catastrophically.

Finally, resilient entities are adaptive. They can adjust in real time to changing circumstances by developing new plans, taking new actions, or modifying past behaviour. The entity is flexible – it bends without breaking.

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Resilience Characteristics in Practice

Cities can apply these concepts to build resilience across physical, natural and social infrastructure.

21st century infrastructure must serve multiple functions, ranging from roadways built or repaired with materials that absorb water or release it slowly during heavy rainfall, to bridges constructed with 3D-printed pilings that flex rather than buckle in high waves. For example, the city of Rotterdam in Netherlands addresses flooding using carparks engineered to function as large water storage facilities, with the capacity to hold 10 million litres. This reflects an awareness of threats and adaptation to current realities, and embodies the characteristics of spare capacity and integrated planning, and getting more benefits from a single investment.

These concepts can also be applied to natural infrastructure. New York's shorelines were once protected by natural buffers, such as oyster beds and tidal wetlands. However, most of these are gone due to industrial and urban development over the last 100 years. As a result, many populated areas were vulnerable to the storm surges from Superstorm Sandy in 2012.

In the aftermath, landscape architects and engineers worked with conservation scientists and local community organisations to restore natural wave barriers by creating layered habitats including oyster reefs and protective ecosystems, nurturing richer biodiversity that will serve as natural buffers against erosion and rising sea levels. This programme has been integrated with educational

initiatives that encourage community members to become stewards for this newly-created natural infrastructure. By coupling these programmes, the city is realising the resilience dividend by increasing its ability to adapt to new climate patterns, and the diversity of the buffers that could protect them from storms, while fostering greater cohesion between community members and improving their relationship with their environment.

This is especially important. While physical and natural infrastructure are the first lines of defence against disaster, friends and neighbours are often the first responders if something goes wrong. Many cities now recognise that investing in social infrastructure is a big part of preparing for and withstanding 21st century challenges.

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01 The Museumpark carpark in Rotterdam not only accommodates cars, but also houses one of the largest underground water reservoirs in the Netherlands.

02 A rendering of the proposed Living Breakwaters, which brings together educational programmes with oyster reef restoration.



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Athens is experiencing this acutely. Homelessness was not a major challenge for the city before the economic crisis, but it increased 25 per cent between 2009 and 2011. Its 60 per cent youth unemployment rate has contributed to riots and continued unrest. Athens will now address these stresses as part of the 100 Resilient Cities Network, pioneered by The Rockefeller Foundation, through the opportunity to exchange best practices with cities facing similar challenges, such as Glasgow and St. Louis.

Physical, natural and social infrastructure individually improve resilience, but at their best, these investments reinforce each other. This was certainly the case in New Orleans. Merely fixing the levees would not have spurred the revitalising growth that the city has experienced in the last decade.



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01 Homelessness is one challenge that several cities are trying to resolve.



Another example of this interdependence can be seen in Medellín, Colombia, where a chronic stress, rather than a single shock, galvanised action. Following decades of rampant drug trafficking and gang violence, the city engineered an innovative transit system using metros, gondolas, and escalators built into steep, mountainous terrain, which then connected the hillside slums to the economic centers in the valley below. But the physical infrastructure was just the beginning. Planners also integrated social services such as health care clinics and daycare providers at station stops. Combined, these physical and social interventions reduced crime rates by nearly 90 per cent and restored social cohesion.

Better Than Normal

In all these examples, cities resisted the basic human tendency to rebuild back to “normal.” In Medellín, high crime had been accepted as the norm for far too long, with tragic consequences. In New Orleans, flooding was a part of city life. Both demonstrate that cities must not be lulled into returning to the status quo, which may have created the vulnerabilities in the first place. Rather, when disrupted, cities must adapt, grow, and revitalise.



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Building resilience requires continuous action. Ten years after the storm, New Orleans is still working to build resilience to address lingering challenges, including sea level rise, wetland deterioration, and crime. In doing so, it has recognised what all other cities must recognise: resilience is not an end-state that is achieved and set aside. Cities that will reap the dividends are forever striving to become more resilient, whether or not they ever put their worst-case emergency response plans into action. With the right governance and planning, cities can stop the lurch from crisis to crisis, and march confidently – and resiliently – into the future.



Judith Rodin is president of The Rockefeller Foundation, one of the world’s leading philanthropic organisations. She was previously president of the University of Pennsylvania, and provost of Yale University. Dr Rodin is the author of more than 200 academic articles and has written or co-written 15 books, including her most recent, *The Resilience Dividend*.