

# RETHINKING URBAN RESILIENCE

**Cities**

# Foreword:

The spread of the COVID-19 pandemic throughout the world has shone a spotlight on the resilience of mankind and on the systems and infrastructure that we rely upon in cities for our physical, mental and economic wellbeing. As the tragedy of the pandemic has shown us, our ability to remain resilient – to overcome shocks and stresses, to cope with uncertainty and to be prepared for whatever challenges the future brings – has been sorely tested.

The immediate and natural response to the crisis has been to focus on recovery, to overcome the preliminary shock – protecting health and wellbeing, keeping business operations functioning, doing whatever is needed to keep essential services functioning. Now that the initial response has passed, we need to become better prepared for the unexpected across the full spectrum of society, and not just on the disruption to business and the economy.

For this to happen, we believe that the definition of resilience needs to be updated, to include two essential qualities: robustness and adaptability. Having **robust** critical systems that we rely upon for society and the economy to function means that those systems – human, physical, digital – are strong enough to withstand whatever pressures are thrown at them by future resilience events. Being **adaptable** means being flexible enough to modify and change those systems over time to improve resilience, responding to changing circumstances and new knowledge.

By focusing on those critical systems and prioritizing our planning and investments to make these more robust and adaptable, we will be better able to function effectively in any future resilience shock, no matter what happens.



On a personal note, we have all witnessed the way in which the pandemic has impacted the communities around us. Many of the old ways of working will be changed for good. At Arcadis, we'll travel less, collaborate with digital tools more, and will continue to strive to find ways to help provide sustainable outcomes for our clients around the world. As global citizens working on every continent and across almost all aspects of society, we will also do everything we can to help the world become more resilient, and help it emerge from this crisis stronger, more robust and more adaptable.

## Piet Dircke

Global Leader Resilience  
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# INTRODUCTION

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The coronavirus pandemic has brought a level of tragedy and disruption to society that brings into sharp focus how underprepared the world was for a virus with the particular transmission characteristics and health impacts of COVID-19. Although pandemic risks have long been warned of, the coronavirus has hit much harder than anticipated and it has had a devastating effect on many of the world's cities. It is hard not to conclude that the world had underprioritized investments to mitigate the effects of a pandemic of this sort, and also underestimated the impacts of the virus once it started its travel across the world, resulting in measures that were often too little and too late.

Cities are vital to our resilience. Well over 50% of the world's population live in cities, and they are the engines driving much of the world's economy, accounting for over 80% of global GDP. Most of the world's cities have spent considerable time and effort enhancing their resilience against a whole host of threats and risks, particularly relating to climate change, extreme weather events and rising sea levels. But until now, the potentially devastating impact of a pandemic had not played a large role in collective thinking about planning, designing, building, and operating urban spaces.

## RESILIENCE AND RISK

In our 2019 report, [The business case for resilience](#), we explored the challenge of bringing resilience investments higher up the agenda for cities and recommended using financial modeling tools and resilient index frameworks to articulate the economic and societal benefits and demonstrate the potential returns on investment from resilience efforts. Given the impact of the pandemic, the investment case for resilience should now become even easier to justify.

Importantly, though, the pandemic has also shown the limitations of framing resilience solely within the context of risk-management. Risk management alone, while clearly important, is not enough to adequately prepare for the future as we do not know for certain what the next resilience event will be. We know that climate change, ongoing urbanization and globalization will bring more shocks and stresses in the coming years, but their exact nature remains uncertain. Analyzing and mitigating risks is important, but a better way to increase urban resilience comes from focusing on strengths and qualities – what makes us more resilient, no matter what crisis occurs. For example, communities in a crisis will always be more resilient and benefit from a strong healthcare system and clean water.

The World Economic Forum's (WEF) [Global Risks Report 2020](#) was a clear demonstration of the limitations of risk management within resilience planning. The report was issued in January 2020, as the coronavirus was spreading largely undetected around the world. WEF surveyed an "extensive network of business, government, civil society and thought leaders," to produce its Global Risks Landscape. A global pandemic did not make the list of the top ten most likely risks for this year. In fact, not even a quarter of the respondents believed that the risk of a large-scale infectious disease outbreak would increase in 2020. With hindsight it becomes quite clear that risk assessments can be woefully inaccurate.

**THE QUALITIES OF RESILIENCE**

Resilience describes the quality of being able to survive, adapt and thrive no matter the stress or the shock. Resilience comes from identifying all of the critical aspects of cities – including citizens, communities, systems and organizations that absolutely need to function, no matter what shock or stress hits the city – and ensuring that they are robust (strong enough to withstand varied and significant stress and shocks) and adaptable (being able to change in response to new circumstances or information, and learning from it to be better prepared next time). This requires constantly monitoring and analyzing activities in order to make smart decisions, earlier, to avoid costly disruptions.

Cities around the world have been particularly hard-hit because the qualities that make them so vibrant – bringing people and ideas together in social, creative, and economic endeavors – are also the qualities that make them so susceptible to the virus. With lockdowns and social distancing happening in cities everywhere, personal resilience and business resilience have become intertwined, as employees face resilience challenges both at home and at their work, without clear boundaries. Some of the most vulnerable and lowest paid inhabitants in cities were also the same people being applauded on a weekly basis for putting their lives and their livelihoods on the line to fulfil critical roles in healthcare or services or utilities. At Arcadis, we believe that planning for urban resilience in a post-pandemic world must include a major focus on improving the resilience of people and the communities in which they live.

As the pandemic eases, it is time to reevaluate the true value of those who provide the critical services upon which society depends – whether there’s a crisis or not. City planners have a responsibility to plan for more diverse and equitable communities by placing community resilience at the center of short-term recovery plans, and longer-term resilience initiatives. This means enhancing the resilience of the most vulnerable parts of the system, because these vulnerable parts will impact the entire system.

This kind of thinking is not new. But the crucial lesson we’re learning from the COVID-19 crisis is that this critical chain thinking is also essential within a societal context.

The experience of second waves of COVID-19 in several cities shows us that addressing inequality is vital. For example, migrant workers across the world have been significantly impacted by the virus, greatly affecting city resilience. Tackling inequality benefits everyone and should be a central part of any resilient recovery strategy. At Arcadis, we are committed to ensuring that all employees feel valued, included and are treated with respect and dignity. We also know that the best creative and innovative thinking for our clients comes from individual diversity and a supportive dynamic work environment.

**COMMUNITY DESIGN**

The crucial role of societal resilience in the COVID-19 recovery is a call to action to place community resilience at the center of urban resilience. In urban design and development, it is important to strengthen collaborative relationships with all the stakeholders in the community. All designs should be made with the end users in mind, with a participatory approach where communities can actively express their desires, wishes and functionalities needed for their resilient recovery. We should go beyond just informing or consulting the community and truly engage them in the journey of development. Let the communities be the diverse voice of the city and spark innovative thinking to come up with most beneficial and resilient urban development, which improves quality of life for all.

The COVID-19 experience has enriched our thinking about urban resilience in the way that it has amplified the need for a reprioritization our efforts to improve the quality of life for all citizens. As well as the imperative to create equitable, diverse and inclusive cities in post-pandemic resilience efforts, there are a number of additional areas that should be explored.



**IT IS ABOUT THE PEOPLE**

We are all in this together. Before the pandemic, we were already explaining to our clients that the resilience of a city depends as much on its citizens, as it does on its infrastructure, institutions, or governance structures. The coronavirus has rendered this point undeniable. Cities are only as resilient as their most vulnerable citizens.

# BUILDING THE BUSINESS CASE

One of the problems that cities and developers face while planning for resilient urban developments, is the fact that the business case is often unclear: what exactly are the resilience costs and benefits and how are these benefits distributed over the different stakeholders? This business insight is necessary in order to accelerate implementation of resilience measures in a cost-effective way by combining and aligning public and private objectives. There are a number of frameworks and digital tools that can be used to help understand the full range of economic and social benefits of investing in resilience over the short, medium, and long-term. These tools, which are being updated to include pandemic responses and public health resilience into cost-benefit calculations, show that there are now additional social benefits in resilience that make resilience pay off even more than anticipated – if we take the right measures in our cities.

## **ROBUST AND ADAPTABLE URBAN PLANNING**

Cities need to embed the principle of creating robust and adaptable urban spaces and public infrastructure, so these places will be functional even during severe shocks. For example, in Wuhan, China, temporary compartmentalization of urban spaces helped to curtail the spread of the virus, and planning public spaces to reduce the congestion of people will be an important consideration going forward.

The planning principle of creating more green spaces provides health benefits to residents but also improves air quality in cities, reduces the impact of noise pollution and helps to combat urban heat island effects. Green spaces also make cities more resilient to flooding by minimizing water run-off and serving as locations for urban water storage and increased biodiversity.

COVID-19 also showed us the importance of creating public spaces near homes that can be used by citizens during a lockdown for their mental and physical wellbeing. Post-pandemic, restaurants and bars – as well as other tourist and recreational services – may require more space for their terraces and other facilities, which could temporarily be provided in those extended flexible green spaces. Green spaces will make communities more resilient, improve quality of life and could contribute to improving the value of real estate in surrounding areas.



### UN-HABITAT – SHELTER PROGRAM

Arcadis and UN-Habitat contribute to one of the most urgent challenges in the world: sustainable and resilient urbanization. UN-Habitat's mission is to promote socially and environmentally sustainable towns and cities by improving the quality of life of citizens around the world. Arcadis supports UN-Habitat in facing these urban challenges by providing pro bono expertise through the Shelter Program, a global partnership that makes a real difference.

In light of COVID-19 Arcadis has supported UN-Habitat by setting up a Rapid Response Help Desk for UN-Habitat staff and UN-Habitat partners, to provide instant technical advice on COVID-19-related issues in the areas of water, environment, buildings and mobility. Arcadis has assisted with creating a checklist for the conversion of hotels and other buildings to medical facilities. Lastly, Arcadis is combining all valuable lessons learned from this crisis to help city administrations to be better prepared in the future, creating a set of recommendations and guidelines for pandemic resilient cities.



### RETHINKING BUSINESS DISTRICTS

The pandemic has also raised questions about how city centers are organized and how they are valued. For example, organizations will be rethinking their use of expensive, city center office space as new working patterns – with more remote working – emerge in the pandemic recovery phase. This crisis has also demonstrated the importance of having affordable housing within city centers, so that critical workers like nurses, bus drivers, and sanitation workers can live closer to where they work. This may mean that there is an opportunity to transfer office space into the public housing realm, creating more mixed use of space and buildings, improving the livability, which could have a positive impact on occupancies and help to overcome a potential decline in real-estate values.

### The COVID-19 crisis showed the need for more adaptive, smart and modular use of space.

In rethinking business districts, the COVID-19 crisis showed the need for more adaptive, smart and modular use of space. During the pandemic, several cities converted buildings temporarily from one function to another, for instance turning convention centers or hotels into field hospitals or long-term housing for healthcare workers. Another example is the car lanes that were opened up for cycling in various cities. This adaptive behavior to circumstances also demands changes in the built environment whereby crucial elements, such as heating, ventilation, air conditions, should be easily adjustable to changing needs. This allows for an increase in multi-use spaces that can be repurposed quickly.

## OPTIONEERING USING THE BANKABLE RESILIENCE TOOL (BaRT)

Optioneering with BaRT is a strategic benefit-based approach which enriches the current risk-based approach in spatial planning. Optioneering using BaRT is characterized by a multi-stakeholder approach whereby design, economic analysis, finance, and policy are combined. In co-creation sessions the design of a planned urban (re) development is optimized to a resilient design. We bring together as many relevant stakeholders as possible – including the communities and their leadership, NGO's, city council, health sector, developers, major employers – and try to identify together the opportunities that create return on investment.

The Arcadis Bankable Resilience Tool (BaRT) is a cost-benefit and multi-criteria analysis tool that we use in the co-creation sessions to support cities and developers in evaluating their resilience options when planning an urban (re) development project. We use BaRT to analyze investment opportunities and prove – through financial modelling – that there is a business case for making a resilience investment in a city's transformation. Moreover, with BaRT we allocate costs and benefits to stakeholders to start the conversation about possible financial arrangements to deliver resilience. BaRT shows the additional value of resilience measures, highlights opportunities to capture the value of related developments, and outlines possible financial arrangements to deliver resilience.

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## ENHANCING MICRO-MOBILITY

The single-owner automobile has emerged as one of the safest ways to travel during a pandemic but an overall shift away from public modes of mass transportation back to private vehicles would hamper the resilience and sustainability of urban environments. Cities could use pricing controls to reduce the incentive of people to use automobiles, like in Singapore. A post-pandemic world that more fully embraces the practice of remote working, internet shopping and using telemedicine to consult your doctor from home could see a significant reduction in commuter traffic in cities. This would benefit the overall resilience of cities in numerous ways: improving air quality, reducing traffic accidents and required parking space, potentially freeing up space for affordable housing or green spaces.

The increased demand for pedestrian spaces and bicycle infrastructure – including e-bikes – must be fulfilled, creating lasting resilience benefits for urban spaces and those who live and work there. Blue-green corridors that combine bike lanes with green spaces, pedestrian zones and green water infrastructure will have the potential to revitalize urban spaces, as cities embrace these necessary alternatives to cars and mass public transport. Infrastructure to support an increase in smaller electric vehicles should be prioritized, along with other individual transportation systems, like funiculars and maybe even moving sidewalks. By embracing these new modes of transport, a smarter and more resilient urban transportation system can be created, monitored and the passenger and user flows managed with the use of big data, and smart infrastructure.



### REBUILD BY DESIGN: “BIG U”

Community engagement is nothing new for Arcadis. In response to Hurricane Sandy, the US Department of Housing and Urban Development (HUD) launched a competition, Rebuild by Design, to bring together the best and brightest ideas to protect the Northeast United States from the next big storm. Along with the Bjarke Ingels Group (BIG), Arcadis and partners were the selected to design resilient urban coastal infrastructure in New York City. This was a state-of-the-art participatory approach to enhance interactive and pro-active stakeholder engagement throughout the recovery process, involving the development – together with the local stakeholders – of a landscaped protective alignment that combines architectural floodwalls, embankments, elevated berms and park space, to protect and enhance local communities, businesses, and the public transport backbone. The East Side Coastal Resiliency project is the first step to realizing the vision of the Big U and a resilient New York City. Arcadis and partners developed feasibility and conceptual design reports to provide flood protection and social infrastructure for 200,000 residents, and 21,000 business in the area. A range of multifunctional resiliency solutions integrated with neighborhood and community amenities improve community access and expand enjoyment of parks and recreational spaces.



### REMEMBER SUSTAINABILITY

Sustainability principles must not be forgotten in the post-pandemic world. Those urban spaces and cities that do thrive will need to be better prepared for a future pandemic but also for climate change impacts, which requires not only an adaptable approach, but mitigation measures too. There should be a renewed focus on new buildings but also retrofitting older buildings with sustainability features such as green façades, energy-efficient power systems and monitoring and evaluation systems which help critical systems to adapt to changing circumstances and to operate more efficiently. The construction industry will also need to improve its own resilience, by increasing productivity and efficiency, embracing the sustainable use of materials and reducing resource consumption, reducing carbon footprints, and designing using cradle to cradle principles. It should also accelerate the adoption of digital tools, prefabrication, and off-site construction techniques.

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# FRAMING THE RESILIENCE DISCUSSION

It is clear that urban systems need to act more quickly to solve the most pressing challenges raised by the pandemic. In our work with private and public sector clients around the world, we focus on the following five means of enhancing resilience:



## PEOPLE

Societies, cities, communities, and organizations are only as resilient as their people. After the pandemic, we must focus on improving the health and wellbeing of the most vulnerable, and enhance the resilience of wherever they live, work or play.



## DESIGN

Resilience can be enhanced by embracing new resilience-conscious ways of designing and retrofitting buildings, facilities, and urban spaces in a post-pandemic world.



## PLANNING

Resilience thinking must be placed at the heart of business continuity planning. Collaboration must also be embraced, between communities, organizations, industry sectors and supply chains.



## DIGITAL

Digital tools and platforms are essential for gathering and analyzing data which can inform smart decisions that can ensure business continuity and lead to competitive advantage.



## SUSTAINABILITY

Resilience and sustainability go hand-in-hand. By implementing projects that improve sustainability performance, reducing resource consumption and protecting the environment, organizations enhance long-term resilience.



## People

Creating equitable, diverse and inclusive cities should be central to enhancing urban resilience.

**Define and promote policies that proactively tackle inequality, injustice and promote diversity within society.** As an open and inclusive organization, Arcadis believes there should never be a place for wide-ranging and systematic inequality – in any form – and we draw strength from our many diverse cultures, backgrounds and experiences.

**Strengthen collaborative relationships with all of the key stakeholders within communities** that can work together to achieve resilience – health services, critical civil infrastructure, public services, governance, including at street or neighborhood level. Resilience within the context of a city relies upon a detailed understanding of the human relationships and the interconnected systems that underpin society and working to make them strong.

**Cities should ensure that services from public utilities are undisrupted, affordable and available to all,** including broadband internet services which have proven to be essential to many aspects of daily life, including telemedicine, remote working, commerce and social connections. It means supporting the roles of critical workers, too. Bring the human element into the design process of cities for greater community and societal resilience.

**Focus investments on making public health more robust and adaptable.** After the immediate COVID-19 crisis is over, cities need to prioritize the resilience of public health, and the services and infrastructure that underpin this. At a policy level, this means promoting steps to reduce the prevalence of underlying health conditions, building societal resilience through public health education, safe public transport, air quality improvements and urban green spaces



## Design

City spaces need to be re-thought, with investments re-prioritized around solutions that will enhance the robustness and adaptability of city spaces, making them more supportive of sustainable communities.

**Cities need to invest in creating city-wide more green and blue spaces to bolster community resilience.** This trend had already begun, but COVID-19 has highlighted the need for more. Parks and waterways will improve biodiversity, water storage and run-off, reduce acoustic impacts, improve air quality, and mitigate urban heat island effects. They also help communities to be more adaptable and mentally resilient, by providing essential outdoor space. Community green and blue spaces add value, not only to quality of life, but could also add to the value of real estate in the neighborhood. Also adding green roofs and greening buildings along their facades and on balconies can contribute to better livability and more ecosystems value.



**Cities need to invest in making transport systems more diverse, greener, smarter, and more supportive of livable communities.** This will enhance resilience and sustainability, with a greater emphasis on micro-mobility. Smart tools will guide car use, cycle-ways and public transport systems, ensuring that public transport usage is optimally distributed for the individual and the collective. Public health benefits can be unlocked by encouraging modal shifts in transport – providing pedestrians and cyclists with more space, creating a new style of public transport.

**Critically reflect on the role that transport hubs and commercial business districts could have in post-pandemic cities.** These hubs may need to be adapted to suit the changing needs of the future, as post-pandemic working practices shift to accommodate greater home working and remote collaboration. Commercial business districts could become more mixed-use, with a range of accommodation types.

**Invest in retrofitting, upgrading or constructing adaptable buildings to better serve the needs of the time.** This includes more flexibility in space use, off-site modular construction, more efficient use of natural resources and better design to enable post-pandemic workplace trends.



## Planning

A robust and adaptable approach will enhance resilience.

**Be prepared for the unknown and the unexpected.** New York experienced three, recent, major resilience challenges: 9/11, Hurricane Sandy, and COVID-19. In all three experiences, the city had been preparing for the previous event, but thinking they were prepared for the future. After each event, resilience was improved, but their experience shows the importance of not solely relying on risk assessment planning. Under this framework, ‘known risks’ tend to be looked for and mitigated against. The next disaster may well be very different.

**Understand the critical systems within urban environments that will enable cities to adapt to the next crisis.** Resilience will come from being both robust and adaptable, it is unfeasible to be 100% resilient against any eventuality, so resilience is a balancing act between sufficient robustness, and additional adaptability. Resilience at the urban level will come from strengthened collaboration between all stakeholders, and adaptable planning tools such as scenario planning/adaptation pathways/learning cycles will help to gain a better understanding of all the factors needed to develop a robust and adaptable resilience strategy.

**Resilience can only be enhanced when cities move from the strategy phase to the implementation phase.** Many cities around the world have committed to resilience, but often plans are stuck in the strategy phase and the step to implementation has

not been taken. COVID-19 has shown the importance of actual implementation. After a crisis there is usually a short period of time where there is an opportunity to focus on making critical systems more robust and adaptable, which means working with organizations that also know how to implement the resulting strategy – architectural and engineering design, master-planning, business planning, program management, access to public and private finance.



## Digital

Digitalization – spurred on by COVID-19 – needs to be accelerated to fully capture the benefits of data, support wider community participation, and enable new business models. Digital security must also be invested in, to reduce system vulnerabilities.

**Digital solutions can significantly enhance the resilience of cities.**

Learning from data can make a city more resilient, and cities should broaden the scope of their consultation on digital initiatives to include citizens too, for effective engagement with communities. Smart utilities will continuously learn and adapt by using data from wastewater and data from mobility to feed into a continuous learning cycle. Sensors will help throughout, identifying where heat stresses are occurring in order to develop cooler cities, or enhance public transportation systems. Smart tools can inform action to help stop the spread of diseases. For example, sensors can monitor and detect viruses in wastewater, which could lead to faster detection of virus outbreaks.

**Be transparent with the data that your smart infrastructure collects as data will significantly inform resilience plans.** Digitalization of physical infrastructure – smart, interconnected infrastructure – is transformative for urban resilience. Owners and operators of significant public infrastructure should harness digital tools to make their asset management – in operation and maintenance – more robust and adaptable to future unknown or unexpected events.

**Within the buildings sector, digital twins are beginning to gain significant ground.**

By using BIM and its associated technologies, a true picture of the relationship that buildings have with the environment can be generated, both in terms of how the building impacts the environment, and how it responds to changing environmental conditions.

**Reclassify broadband internet as a critical utility.** Internet services underpin so many aspects of resilience within cities that broadband internet services should be repositioned as a critical service, offered universally. Digitalization can enable significant shifts in how cities function (remote working changing commuter patterns and workspace utilizations, reducing environmental impact, and expanding business districts into mixed use communities).

**Invest in data security too. Digital infrastructure is also a resilience threat.** Failures in technologies and processes, cyber-attacks and power outages can lead to system vulnerabilities. There are well-trodden paths to ensure digital resilience which should be taken.



## Sustainability

As we enter the post-pandemic phase, it is crucial to use this short window of opportunity to accelerate sustainability and resilience in urban areas.

**Avoid focusing solely on economic recovery and resilience at the expense of sustainability.**

Use the acceleration of building activities (repurposing existing assets, transforming commercial business districts) post-pandemic to embrace sustainable construction.

**Embrace nature-based solutions that will make cities more resilient, as they are more robust and less vulnerable.** For example, cities like Rotterdam and New York combine flood protection measures with other urban functions such as parking, transport, recreation, and tourism, as well as natural functions such as ecosystem-based functions.

**Cities have now an opportunity to recover from COVID19 in a more sustainable and resilient way.** Invest in carbon neutral projects and accelerate the pace of change in the transition to clean energy. The world is in a sustainability transition period, where it is an increasing imperative to transition from fossil fuels to alternative sources. Being more sustainable (accelerating the energy transition, becoming more self-sufficient with local food production, but also less dependent on water supplies and fossil fuels) can help in making our cities more resilient to shocks and stresses.

## CALLISONRTKL Case Study: Red River Redevelopment Hanoi, Vietnam



Using urban flood resilience as a catalyst for investment, Arcadis worked alongside CallisonRTKL (CRTKL), a global architecture, planning and design practice, to create an urban waterfront masterplan for the Red River in Hanoi that paves the way for socio-economic growth, high-level job creation, housing investment and enhanced social mobility.

Charged with limiting the flood risks for Hanoi while creating a sustainable and resilient urban development along the river, Arcadis and CRTKL undertook the strategic assessment of three potential flood protection options:

1. A new conventional dike;
2. The combination of a new dike and an improvement of the existing dikes;
3. A riverbank stabilization option, designed for flooding, without a dike.

The third option was favoured for its ability to create a spacious and eco-friendly river landscape and an attractive urban setting with flood-resilient housing, boulevards, parks, tourist, and recreation facilities serviced by a public transport system.

Designed to emulate the success of river cities such as New York, Shanghai, London and Singapore, the plans for Red River's 11,000+ hectares of riverside protect Hanoi from a 500-year flood event and also:

- Maximize land development opportunities
- Maximize property values
- Attract investment and a diverse population
- Create higher salary jobs
- Generate additional tax revenues for the city
- Increase contribution to the nation's GDP

The project team also expanded the scope of work with consideration given to the 'squatters' that have illegally inhabited the flood plains of the Red River for many years and how they too could be protected with improved flood hazard safety, community services and infrastructure, housing stock, education and training, and viable industry connections with the larger Hanoi metropolitan area.

The resulting strategies offer a solution for city and community resilience, with funding for this project currently being studied by local, national, and foreign direct investment.

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# CONCLUSION

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As we emerge from the pandemic, it is crucial to place resilience at the heart of all urban planning decisions. Post-COVID-19 resilience will come from focusing on the systems or assets or approaches that make a city and its communities stronger, no matter what. Robustness is a desirable aspect of resilience, but it cannot be pursued at-all-costs. Absolute robustness is ultimately unaffordable and unobtainable and may also not prepare cities for the unthinkable. But robustness combined with adaptability means that these systems and assets will not only be better capable of withstanding major stressors and even some shocks, but when those unexpected shocks happen, changes and adjustments can be made so that the critical parts of the system can recover and still function. Cities should:

- Take a systematic approach to learning from the pandemic experience. Use adaptive thinking (embracing a continuous learning cycle) to reflect and learn from what worked well, what went wrong, and build in learning in your organization to avoid being surprised in the future. Smart and adaptive thinking – making full use of digital technologies – will enable planning for a better and more resilient future. There is a short window of opportunity that needs to be taken.
- Cities should realize that resilience can pay off. In our white paper of 2019, The business case for resilience, we made the case for using resilience index tools and financial risk tools to make the case for return on investment for a long-term investment in resilience. The experience of COVID-19 shows that investing in resilience is crucial and justifies resilience investments in the future.
- Cities should act on lessons learned from the crisis. Normalcy will eventually return, but COVID-19 is a wake-up call for an investment in the redesign of our urban spaces. Learn from our experiences and take adaptive measures to ensure the long-term quality of life in our cities. Investing in a robust and adaptable system – that is feasible and achievable – generates revenues no matter what or when the next shock will be.



**It is time to move away from the notion that returns on investments in resilience are only obtained when and if a shock occurs, to a new state where it's understood that resilience – built on the qualities of robustness and adaptability – is an inherently valuable goal to pursue.**

At Arcadis, our experience shows that there are usually just a few years following shock events – floods, hurricanes, superstorms, terrorist attacks – within which greater steps can be taken towards increasing resilience. This is typically the timeframe within which discretionary and disaster or stimulus funding is made available, aligned with a supportive political and public opinion environment. It is crucial that cities move quickly to eliminate the gap between resilience planning and resilience implementation, using a clear value framework that can demonstrate the true benefits to cities of embracing resilience.

Cities should now have the confidence to invest in the resilience of their people, their assets, their important operational systems, and their communities. It is time to move away from the notion that returns on investments in resilience are only obtained when and if a shock occurs, to a new state where it is understood that resilience is an inherently valuable goal to pursue.

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