

An aerial photograph of a coastal construction site. In the foreground, there's a rocky shoreline with waves crashing. A large yellow excavator is positioned on a sandy area. To the right, there are several buildings under construction, with some concrete structures visible. The background shows more of the construction site with various pieces of equipment and materials.

**AECOM**

ISSUE 1  
FALL 2015

# Q

**INNOVATION QUARTERLY**

**BACK TO THE FUTURE**

HISTORIC EARTHQUAKES HELP  
WITH FUTURE DISASTER PLANNING

**SMART SPENDING**

INVESTING IN INFRASTRUCTURE CAN  
SUPPORT GROWTH

**BANDUNG RISING**

VISIONARY MAYOR WANTS A LIVABLE,  
LOVABLE TECHNOPOLIS

**SPECIAL EDITION**

**INNOVATION +  
RESILIENCE**

# INNOVATION+ RESILIENCE



Innovation is a key component in tackling the dynamic global changes that can influence our environment, how we live, what we create and what we can achieve. Innovation, in the hands of people with experience, vision and a passion for what they do, can improve lives and transform communities.

Innovation that promotes positive change, that answers the world's most complex challenges, is at the heart of what we do at AECOM.

I hope you enjoy this first edition of our new magazine – *IQ, Innovation Quarterly* – which combines the themes of innovation and resilience and explores how innovation allows us to adapt to, overcome or get ahead of change. The magazine weaves together great project stories with client interviews from around the world. Among the stories are how to better understand the risks of natural and human threats, how

to build back better after disaster, and how to tackle issues from cybersecurity to financing major projects.

As a leading, fully-integrated global infrastructure company, AECOM counts among its workforce some of the brightest minds in our industry – talented people whose work cuts across the spectrum of design, engineering, construction, financing, government services and operations. Time and again, we demonstrate our outstanding ability to advance innovation in delivering high-performing projects that answer our clients' needs, while supporting their efforts to deliver better services or products to their customers.

We're glad to be able to spotlight our thinking and our work in this magazine, with the hope that it sparks new innovation and inspires you to join us in our efforts to deliver a better world.

**Mike Burke**  
Chairman and  
Chief Executive Officer

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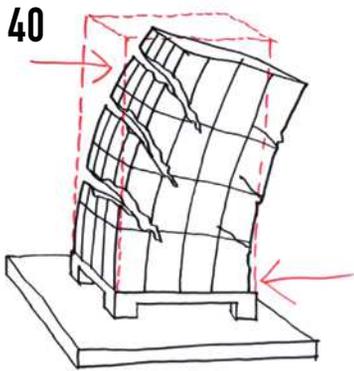
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### Front cover

Rising tides: Innovative solutions are continually being sought to protect the world's coastal communities and improve their resilience. Here, the San Diego Regional Beach Sand project in California, U.S., involved repairing decades of erosion by building up sand dunes to provide protection from high tides. This assignment won AECOM photographer David Lloyd a photographic prize awarded by Engineering-News Record.



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# HOW DO BIG COMPANIES INNOVATE?

A vibrant, colorful tunnel installation made of translucent, multi-colored ribbons (red, green, blue, yellow, purple) that create a complex, abstract pattern. The tunnel is arched and has a white floor. Three people are walking through the tunnel, their silhouettes and shadows cast on the floor. The overall atmosphere is bright and artistic.

Having the breadth and capacity to tackle many of the world's most complex challenges means that large companies have plenty of creative muscle to flex says AECOM's Chief Executive of Innovation and Knowledge Share, Jason Prior speaking to IQ business writer Hilary Hastings



Left, Pavilions of splendor: the annual temporary Serpentine Pavilion in Hyde Park is a fixture in London's summer season. Working with architect SelgasCano in 2015, AECOM delivered engineering and technical design services to realize this eye-catching structure. Above, AECOM's Chief Executive of Innovation and Knowledge Share, Jason Prior.

**W**here does innovation begin? For many people, the answer is that technology and startup companies are the hotbeds of ideas and invention. However, with big companies working on thousands of projects at any one time, innovation is ubiquitous. "We are hardwired to deliver solutions that are always more effective and efficient than those that have gone before, says AECOM's Chief Executive of Innovation and Knowledge Share Jason Prior. "Nevertheless, we can learn a lot from tech and small companies, particularly their agility and speed at getting to the market."

#### **Much more than an idea**

The definition of innovation at AECOM is a broad one – it can embrace new and improved products, processes or services. The richness of this work is also enhanced by partnerships with academic institutions, collaborating in large teams of like-minded firms, and working alongside clients and their teams. However, in each case innovation is much more than an idea; it has to be something that's been successfully deployed in a project to save time, resources and/or costs – or even to create a whole new approach to a problem.

"For big companies in particular, innovation often lies in the assembly of a number of good ideas and practices," says Prior. "Our breadth means that we are prolific in generating innovative ideas, and success lies in cross pollination, moving and adapting those ideas between industries and from one region or country to another."

#### **An innovative approach**

AECOM has an inventive approach to its own innovation culture and processes. "To get the best results, it's important to make innovation a priority," says Prior. "That means creating a structure that everyone in the company knows about, can understand, and use and benefit from. Ultimately, this is about making sure we celebrate our brilliant work and use the very best ideas to improve future

projects." He adds that innovation is highlighted as one of AECOM's core values and the focus on innovation is regularly cited in employee surveys as one of the top reasons why people are attracted to work for the company.

At its heart, AECOM's innovation program has a dynamic network of "Agents" – their numbers are rising to 1,000 people around the global company. This network comprises specialists of all types throughout the business – from experts in civil and structural engineering to economists, project managers, architects and scientists. They have been nominated by managers and peers as people who have a talent for spotting and generating great ideas, and because they are excellent communicators.

"The Agents are our great strength," says Prior. "They are embedded in the business and they know what the marketplace is looking for, whether it's new and more efficient ways of generating clean energy, running a railway network or protecting coastal communities from the threats of rising tides. They can deep dive into the knowledge of the technical practice groups – we have more than 120 of these, and then bring up ideas that can be replicated and scaled elsewhere. Things get exciting when you break through the traditional professional silos and transfer ideas across them."

#### **Spreading the news**

The knowledge-sharing process forms the foundations of any robust program. "It is invaluable to know what we know," says Prior. "Innovative projects make fantastic stories, so having a great internal communications plan is one important step to ensuring that the work is widely disseminated. AECOM has numerous platforms for sharing stories, so everyone has the opportunity to learn from colleagues around the world."

As part of the knowledge-sharing process, success comes when innovations from one part of the business are transferred and replicated, and also sometimes scaled, in another part. For example, experience gained using unmanned aerial surveillance (drones) in conducting environmental surveys of inaccessible coastal areas can be transferred for use in surveying the difficult-to-reach upper levels of bridges and buildings. Says Prior, "It's extremely exciting to see people from different parts of the globe sharing their expertise, and even more satisfying when we see innovations jump from one industry to be applied successfully in another." **IQ**



Kozak Collection, NISEE, University of California, Berkeley

## HISTORIC EARTHQUAKES HELPING WITH TODAY'S DISASTER PLANNING

The historic and epic U.S. earthquakes in New Madrid, Missouri, not only caused devastation to property and communities, they had the power to create temporary waterfalls in the Mississippi River and ring church bells in Boston, more than 1,000 miles (1,610 kilometers) away. Now, for the first time, historical eyewitness accounts are being used to digitally recreate these earthquakes of 1811 and 1812, which took place a century before Seismographic recording was introduced. Gaining a better understanding of the magnitude of these earthquakes in the New Madrid Seismic Zone the largest earthquakes ever recorded in the Midwestern United States, has the

potential to help in planning for future disasters that could cause widespread damage and loss of life. "Earthquakes are the most potentially catastrophic natural hazards in this area, so learning from earthquake simulations is helping us to prepare for the next big one," said Paul Somerville, California-based principal seismologist at AECOM who is partnering with the U.S. Geological Survey (USGS) on the project.

The computer-based seismic velocity model of the central U.S., developed by the USGS, accurately represents the structure of the layers of earth and covers 251,000 square miles (650,000 square kilometers). By propagating the ground motions that originate from a fault

rupture model of an earthquake through this seismic velocity model, it is possible to replicate the pattern of observed ground-shaking intensities throughout the affected region. The known earthquake source characteristics of the magnitude 5.4 Mount Carmel, Illinois, earthquake of April 18, 2008, were used to demonstrate the ability of the seismic velocity model to simulate the recorded ground motion intensity distribution of a modern day event. The simulation showed similarities with those of the New Madrid earthquakes. Scenario simulations have also shown that in a similar event today, more than eight million people would be exposed to dangerous ground motions, and tall

structures would be at risk. Work is now continuing on "rupture directivity." "The direction in which an earthquake ruptures along a fault has a strong influence on the level of ground shaking and the potential for damage," said Somerville. "Taking account of potential rupture directivity effects before the next large earthquakes occur provides an invaluable tool for generating ground shaking maps for use in planning for future events."

AECOM's leading team of seismologists and earthquake engineers is working around the world, with a special focus on the Asia-Pacific Region, including Japan, Australia and New Zealand.

Club Ride: Jumping on a bike in Las Vegas brings multiple benefits from saving commuting costs and reducing pollution to getting fitter and gaining discounts, deals and cash prizes. At his workplace reporting kiosk, this cyclist uses the screen to record his commutes.



# BE A PART OF THE MOVEMENT

**W**hether your choice of transportation is cycling, carpooling or riding transit, being a green commuter in the gaming capital of the world is a win, win situation. Participants in the Regional Transportation Commission of Southern Nevada's (RTC) free Club Ride program are not just helping ease congestion and reducing CO2 emissions to improve air quality, but they are also receiving discounts at local stores. Some of the deals include two-for-one tickets to the Las Vegas 51s baseball games, restaurant discounts, and the chance to win over 300 prizes every month. Created by the RTC, the incentive program has attracted 25,000 Las Vegas area residents who report their green commutes to

enter monthly prize draws for the chance to win \$10, \$25 and even \$50 gift cards.

"Reaching commuters through employers has been a key feature of the program," said Tina Quigley, General Manager of the RTC. "We also use different forms of technology, such as the website and mobile app, to make the program more accessible to members." Helping to expand Club Ride's reach is a new app developed by AECOM which has supported the program since 2009 with transportation specialists providing guidance and expertise at every stage. The latest work on the app has been designed to make it quicker and easier for participants to register for the program, report their commute and be eligible for

the prizes – this is particularly important for the diverse population in the metropolis, where people are more likely to use their smart phones than desk computers to report their commuting. "The easier we make it for people to participate, the more will come on board," said Diane Hanson, project manager for AECOM. The app also provides a way to set reminders for reporting a commute and the opportunity to report back up to 30 days. "When we surveyed our members, the most common reason for not reporting a commute was 'I forgot,' so these app features make it even easier for members to report," said Hanson.

The project is funded by the Federal Congestion Mitigation and Air Quality

Improvement Program (CMAQ), and has won impressive endorsements for its success including the U.S. Environmental Protection Agency's 2015 Clean Air Excellence Award in the category of Community Action. This national award recognizes innovative state, local, tribal and private sector programs that protect health and the environment, educate the public, serve their communities and boost the economy. Club Ride also received the "Best of" award for Commuter Supporting Agencies in the Best Workplaces for Commuters Race to Excellence. Best Workplaces for Commuters is a program established by the University of South Florida's National Center for Transit Research.

Photo courtesy of Club Ride

Often the innovative solutions for today's greatest challenges are right before our eyes. When the U.K. seaside town of Blackpool experienced devastating flooding as a result of rising sea levels and fierce winter storms, it was clear that protecting the town was essential to its future as a tourist destination. The natural shapes of sand dunes provided the inspiration for the new serpentine-shaped sea defenses and breakwater.

From technical drawings, 3-D scale models of a portion of the wall and headland were constructed directly from the digital models using a computer numerically controlled (CNC) cutting system. The sections were then tested in a water tank with waves of varying strengths up to the force of a one-in-100-year storm event. With the action recorded on video and then analyzed, the designs were refined to form the smoothly rounded headlands. The analysis showed that by combining steps with a serpentine shape it was possible to significantly reduce the wave impact,

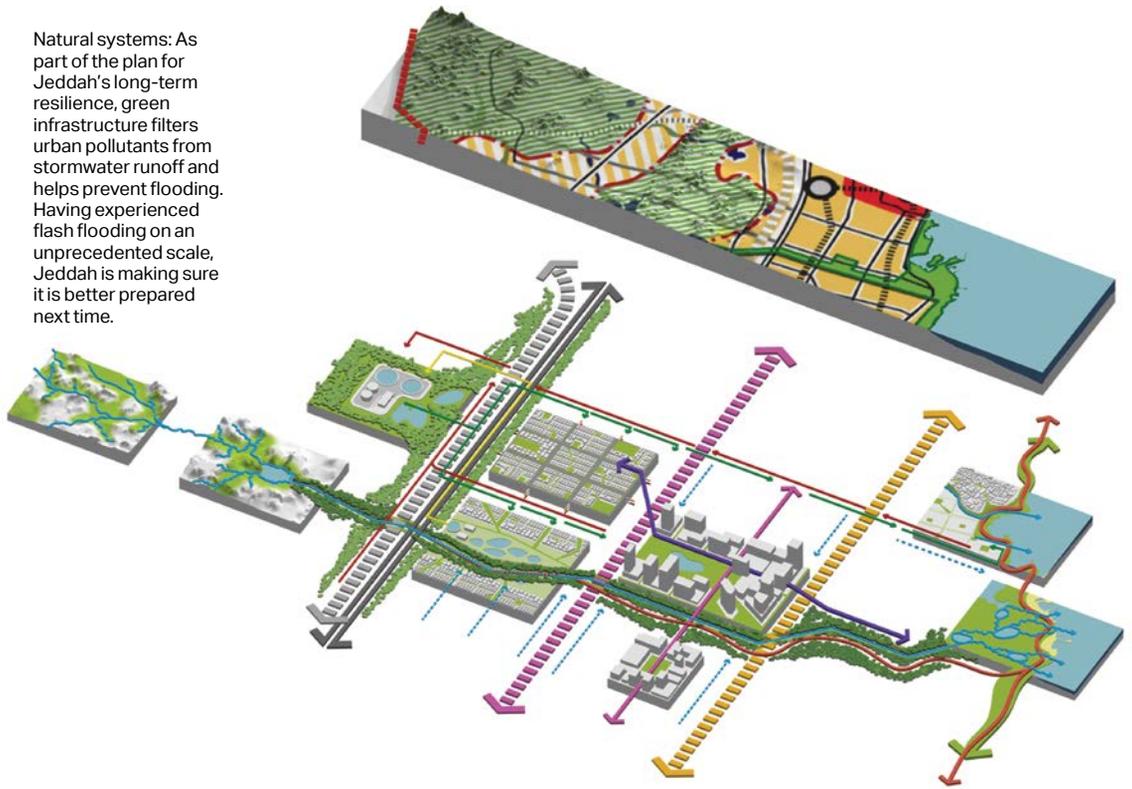
as each step acts as a small breakwater. And to cope with even the most ferocious seas, the steps are crowned by a wall with a concave face designed to turn waves back towards the sea. Curved railings and sculptural seating details echo the organic design theme.

Because of the challenges of pouring concrete in a saline environment, the wall units were precast offsite in a nearby temporary factory and fitted together like a vast three-dimensional jigsaw on site. Computer modeling was used again to calculate the optimal size, weight and shape of each precast unit, some of which weighed more than 16 tons. A crew used cranes to lift each piece and slot it into place, working between the tides to ensure maximum on-site building efficiency. To complete the attention to detail, and make sure the new structure looked at home on the beach, the concrete was coloured to achieve an exact match with the famous Blackpool sand.

## HOLDING BACK THE WAVES



Natural systems: As part of the plan for Jeddah's long-term resilience, green infrastructure filters urban pollutants from stormwater runoff and helps prevent flooding. Having experienced flash flooding on an unprecedented scale, Jeddah is making sure it is better prepared next time.



# SECURING A SUSTAINABLE FUTURE FOR JEDDAH

**A SEQUENCE OF WELL-DESIGNED AND WELL-SERVED CENTERS THAT ENABLE RESIDENTS, ESPECIALLY WOMEN, TO BENEFIT FROM IMPROVED ACCESS TO AMENITIES, JOBS, AND PUBLIC TRANSPORTATION.**

**A** series of new plans is set to guide the long-term resilience and sustainable growth of the Saudi Arabian city of Jeddah by accommodating growth, generating employment, and improving streetscapes and the quality of the built and natural environment.

Called the Jeddah Plans, the documents are designed to shape the city over the coming 20 years. Work on these plans was prompted by a storm that caused widespread damage and loss of life. The extent of destruction was exacerbated by a history of haphazard and informal development, and by the poor quality of the city's infrastructure.

As the principal gateway to the holy city of Mecca and a key urban hub in the Middle East, Jeddah has experienced unprecedented growth in the past five decades and anticipates that its population of four million people will increase to six million in the coming two decades.

In partnership with Jeddah Municipality, also known as Amana Mohafeza Jeddah, AECOM has worked to reverse current development trends, and delivered a series of plans that will redefine the city's future character. This will be achieved by creating a sequence of well-designed and well-served centers that enable residents, especially women, to

benefit from improved access to amenities, jobs and public transportation.

At the heart of this work are four spatial planning documents that range from a high-level strategic plan encompassing the municipality's vision, mission and development strategy, to detailed development strategy and local area plans.

The suite of plans provides an integrated and holistic approach to long-term growth and sustainable economic development.



Recordbreaker: Towing the huge concrete components into position before they are filled with sand to help resist large waves.

## WORLD-RECORD CAISSON BREAKWATER

**T**he massive swell of the Pacific Ocean and the threat of storms pose big challenges to coastal developments. Conditions were particularly demanding when it came to building the first natural gas terminal for the Mexican state of Baja California on a waterfront with no natural harbor. The site had a one-in-1,000-year significant wave height of 30 feet (9.2 meters). For tankers to unload safely, they must be protected from the powerful and unpredictable waters.

The solution was to design and construct the world's

largest caisson breakwater just off the coast. It comprises 12 massive concrete components, each up to 246 feet (75 meters) long, 125 feet (38 meters) wide and 84 feet (25.6 meters) high – the size of a multistory building, and individually weighing up to 32,000 tons. The barrier is almost 2,150 feet (655 meters) long and, when completed, was the only one of its kind built in such deep water, with depths up to 92 feet (28 meters).

Building this huge structure involved an innovative approach using tugs to tow

and maneuver each of the dozen components into position. The caissons were then filled with sand as ballast to anchor them into position and resist the advancing storm waves.

The design incorporated an innovative system of interlocking concrete armor units, called Core-Locs, to stack around the base of the breakwater. These provide a defense against erosion of the seabed caused by swirling currents generated at the structure's base. The breakwater's roughened caisson base significantly reduces

caisson size and weight – and minimizes the overall impact on the sensitive marine environment at the project site.

For energy company Energía Costa Azul, the breakwater provides a safe environment for the tankers loading and unloading at this important location for Mexico's infrastructure. AECOM was the project's lead designer.

# DISRUPTIVE TECHNOLOGY AND BEATING THE TRAFFIC



Reconnected city: Anyone can play at being a transportation planner with this digital table-top game created for the Vivid Sydney creative festival of light, music and ideas.

**H**ave you ever been stuck in traffic and thought “I could do a better job at transportation planning here?” To put this to the test, a table-top digital simulation game called Reconnected City was created for Vivid Sydney 2015, a creative festival of light, music and ideas in the Australian city. The game’s players were challenged to improve traffic congestion in a virtual city while keeping its capital costs, as well as water and energy consumption, in balance.

The game was featured in the Reconnecting Sydney event. As part of this, a panel of experts discussed the question: “How will emerging technology connect Sydney and change the way we move?” Panelists included global visionaries such as Raj Vaswani, co-founder of Silver Spring Networks, and a networking technology specialist, who said the most significant change in the coming 50 years will be the rise of machine automation. “Technological trends will continue to create more and more

possibilities for things to be connected, monitored, controlled, and integrated. These massive scale, interoperating machine networks will radically augment our environment, improving health, safety, comfort, convenience and control,” he said. Co-founder of think tank Future Crunch, Dr. Angus Hervey, said with the predicted advance of telemetry and associated technologies such as driverless cars, Sydney may not need as many roads or train lines. “This technological disruption, which is part of the larger digital revolution, will mean most cars become a lot more efficient thanks to more effective driving algorithms. That means better traffic management and more passengers per car trip.” He also said “Sydney is spending billions of dollars on roads that may not be necessary. Surely the city could get more bang for its buck by investing in something like the world’s most advanced data center, as China is currently doing?”

The panel event was hosted by AECOM, which created

the game with the creative technology agency S1T2, using data drawn from AECOM’s Sustainable Systems Integration Model (SSIM). SSIM is an integrated Geographic Information System-based design, planning and feasibility tool. It was developed to help decision-makers and others to evaluate the numerous alternatives for balancing social, environmental and economic priorities and impacts, while ensuring a sound assessment of costs and benefits. “We need to be flexible in our approach to planning the future of Sydney,” said AECOM’s James Rosenwax, managing director, design + planning, Australia and New Zealand. “With the advancement of technology to connect and move us, change and disruption will be very high on the agenda. Certainty in Sydney should come from the delivery of a well-integrated transport network, and we should be prepared to allow for innovation in how we live, work and play in and around this network.”

# GIRLS AND WOMEN AS PEACEMAKERS IN SUDAN



Friendly rivals: Volleyball is just one of the sports being introduced to girls in the Blue Nile State. Above, the team from Zatelntigaia is on its way to victory, and below girls from Damazin line up for a team photo.

**A** new conflict-mitigation program centered on girls and sport is underway in Blue Nile State, Sudan, eastern Africa. The work is delivering fresh perspectives; seeing girls and young women not as victims of violence, but as leaders in peace building.

Using school athletics to bring together girls from divided communities, the program is enhancing local relations and promoting peaceful coexistence between communities previously at war over ethnic differences and competition for resources. Together with learning sports in their own schools, the girls are also taking part in tournaments with other schools. One of the program's earliest successes was a competition involving 13 girls' schools from the communities of El Rosaries and Tadamon, along with the state capital Damazin. According to 16-year-old pupil Saffa Hassan, one of the athletes, "the relationship between peace and sport is that it allows people to get to know each other."

Blue Nile State has a history of relatively peaceful coexistence between more than 25 indigenous ethnic groups and tribes. Renewed conflict in September 2011,

which displaced an estimated 250,000 people, made the state volatile and increasingly vulnerable to wider violence. Many groups managed peaceful coexistence prior to Sudan's decades-long civil war which ended with South Sudan's independence. However, some of today's main drivers of conflict include a lack of tolerance and understanding of some groups, and the exclusion of others.

As part of this program, local women are also being trained as community leaders in conflict mitigation, peaceful coexistence and the importance of their role in peace building. These leaders have facilitated a number of inter-community dialogues in the state.

The program is funded by USAID and implemented by AECOM in partnership with the Blue Nile State Ministry of Education, and in collaboration with the Ministry of Information, Culture, Youth and Sports.

**LOCAL WOMEN ARE BEING TRAINED AS COMMUNITY LEADERS IN CONFLICT MITIGATION, PEACEFUL COEXISTENCE AND THE IMPORTANCE OF THEIR ROLE IN PEACE BUILDING.**



# KUALA LUMPUR'S LIVING LABORATORY OF INNOVATION

**D**iving innovation and sustainability to improve livability in Kuala Lumpur, the city has opened its groundbreaking Centre for Sustainable Innovation (KLCSI). The center brings together entrepreneurs, inventors, students and designers, along with government agencies, local communities and research institutes, to provide a hub for the exchange of brilliant urban ideas. The goal is to create pilot projects based on shared knowledge and resources that focus on built environments, urban mobility, city management, IT, public safety, waste and

water management, and clean energy. To fast track these innovations, KLCSI provides living laboratory services – an environment where new ideas and products are introduced to a community of people who can use and test them, while helping creators refine, improve and perfect them through collaboration.

“Kuala Lumpur is a thriving, fast-moving economic center for Malaysia, and in tandem with the country’s economic transformation program, KLCSI’s core focus is to increase city livability,” said Dr. Thomas Tang, managing director of

KLCSI and AECOM’s sustainability director for Asia.

The center opened in fall 2015 with a special event attended by representatives from AECOM’s joint-venture partner, Yayasan Wilayah Persekutuan.

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**HOW GREEN IS YOUR CITY?**

Latin American and European cities are the least reliant on fossil fuels to generate their electricity according to a new report by CDP and AECOM



Looking across the Kathmandu Valley, Nepal, this is a photograph of the April 2015 earthquake as it unfolded. The photographer was Guillaume Prudent-Richard, an Australia-based member of AECOM's disaster risk management team who witnessed the 7.8 magnitude earthquake that hit the capital city Kathmandu. He was in Nepal with colleague Amit Prothi, based in Vietnam. The two arrived just before the earthquake to set up and run a disaster risk management workshop with the Asian Development

Bank. Participants due to take part included representatives from the Government of Nepal ministries and the Kathmandu Valley Development Authority. The day the earthquake struck was a holiday, and so Prudent-Richard and Prothi had taken the opportunity to hike into the mountains surrounding the Kathmandu Valley. "Even a long way out of the city the shocks were so severe, we had to sit on the ground and wait for the worst to pass," recalls Prudent-Richard. "When we returned to the city later that day, the devastation was everywhere,

with centuries old temples and so many other buildings in ruins, and of course thousands of people dead and injured." Prudent-Richard returned to Kathmandu in the fall to participate in a follow-up workshop. He also visited Manila with a Nepalese delegation to share knowledge and present at an Asia Development Bank regional workshop on disaster risk management.

# LEARNING AND ADAPTING



Resilience man: Josh Sawislak joined AECOM from the administration of U.S. President Barack Obama, his responsibilities are to lead the firm's business in global resilience and climate-adaptation strategy.

Humans have always used innovation and ingenuity to overcome the obstacles of change, and today is no exception says AECOM's Global Director of Resilience, **Josh Sawislak**

**T**hroughout our history, humans have created new approaches to adapting to our environment and changes in society. To take one example, researchers have found a strong correlation between climate change in the Middle Stone Age (ending about 40,000 years ago) and the development of human culture and technology such as the crafting and use of the first stone tools. In the broadest sense, we call this adaptation to threats we face “resilience.”

Resilience is a term in physics that describes the ability of a material to recover from compression or expansion. More commonly today, we talk about resilience of communities as a measure of how well those communities can absorb and quickly recover from acute shocks and chronic stresses. Flexibility and agility are keys to community resilience because in terms of adapting to a changing climate, we don't always fully understand the specific threat we face, either in scope or in timeframe.

For example, our ability to predict weather has improved significantly in the past 50 years with a better understanding of the science, and with new tools and technology like satellites. However, even though we can estimate the number of annual Atlantic hurricanes we expect every year before the start of the season,

we can't predict if and where those storms will make landfall beyond about 72 hours ahead of the storm. Telling people on the U.S. Gulf Coast that 10 hurricanes are expected to form and three will hit land that year means nothing unless you can say that one will impact them. And in the case of some threats, such as earthquakes, we have made great technological advancements in the ability to assess seismic risk in the past few decades, but limited progress in our ability to predict accurately where, when, and how large the next big one will be.

What all of this means is that we need to use existing data and tools to design and build more resilient communities. While we can't predict exactly when an earthquake will strike, we do know which areas are at greater risk, and we can establish and enforce stronger building codes. We know that hurricanes and typhoons will make landfall and that we must be ready to weather the storm. Innovation will drive the development of new materials and designs that allow us to lower the risk when these events do occur.

Like our Middle Stone Age ancestors, we see that our climate is changing and we know that we must find new ways to adapt. They may have created stone tools to access new food sources and build better shelter, but we have the ability to plan cities that better withstand more severe weather and drought, and that account for sea level rise and increased urban migration. Innovation is what we as humans do best, and it is what the future requires. **IQ**

# KNOWING THE PROBLEM



Bandung rising: Mayor Ridwan Kamil has a powerful vision.  
Photo by Muhammad Fadli  
courtesy of Monocle magazine.

To attract investment and provide citizens with an appealing quality of life, cities need confidence that they can withstand and bounce back from a whole range of shocks and stressors. IQ sustainability correspondent **Jill Jago** describes how a new approach to understanding risks is helping Bandung, Indonesia, and other cities to plan for the future.

**B**andung, Indonesia's third largest city, has a regional population of more than nine million people, lies in a river basin and is surrounded by volcanoes. It faces an elevated risk of flooding and landslides exacerbated by poor urban development, and in early 2015 the province of West Java was on natural disaster alert. Data from the Indonesian National Disaster Mitigation Agency shows as many as 1,525 disaster events in 2014. These disasters left 566 people dead, 2.66 million others displaced, and caused damage to more than 51,000 homes and hundreds of public facilities.

Faced with these challenges, a bold vision emerged. "I have a dream for Bandung," says the city's Mayor Ridwan Kamil. "This is going to be a great city; a livable, lovable technopolis. It will be a thriving hub for technology businesses, manufacturing and the creative industries.

But we need more than hard work and luck to achieve this."

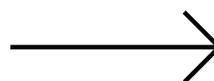
With so much at stake and so little time to achieve his vision, Mayor Kamil, who is also a well-respected architect and urban planner, embraced the United Nations' (UN) International Strategy for Disaster Risk Reduction (UNISDR) ARISE initiative as the best place to start the process of improving the city's resilience.

UNISDR ARISE is an ambitious global initiative that aims to reduce shared risk and increase shared value through greater collaboration between the private and public sectors. It aims to make all development investment risk sensitive, and ensure that it contributes to building the resilience of local communities and the global economy as a whole. It encompasses activity streams such as Disaster Risk Management (DRM) Strategies, Risk Metrics, DRM Standards, DRM Higher Education, Responsible Investing, Resilient Cities, Insuring Resilience, DRM in the UN as well as the international "Making My City Resilient" campaign. A Biannual Global Assessment Report is also produced by UNISDR to summarize actions taken to improve resilience.

AECOM has joined UNISDR and PwC to build a broad alliance in support of the program with others, including the Economist Intelligence Unit, Willis Insurance and Principles for Responsible Investment. A partner organization, AECOM is leading one of the initiative's



**A LIVABLE, LOVABLE  
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BUT WE NEED MORE  
THAN HARD WORK AND  
LUCK TO ACHIEVE THIS."  
RIDWAN KAMIL,  
MAYOR OF BANDUNG**





Meiwan Kartiwa

work streams, focusing on supporting local business communities and government departments to increase disaster resilience in municipalities and cities.

### **Bandung and knowing the score**

Bandung's work began by using the Disaster Resilience Scorecard – a tool developed by AECOM and IBM in partnership with UNISDR – to gain an understanding of the risks it faced. The scorecard has proved invaluable in engaging the city's local business communities and government departments in building a quantitative data picture of strengths, weaknesses, opportunities and threats upon which to prioritize disaster risk reduction measures, response planning and recovery.

The highly accessible and visual quality of the information produced by the scorecard has also proved to be helpful in communicating with Bandung residents. With more than 90 percent of Bandung's two-and-a-half-million citizens on Twitter (60 percent of the population is aged under 40), the mayor has embraced social media to engage citizens in the dialogue, create transparency in government, and quickly identify – and resolve – issues.

Leveraging its technology platform – every local government department is required to have a Twitter account and access to the new government YouTube channel – the city has been able to combine and correlate scorecard data with social media and multimedia to under-

stand the indicators of impending incidents. For example, local planners can test available resources against need by using historical and consequence data to simulate an event (such as a bad storm or a terror threat), and then crowdsource data using social media to determine where emergency or law enforcement resources may be required.

The process has helped strengthen the links between the companies impacted by natural disasters, and the public and private stakeholders who can contribute to disaster risk reduction. "Greater collaboration has been one of the key values of this initiative," says Mayor Kamil.

Not one to rest on his laurels, the mayor is looking to the future and is very optimistic for his community. He knows there is still much work to do, but as he focuses his team on the key issues and threats identified in the process, others are starting to take notice. The mayor's efforts have resulted in the Organisation for Economic Co-operation and Development (OECD) selecting Bandung to join the international Green City network. Within the coming five years OECD representatives will provide help on green city issues with funding support from member countries and the United Nations allowing Bandung to further improve its resilience and share best practices with other cities. Disaster risk reduction is about understanding threats, and being creative and innovative in organizing the resources to mitigate and manage risk.

**“GREATER  
COLLABORATION  
HAS BEEN ONE OF  
THE KEY VALUES  
OF THIS  
INITIATIVE”  
MAYOR KAMIL**

Aftermath: Scene of destruction in Kathmandu following the April 2015 earthquake. Photo by Guillaume Prudent-Richard

#### ARISE to the challenge

The United Nations has been actively working to reduce the impact of natural disasters. The first World Conference on Natural Disaster Risk Reduction was held in Yokohama, Japan in 1994, followed by the second World Conference in Kobe, Japan in 2005, which produced the Hyogo Framework for Action 2005–2015. In March 2015, representatives from 187 U.N. member states adopted the Sendai Framework, a far reaching new framework for disaster risk reduction with seven targets and four priorities for action.

UNISDR ARISE, A Private Sector Alliance for Disaster Resilient Societies, is focused on collaboration and tangible action to achieve risk-sensitive investment through a variety of initiatives. In this way, UNISDR will contribute to building the resilience of local communities and a more sustainable global economy. It will:

- \_ Act through activity streams under the oversight of the UNISDR;
- \_ Connect key communities with the resources and ability to influence the direction of disaster risk management (DRM);
- \_ Deliver information, application and education to implement comprehensive DRM for business investment; and
- \_ Move with urgency, delivering a multi-year program to achieve its ambitious goals.

The ARISE Initiative seeks to build a strong alliance that spans the globe, connects countries and allows for open exchange within and between industries and sectors. Learn more at [www.unisdr.org](http://www.unisdr.org)

# 68,000

lives lost to natural disaster worldwide per year (94–2013).\*

# 44%

the increase in climate-related disasters per annum since 2000.\*

# \$309bn

the cost of damage in the Japan tsunami.\*

# 8,633

lives lost in the Nepal earthquake.\*

# \$3.9bn

the cost of damage in the Nepal earthquake.\*

# 226m

the number of people affected by disasters every year – United Nations.

# 680,000

the number of people who died in earthquakes between 2000 and 2010 due mainly to poorly-built buildings – United Nations.

# 0.7%

the percentage of total relief aid that goes to disaster risk reduction – United Nations.

\* D. Guha-Sapir, R. Below, Ph. Hoyois – Emergency Events Database (EM-DAT); International Disaster Database – [www.emdat.be](http://www.emdat.be) – Université Catholique de Louvain – Brussels – Belgium.

## **Disaster Resilience Scorecard – an innovative approach**

Recognizing that true resilience lies in social cohesion, a fresh approach to understanding risk has been developed for the United Nations by AECOM and IBM. Called the Disaster Resilience Scorecard, the tool helps cities assess and respond to the risks they face in potential natural or human disasters.

Based on the United Nations' "Ten Essentials for Making Cities Resilient", the Disaster Resilience Scorecard is the first tool to provide a single, holistic, cross-sector evaluation of any city's ability to adapt to, respond to and recover from a disruptive event.

"The ability to withstand, quickly recover from and continue to prosper in the face of unpredictable acute shocks or natural disasters is the measure by which cities will ultimately succeed or fail in the race for global competitiveness," says Dale Sands, AECOM's senior vice president and global director metro & climate adaptation services, environment, and vice chair of the Private Sector Advisory Group for UNISDR. Sands spearheaded the scorecard collaboration with fellow advisory board member, IBM. "Perhaps the greatest obstacle standing in the way of a more secure, prosperous future is the yawning gap between overwhelming amounts of scientific data and metric minutiae, and the ability to translate it into meaningful, actionable information. What's needed is the kind of data that enables cities to move forward with investment plans that are technically possible, economically feasible and politically viable. This scorecard is unique in its ability to integrate the existing data sources, and stimulate cross-sector collaboration and dialogue – the real predictor of success and security."

Combining AECOM's climate adaptation science and engineering data with IBM's big data and analytics capabilities, the scorecard reviews policy

and planning as well as the engineering, informational, organizational, financial, social and environmental aspects of disaster resilience.

The creation of this tool responds to the growing imperative for all cities to become resilient in the face of many types of threats. While mortality is down from disasters, capital losses are rising, largely due to increasing frequency of disasters and rapid urbanization. Responsible for about 80 percent of total investments in a city, the private sector has a significant stake in making sure cities are more resilient. The goal of the scorecard was to facilitate public-private engagement so city stakeholders can respond to disasters together, rather than individually.

The Disaster Resilience Scorecard recently received global attention when it won a Notre Dame Global Adaptation Index Prize for 2015. [10](#)

**"ECONOMIC LOSSES FROM DISASTERS ARE OUT OF CONTROL AND CAN ONLY BE REDUCED IN PARTNERSHIP WITH THE PRIVATE SECTOR."**  
**BAN KI-MOON**  
**UNITED NATIONS**  
**SECRETARY-GENERAL**

Storm surge: Inundation mapping showing the extent of a 100-year storm surge with 66-inches of sea level rise in Bayview, San Francisco. Used as part of our work with the San Francisco Public Utilities Commission to complete an inventory of its wastewater assets within the sea level rise vulnerability zone.

1/

Put in place organization and coordination to understand and reduce disaster risk, based on participation of citizen groups and civil society. Build local alliances. Ensure that all departments understand their role in disaster risk reduction and preparedness.



An aerial photograph of a city, likely New York City, with a large blue overlay representing flood risk. The overlay covers a significant portion of the city, particularly along the coast and in lower-lying areas. The text boxes are overlaid on the image.

**2/**

Assign a budget for disaster risk reduction and provide incentives for homeowners, low-income families, communities, businesses and the public sector to invest in reducing the risks they face.

**3/**

Maintain up-to-date data on hazards and vulnerabilities, prepare risk assessments and use these as the basis for urban development plans and decisions. Ensure that this information and the plans for your city's resilience are readily available to the public and fully discussed with them.

**4/**

Invest in and maintain critical infrastructure that reduces risk, such as flood drainage, adjusted where needed to cope with climate change.

**5/**

Assess the safety of all schools and health facilities and upgrade these as necessary.

**6/**

Apply and enforce realistic, risk-compliant building regulations and land use planning principles. Identify safe land for low-income citizens and upgrade informal settlements, wherever feasible.

**7/**

Ensure that education programs and training on disaster risk reduction are in place in schools and local communities.

**8/**

Protect ecosystems and natural buffers to mitigate floods, storm surges and other hazards to which your city may be vulnerable. Adapt to climate change by building on good risk reduction practices.

**9/**

Install early warning systems and emergency management capacities in your city and hold regular public preparedness drills.

**10/**

After any disaster, ensure that the needs of the affected population are placed at the center of reconstruction, with support for them and their community organizations to design and help implement responses, including rebuilding homes and livelihoods.

UNISDR ten-point checklist

# 10 ESSENTIALS FOR MAKING CITIES RESILIENT



# BUILDING BACK BETTER

From the wreckage of disaster often comes rich opportunity for innovation in how we can improve our cities, companies and communities; exploring lessons learned from 2012's Hurricane Sandy, **Fay Sweet** discovers some of the ways that New York is building back better

**A**s preparations were underway in New York in anticipation of Hurricane Sandy, no one could have guessed what was in store. On October 22, Sandy developed into a tropical storm in the Caribbean Sea, the following day it was classified a Category 1 hurricane. On the 24th it made landfall near Kingston, Jamaica, with winds of 80 mph (129 kph). Five days later, New York City went into lockdown as the extreme event wrought its havoc. The devastation and loss of life were beyond any expectations. "There is no playbook for events like Superstorm Sandy," says Dominic Veltri, director of facilities engineering and construction at leading communications company Verizon. "No matter how many times you go through your recovery exercises, the real event does not match the rehearsals. The best plan is to anticipate as many eventualities as possible and get expertise on site as soon as possible."

Despite extensive preparations in the days before Sandy's landfall, Verizon saw more than 50 of its facilities in the New York metropolitan area impacted by the storm. "In the days up to and including the storm, we followed our protocols for significant storms," says Veltri. "We were constantly monitoring the event and knew it carried significant wind power and rising tides."

As the storm progressed, its enormity became apparent. "Our network is fully monitored and 100 per cent surveilled," says Veltri. "We saw losses of commercial power and our facilities, as they are designed to do, transitioned to backup power systems. But as the storm intensified, we started to see additional failures on the backup power systems, largely due to widespread flooding and isolated fuel system failures. Our focus for preparing for these types of events has now changed to include addressing what concerns us most – earthquakes, fire and



Testing times: Verizon's 140 West Street building which suffered from water damage. Photograph courtesy of Verizon

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flood – recognizing that they can happen at any time and anywhere. Of course it's impossible to guard against every eventuality, but whatever happens we know we can learn from them and get better."

## Lessons learned

Exposed to some of the worst ravages of the storm on Lower Manhattan were key Verizon buildings, including 140 West Street which stands as an example of the extensive repair and resilience measures that the company has undertaken. Much of the planning that went into protecting this building after the September 11 terrorist attack on the nearby World Trade Center proved to be effective. Rooted in lessons learned, the building's enhancements included moving sensitive and complex telecommunications switching equipment to higher floors, raising chiller plants and

familiar with the buildings and systems and get the expertise on site as soon as possible. It's better to have 30 people right there asking what they can do, than wondering where they are and how quickly they can get to the site."

### **Regional planning is essential**

Innovation has been at the forefront of all Hurricane Sandy recovery work undertaken by AECOM's Tishman Construction operation, part of the company's Building Construction group. Teams worked alongside Verizon throughout the entire event from anticipating the storm, securing sites, having expertise on standby, managing emergency responses and then partnering during the following years on building and systems refurbishment.

For Jay Badame, Tishman's president and chief operating officer for New York, New Jersey and Pennsylvania regions, Hurricane Sandy will be unforgettable in many ways. On a personal level, his home on the New Jersey Shore was directly in the storm's path. "The sea was a rollercoaster, but with our hurricane shutters and being built at a higher elevation, the building came through," he recalls. However, he did lose valuables and ended up with a pile of wreckage on his property. For several less-fortunate neighbors who lost their properties, Badame's home provided a place to stay during the months following Sandy.

In his work, Badame and the AECOM/Tishman teams were deployed on numerous projects before, during and after the storm. "For me, the resiliency of New York City was never in doubt," he says. "The city was going to bounce back and be stronger than before. In a time of climate change, we learn from the disaster and use it to prepare for the future." The expertise and massive capacity of AECOM is now being used by New York City to speed up its Build it Back program, and repair and rebuild 1,000 homes in Queens.

In addition to supporting Verizon, the works ranged from pumping out water from the flooded World Trade Center site to organizing a crisis response team to perform housing inspections at command centers in the boroughs of Staten Island and Queens. In addition, there was the provision of numerous services to support the restoration of transportation networks in the days following the hurricane, working with long-term clients such as the Metropolitan Transit Authority,

Days after: Sandy's trail of devastation uprooted homes and lives. AECOM staff joined the teams of volunteers handing out clothes and food.



backup generators above flood levels, and making modifications to key systems such as fuel oil to improve reliability during these types of events.

There were challenges as well: New York City's building code required fuel oil to be stored on the lowest level of a building due to fire concerns, and three subfloors full of water at the West Street building caused the fuel systems to fail.

Within a few days, the building was back up and running on temporary systems. And subsequently, post Sandy, more design modifications have been added to the building:

\_\_\_ Cable drying systems (also known as compressor dehydrators) have been relocated to higher floors.

\_\_\_ A new fuel oil tank, reconstructed to withstand 100 feet (30 meters) of water pressure, has been installed.

\_\_\_ Fuel oil pumps are now housed in a waterproof steel vessel also able to withstand 85 feet (26 meters) of water pressure and designed to operate in severe flooding conditions.

\_\_\_ All critical system components are now water submersible or engineered to operate as designed in another flood situation.

\_\_\_ A portable flood barrier that can be erected around the entire building on short notice was designed and constructed on commission from Verizon.

All of these modifications were completed before the 2013 hurricane season.

For Veltri, the key learning has been in planning, people, partners and building back better. "Plan well ahead, run through the scenarios, make sure your teams are

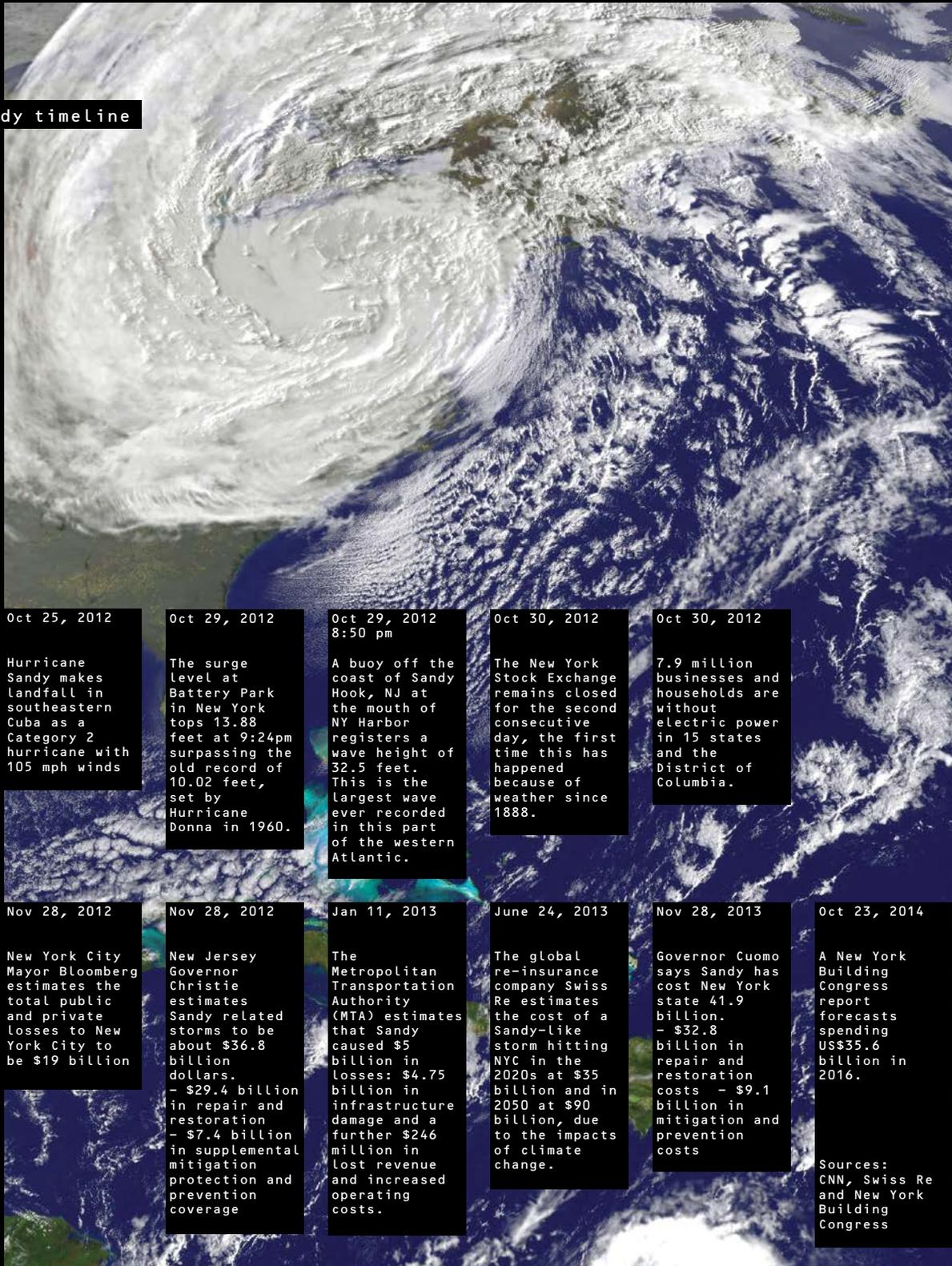
**"FOR ME, THE RESILIENCY OF NYC WAS NEVER IN DOUBT. THE CITY WAS GOING TO BOUNCE BACK AND BE STRONGER THAN BEFORE."**  
JAY BADAME

New Jersey Transit and the Port Authority of New York and New Jersey to restore service to such crucial parts of the transportation network as the New Jersey PATH trains, the New York City subway system, the Long Island Rail Road and NJ Transit, each of which was devastated by hurricane-related floods. AECOM also conducted 8,000 substantial damage evaluations on commercial and residential properties under our Hazard Mitigation Technical Assistance Program contract with the Federal Emergency Management Agency.

"There was an enormous benefit to be able to reach out across the broader region and, based on industry relationships, put equipment on the road long before purchase orders and contracts could be put in place," adds Badame. "Such regional disaster planning is essential in this day and age, and there is an ever growing need on the part of local government and agencies to assess potential risks for such events and, where possible, design for the same with permanent construction or quickly mobilized temporary protective devices."

The old adage, "don't let a good crisis go to waste" was fully embraced in the Sandy recovery. President Obama's Hurricane Sandy Rebuilding Task Force coordinated the full authority and resources of the federal government, governors and mayors in the several states worked together to support an international competition to design resilient communities, and private sector companies like Verizon showed that flexibility and innovative thinking are the key to resilience. **□**

Hurricane Sandy timeline



Oct 22 - Nov 5, 2012 -

Hurricane Sandy, as a hurricane and a post-tropical cyclone, kills at least 117 people in the United States and 69 more in Canada and the Caribbean.

Oct 25, 2012

Hurricane Sandy makes landfall in southeastern Cuba as a Category 2 hurricane with 105 mph winds

Oct 29, 2012

The surge level at Battery Park in New York tops 13.88 feet at 9:24pm surpassing the old record of 10.02 feet, set by Hurricane Donna in 1960.

Oct 29, 2012 8:50 pm

A buoy off the coast of Sandy Hook, NJ at the mouth of NY Harbor registers a wave height of 32.5 feet. This is the largest wave ever recorded in this part of the western Atlantic.

Oct 30, 2012

The New York Stock Exchange remains closed for the second consecutive day, the first time this has happened because of weather since 1888.

Oct 30, 2012

7.9 million businesses and households are without electric power in 15 states and the District of Columbia.

Nov 2, 2012

According to the U.S. Chamber of Commerce Business Civil Leadership center, businesses have contributed more than \$33 million in donations.

Nov 28, 2012

New York City Mayor Bloomberg estimates the total public and private losses to New York City to be \$19 billion

Nov 28, 2012

New Jersey Governor Christie estimates Sandy related storms to be about \$36.8 billion dollars.  
 - \$29.4 billion in repair and restoration  
 - \$7.4 billion in supplemental mitigation protection and prevention coverage

Jan 11, 2013

The Metropolitan Transportation Authority (MTA) estimates that Sandy caused \$5 billion in losses: \$4.75 billion in infrastructure damage and a further \$246 million in lost revenue and increased operating costs.

June 24, 2013

The global re-insurance company Swiss Re estimates the cost of a Sandy-like storm hitting NYC in the 2020s at \$35 billion and in 2050 at \$90 billion, due to the impacts of climate change.

Nov 28, 2013

Governor Cuomo says Sandy has cost New York state 41.9 billion. - \$32.8 billion in repair and restoration costs - \$9.1 billion in mitigation and prevention costs

Oct 23, 2014

A New York Building Congress report forecasts spending US\$35.6 billion in 2016.

Sources: CNN, Swiss Re and New York Building Congress

Sandy from space: Image taken on October 30 at 6:02am EDT. NOAA-NASA GOES Project

# NYC: BUILDING TOMORROW'S INFRASTRUCTURE TODAY

## Working with FEMA

In 2013, AECOM worked with the Federal Emergency Management Agency (FEMA) and New York City to review and develop flood insurance risk maps for the city's 350 miles (563 kilometers) of shoreline over an intense three week period of work. Midway through the project, Hurricane Sandy hit. The team carried on, producing a new set of maps that took on an even greater sense of urgency. Nationally, we've helped the agency analyze the potential long-term implications of climate change on the National Flood Insurance Program (NFIP) developing an approach sensitive to regional needs.

## New York's Wastewater Resiliency Plan

Working for New York City Department of Environment Protection (NYCDEP), this innovative program will see the US\$200 million resiliency upgrade for the city's 14 wastewater treatment plants and more than 50 pumping stations across the five boroughs.



A symbol for a city's resilience, the World Trade Center redevelopment rejuvenates an important part of the city that faced the dual challenges of a terrorist attack and Hurricane Sandy.

New Whitehall Ferry Terminal for NYCDOT and NYCEDC.

Montague Tube Rehabilitation for MTA.



A soccer game at Brooklyn Bridge Park, designed and engineered by AECOM with Michael Van Valkenburgh Associates.

Yonkers Flood Vulnerability Study for the Westchester Department of Environment Facilities.

West Harlem Waterfront Redevelopment for NYCEDC.

Liberty State Park, Jersey City.

Design of the Fulton Avenue Mall streetscape.



A 5-mile (8-kilometer) park along Manhattan's western waterfront, Hudson River Park has been undergoing a series of interventions to make it a more enjoyable and distinctive space. The project includes 13 public piers, 90 acres of landscaped plazas and a playground.

The Tappen Beach Coastal Engineering Study in Oyster Bay explored solutions for how to cope with the problem of rapid sediment accretion.



United Nations Headquarters: Working for NYCEDC, AECOM has proposed a new piece of infrastructure for pedestrian and bicycle use to connect the missing link along the eastern waterfront of Manhattan, from East 37th to 60th Street, opening up a whole piece of waterfront made inaccessible by FDR Drive.

The Verizon Building, 140 West Street.

AECOM is a member of the general engineering consultant team for the new US\$7.3 billion East Side Access project to bring Long Island Railroad (LIRR) services into Grand Central Terminal. This is the largest construction project ever undertaken by the MTA. AECOM is providing all structural engineering and architectural design for the new LIRR terminal within Grand Central Terminal, as well as scheduling, estimating and force account design.

Pennsylvania Avenue and Fountain Avenue landfills remediation and ecological restoration for NYCDEP.

A Long Beach Shoreline Study from East Rockaway Inlet to Jones Inlet identified and evaluated possible solutions to the ongoing problems due to the continued erosion of the 9-mile (14.5-kilometer) beachfront.



The green roof at Barclay's Center achieves two goals in one – it will naturally treat rainwater, relieving pressure on New York's sewage system, and it muffles sound enhancing the acoustics of America's boldest new arena.

Breaking down silos: AECOM's manifesto for London addresses the multiple challenges to infrastructure, planning, transport and housing that are crucial to London's competitiveness and quality of life. But its most radical proposition takes the issue of London's borders head on. The city's successful future is about the entire city region, which needs to be thought of as a whole.



# THINKING BEYOND BORDERS

As ever, cities are the hubs of invention in creating a better future, but to achieve our goals we need to think about cities and regional governance in new ways. IQ cities correspondent **Daniel Elsea** compares the examples of London and San Francisco



**T**he architect Rem Koolhaas has said that “more than ever, the city is all we have.” The statement carries a lot of truth. Now that most of the world’s population lives in cities, these are where we need to seek solutions to today’s global challenges including climate change, rapidly growing populations, cyber-attacks and terrorist threats. However, because so many of these challenges have impacts way beyond familiar city borders, when it comes to building resilience, we need not be confined to jurisdictional boundaries. And this includes considering innovative forms of governance at a regional level.

### **Europe’s global megacity**

Take London as an example of where the future lies in seeing the bigger picture. The U.K. capital is usually described by population size and land area, but this is only half the story. Its influence and impact on the surrounding region is immense, economically, socially and environmentally. Among its many challenges is the need to accommodate a further five million people and to build 2.5 million homes in the coming two decades. Providing a unique view of the capital, the visionary document *London 2065: Big Bold Global Connected*, researched and produced by AECOM, looks at London as a city region. It explores the multiple challenges to infrastructure, planning, transport and

housing that are crucial to keeping the capital competitive, and improving the quality of life. To plan for a resilient future, London will need to coordinate with neighbouring counties and more powers will need to be devolved from central government. The report suggests that this integrated approach could be delivered by a London City Region Board – a new body encompassing government, local authorities, developers, communities and infrastructure providers across the redefined metropolis, with a similar region-wide authority looking at transport planning in line with growth.

### **A new approach in action**

More than 5,000 miles away in California, San Francisco is facing similar pressures, and is starting to adopt a new approach to governance. San Francisco proper (that is, the City and County of San Francisco) is small compared to London, with only 10 percent of the population at 850,000, but it sits at the heart of a larger metropolitan area of almost eight million people with the GDP of Sweden. Comprising nine counties, and 100 cities, the area is anticipating significant housing and employment growth in the coming 30 years, with the attendant pressures on all services. However, it is located on a vulnerable coastline and above one of the world’s most active seismic zones. Many areas of anticipated

growth, particularly those along the bay shore-line, are at risk from earthquake-induced liquefaction and sea level rise.

In an example of joined-up working to address these challenges, the transportation and land use/housing strategy called *Plan Bay Area*, provides a long-range integrated approach. AECOM contributed the environmental impact report as part of this work which was commissioned by a number of regional bodies including Association of Bay Area Governments, Metropolitan Transportation Commission, Bay Area Air Quality Management District, and the Bay Conservation and Development Commission.

More of this kind of ‘city region’ approach will ensure resiliency strategies are increasingly joined up and don’t duplicate efforts. It begs the question – should the San Francisco Bay Area go big and formalise its city region? Up the coast in Oregon, Portland may provide the model not just for the Bay Area but for other cities too. There, a devolved authority called Oregon Metro, aggregates the wider Portland metropolitan area to deliver shared services and growth strategies across city boundaries for the common good. The result has been a city region that is widely regarded as innovative and the trend-setter in sustainable urban development in America.

So, while “the city is all we have”, it’s clear we also need to think differently – and more broadly – about how we define the city. **IQ**





### San Diego Living Safely

The Living Safely strategy is the plan for making San Diego County one of the safest communities in the U.S. Living Safely focuses on achieving three outcomes over time to ensure San Diego is a region where:

- \_ Residents are protected from crime or abuse
- \_ Neighborhoods are safe to work, live and play
- \_ Communities are resilient to disasters and emergencies

Source: County of San Diego

### Cyber resilience case study

#### Keeping the water flowing

The Chicago Department of Water Management operates the two largest capacity conventional water treatment plants in the world. Together the facilities have the capacity to process almost a billion gallons of water every day, supplying water to the city of Chicago and 125 suburban communities in Illinois. To help ensure continuity of this critical service, we completed a threat and vulnerability assessment update for the department using the American Water Works Association's risk and resilience standard J100; Risk Analysis and

Management for Critical Asset Protection Standard for Risk and Resilience Management of Water and Wastewater Systems. This project was one of the first full-scale applications of the J100 methodology for a large water utility.

During the work, critical assets were identified; appropriate threats and hazards were determined; we estimated consequences, effectiveness of existing mitigation measures, and threat likelihood for critical threat-asset pairs; calculated the baseline risk; applied mitigation measures and evaluated the cost benefit of implementing various mitigation suites. We evaluated the resiliency of the supervisory control and data acquisition hardware

and software, system access vulnerabilities, malware prevention and control and performed penetration testing and rogue wireless testing. We led several group meetings and workshops throughout the project with DWM staff, as well as the Chicago Police Department, FBI, Coast Guard, Office of Emergency Management and Communications, and the Joint Terrorism Task Force. These workshops provided knowledge sharing and served as a tool for achieving consensus on tough issues and making everyone involved feel that they participated in the solution.

We customized several components of the J100 methodology to meet the client's unique needs. For

example, we modified the methodology used to estimate the likelihood of terrorist threats, and developed methods for estimating other threats and hazards such as the likelihood of proximity hazards and workplace violence incidents. We then completed an economic analysis to estimate the regional economic impacts of a major water disruption or contamination event. After completing the assessment, we worked with the Chicago utility to develop a security and preparedness capital improvement plan that prioritizes the investments that the city will make to improve the security and resiliency of its critical infrastructure.

AECOM has been working on a number of projects enhancing the sustainability of U.S. military assets, including basewide sustainable infrastructure assessments for six air bases with more than 8.5 million square feet across 450 buildings.



### Cyber resilience case study

#### Making connections and saving energy

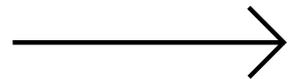
Helping the U.S. Army to make more efficient use of energy and water at its sites, our teams have connected vital industrial control systems for the U.S. Army Corps of Engineers in Fort Belvoir, Virginia. Following the introduction of legislation requiring metering in all federal buildings, the Army Central Metering Program involves installing, and protecting from cyber threats, a network of advanced meters that report remotely to a central database located at Fort Belvoir. This work encompasses some 6,700 Army, Army Reserve and Army National Guard

facilities at more than 480 sites worldwide. The meter system provides army installations with a resilient capability of measuring and tracking electricity, water, natural gas and steam consumption at individual facilities.

The army is also undertaking the installation of advanced utility meters on all military construction projects and for renovation or energy projects with a programmed cost of \$250,000 or more that include electrical, natural gas, water or steam components.

AECOM troubleshot configuration settings and network designs, and developed a solution enabling the full integration of vastly improved meter data reporting. The

successful project established cybersecurity and resilience solutions enabling secure communications to facilitate the collection of data from multiple sites to meet legislative requirements.



# \$2.1 TRILLION

is the estimated cost that data breaches and cybercrime will cost businesses around the globe by the year 2019.

Juniper Research

# \$65 BILLION

will be spent on U.S. cyber security contracts 2015-20.

U.S. federal budget projection

# \$445 BILLION

is lost annually to cybercrime and espionage around the world.

Center for Strategic and International Studies

# 43%

of firms in the United States experienced a data breach in 2014.

Ponemon Institute

# 317 MILLION

new pieces of malware were created in 2014.

Verizon 2015 Data Breach Investigations Report

# CYBER FACTS

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# SMART SPENDING FOR BEST RETURNS



## Investing in infrastructure is costly, but the rewards can be impressive says AECOM's Global Director of Resilience, **Josh Sawislak**

Ranked as the longest cable-stayed bridge in the world by *Engineering News-Record*, the Sutong Bridge has a main span of 1,190 yards (1,088 meters). The bridge crosses the Yangtze River and connects the cities of Suzhou and Nantong in China. AECOM provided design and construction engineering services to the main contractor, China Communications and Construction Company, Second Navigational Engineering Bureau, during the construction phase of the bridge.



**W**hen I went looking for my first job, my dad suggested that I needed a new suit. So he took me shopping and we picked out a reasonably priced grey flannel off the rack at a reputable clothing store. My father, who only bought anything when it was absolutely necessary, realized immediately that investing in my suit would pay the return of me getting a job sooner and thus I'd be less likely to ask him to pay my rent. He was thrifty, but he understood that the revenue generated by my new job offset his investment in the suit and his future costs for my rent, food, and so on.

The research arm of the management consultancy McKinsey & Company, estimated recently that the global need for infrastructure investment between 2013 and 2030 is \$57 trillion just to keep up with global GDP growth. Without this investment, we will impact our ability globally to create value and essentially leave money on the table that we could have realized. It also means that more people will get sick from not having clean water and will starve as a result of issues in food production and transport issues, among other factors. I think everyone would agree that these are not desirable outcomes. The \$57 trillion question is... who pays?

When we talk about the costs of infrastructure – those systems and assets that support our communities such as power, water, sewage, and transportation, we often hear project teams suggest seeking innovative finance options. But

the first rule of finance is that you have to pay back what you borrow, and with interest. If you don't have to pay it back, then it's not financing, it's funding (or a default). The "innovation" in most innovative financing is in how we capture the value of the investment and find the revenue source that will pay back the capital – and in the case of infrastructure, how we pay the ongoing operations costs as well. Some of these successful schemes involve capturing the value of increases in land and property values, spin-off economic activity, or marginal tax revenue. I have even seen some new proposals looking at realizing the value of reductions in risk through insurance savings, but in each case it comes down to finding that source of revenue (like my first job) that will allow us to realize the return on our initial investment.

When we add in issues such as climate change, technology obsolescence, and migration and development patterns, the calculation becomes even more complex. But we also create new opportunities to realize value by better understanding the changes in risk over time. Looking forward and embracing those changes, it is possible to realize new ways to define and capture value. The data generated by these smart systems can be used to optimize and scale systems with very significant improvements in efficiency and performance. Mayor Annalise Parker of Houston, Texas, recently noted that when the city changed to LED street lighting, the cost savings from not having to maintain or change the bulbs in streetlights for several decades provided an immediate payback on investment.

In many cases, being creative and taking a longer term view is the answer. If we don't get creative and find ways to pay for our global infrastructure needs, it is not just money at risk, it's people as well. **IQ**

# HOW GREEN IS YOUR CITY?

Latin American and European cities are the least reliant on fossil fuels to generate their electricity, reveals new analysis of major cities around the world. Asia Pacific cities continue to exhibit a high dependency on fossil fuels, while North American and African cities sit somewhere in the middle. More than 300 cities participated in the 2015 CDP\* to better manage their climate change strategies. As part of the process, they were asked to disclose the fuel mix for the electricity that powers their

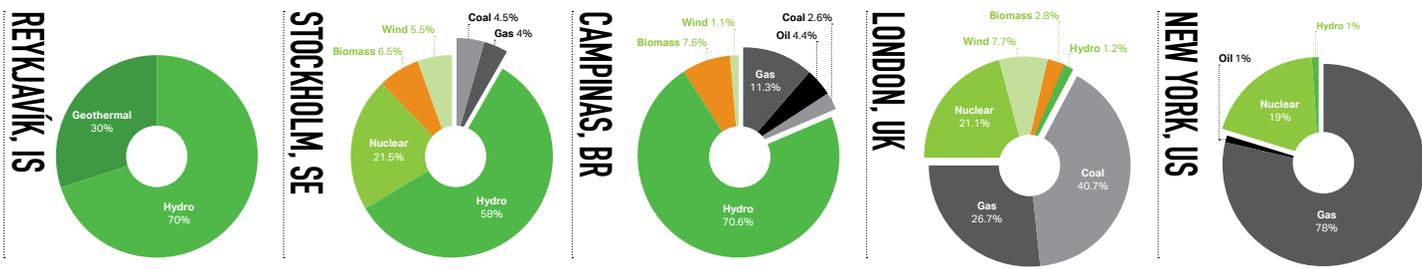
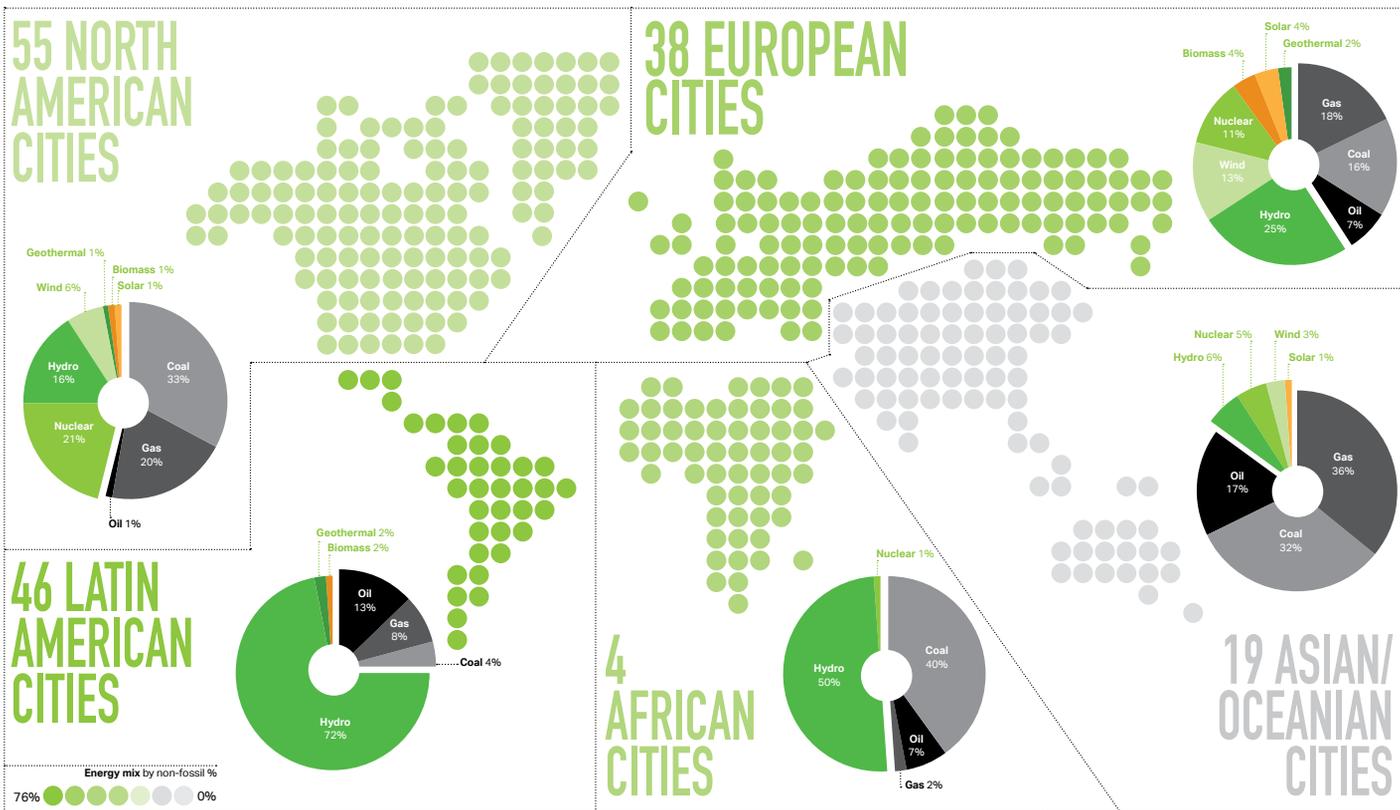
city. In 2015, 162 cities responded and revealed their use of fossil fuel versus clean power sources, reporting coal, gas, oil, nuclear, biomass, geothermal, hydro, solar and wind. The annual report is a joint project by CDP and AECOM.

\*CDP, formerly Carbon Disclosure Project, is an international, not-for-profit organization providing the only global system for companies and cities to measure, disclose, manage and share vital environmental information

## CAN CITIES QUIT FOSSIL FUELS?

**162 CITIES REPORTED THEIR ENERGY MIX,** revealing a diversity of responses, for cities large and small across all regions.

**THE RESULTS ARE DIVERSE,** REVEALING MIXES FROM 100% NON-FOSSIL TO 100% CONTINUED RELIANCE ON FOSSIL AND MANY COMBINATIONS THEREOF.



**CITIES ARE HUBS FOR...**

...innovation and collaboration. More than half of the world's people live in them. Cities consume...

**78%**

...of energy globally. Untapped potential in cities can significantly accelerate a global shift away from fossil fuels.

Power generation is the single largest carbon emitter – and by a big margin. Per year, the power market currently emits...

**12.6GT CO<sub>2</sub>**

This number is projected to double by 2040. Our data reveals that cities can directly and indirectly influence this sector – in a big way.

# JUST A LITTLE CHANGE WILL GO FAR.

43 cities reported that they want private sector support to deliver community renewable projects. CDP data indicates that less than half of these projects are located in the global south.

# \$57 TRILLION

will be invested in infrastructure through 2030. That means that less than 0.01% of this sum, or just

# \$1 OF EVERY \$8K

spent is required to deliver the clean electricity in those cities that report their existing electricity consumption, energy generation mix and a renewable electricity target. At just over \$7 billion in total, this is still a large price tag, but it's certainly within reach.

# IN 2015, 308 CITIES

reported to the world's definitive study on cities and climate change.

# IT'S 6X MORE

the number that reported in the survey's first year, 2011.

# 446,000,000

people live in these cities, accounting for 6% of global population, or...



...the combined population of three G7 nations - America, Britain and France.

# 1.67 BILLION TONNES REPORTED

of emissions (CO<sub>2</sub>e) for all reporting cities.

## When disaster is an inspiration

The potential of destruction has always helped to shape our built environment, science writer **Lauren Rugani** visited a recent exhibition to discover the latest innovations in mitigating destructive forces.

Wall of Wind: The International Hurricane Research Center in Miami, Florida, features 12, six-foot tall fans—a virtual Wall of Wind™—capable of simulating Category 5 hurricanes to test the performance of structures and materials.



Wall of Wind™, Florida International University.

[AECOM was a sponsor of this exhibition.](#)

Earth, air, fire and water - once thought to be the basic elements of the natural world, these were recast as powerful and destructive forces in *Designing for Disaster*, a 15-month exhibition at the National Building Museum in Washington, D.C. that focused on understanding these forces to build more resilient communities.

Stemming from a series of public programs called “Building in the Aftermath”, the exhibition was guided by fundamental questions about where and how communities choose to build. Through artifacts from historic and recent disasters, multimedia storytelling, and interactive displays, *Designing for Disaster* showcased innovative mitigation projects from across the nation whose scale and complexity were as varied as the hazards they protect against.

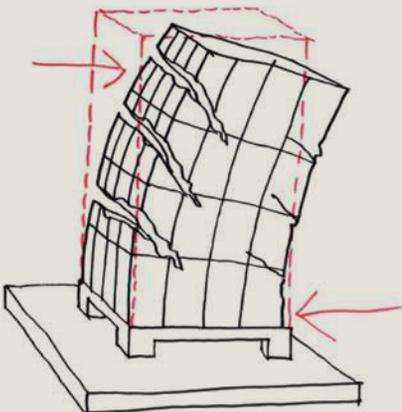
*Designing for Earth*, the gallery devoted to earthquakes and seismic events, featured the California Memorial Stadium in Berkeley, a historic landmark straddling an active fault, which was retrofitted with seismic blocks that tilt and rotate to accommodate expansion, compression, and lateral movement. At the press of a button, a full-scale mockup of the stadium’s risers shifted in multiple directions at once.

A FEMA-specified safe room was the focal point in *Designing for Air*. The pre-fab model, which can be used in new construction or built into older homes, reveals layers of concrete and steel-reinforced wood framing that can withstand tornadoes up to 250 mile-per-hour

winds and 100-mph debris impact. A table-top version of the International Hurricane Research Center’s “Wall of Wind” allowed visitors to try their hand at designing for disaster by testing how roofs of various shapes and orientations perform under simulated Category 5 hurricane conditions.

Case studies in the fire and water galleries provided examples of incorporating the natural environment into planning and design, for instance by limiting vegetation and other natural fuel sources in the home ignition zone to thwart the spread of wildfires, or building gabions – rocks and shells encased in wire mesh – to protect against floods and storm surges.

Curator Chrysanthe Broikos described *Designing for Disaster* as the most challenging of the more than two dozen exhibitions she has staged during her tenure at the National Building Museum, because it was the first to center on destruction rather than celebrating progress. But emphasizing innovation in planning, design, and infrastructure imparted a positive air to the exhibition and left more than 90,000 visitors empowered to do their part.



# Resilience and the art of the possible

The city conference circuit can sometimes fall short in delivering inspiration and innovation, but one recent event in the UK exceeded expectations and even made resilience fun, explain participants from Glasgow, **Cathy Johnston** of the city's Development and Regeneration team and **Frankie Barrett** of Sustainable Glasgow

In April 2014, Glasgow was named as one of the first 32 members of the Rockefeller Foundation's 100 Resilient Cities (100RC) Network.

**AECOM was lead sponsor of the Designing City Resilience conference**



Full flow: "Mayor" Ledward brings a fresh approach to discussing resilience.

Explosive outbursts, random decision making and hopelessly impractical strategies... just some of the idiosyncracies of a city mayor resisting the need for a productive debate on urban resilience. In this case the "mayor" was Charlie Ledward, global head of planning at AECOM, and his forum was one of the workshops at the Designing City Resilience conference staged by the Royal Institute of British Architects in London.

City resilience is a hot topic, but all too often the recent crop of conferences around this subject have become mired in negativity and ground down by gloom. This London conference was quite the opposite – it fostered an upbeat debate about the art of the possible, and managed to inject some fun into the proceedings too.

In addition to world-class speakers providing insight into

topics including "The role of technology in improving resilience" and "Climate change and shocks to the system," there were case study presentations from New York, Bristol and Barcelona along with the City Resilience Challenge workshops. To name just a few big names, the roll call of speakers included Peter Williams from IBM Big Green Innovations; Julia Bricknell of the International Finance Corporation, part of the World Bank; Melbourne's chief resilience officer Toby Kent; Brian Field of the European Investment Bank; Claire Bonham-Carter sustainability director at AECOM, and so the list went on.

For us, the innovative approach of the workshops brought to life the issues every city is experiencing. The scenario was that our "Mayor" Ledward in his fictitious town hall, probably somewhere in the Middle East, was facing the challenge of

developing resilience in his emerging city. The discussion focused on challenges posed by the stresses of mass urbanization, climate change and unexpected shocks to the system, and their negative effects compounded by bureaucratic and out-of-touch leadership. Participants in our debate concerning the city's future included architects, landscape architects, economists, planners, students and entrepreneurs. Immediately immersed in the reality of the scenario, thanks to our mayor, participants ensured that the debate was energetic and engaging. The topic of governance was particularly stimulating in a room full of people drawn from all corners of the globe – around Europe, Africa and Asia. The workshop was especially fascinating because as the session progressed, we all started speaking the same language, understanding each other's problems and becoming united in the effort to develop strategies for achieving resilience. At the heart of this, we were clear that when governance is inclusive and empowering, it actually enables innovative responses to the resilience challenge.

The conference provided key benefits and inspired us to further develop innovative approaches towards a resilient Glasgow. Reporting back to our city leaders has helped us explain the value of a broader and holistic multiagency approach to our challenges that enables long-term value creation in all investment and risk management for the future. We'll be back next year.

# Sustainable and convivial cities

How can food shape the future of our cities?  
**Harriet Ash** savors a new book by foodie urbanist Susan Parham

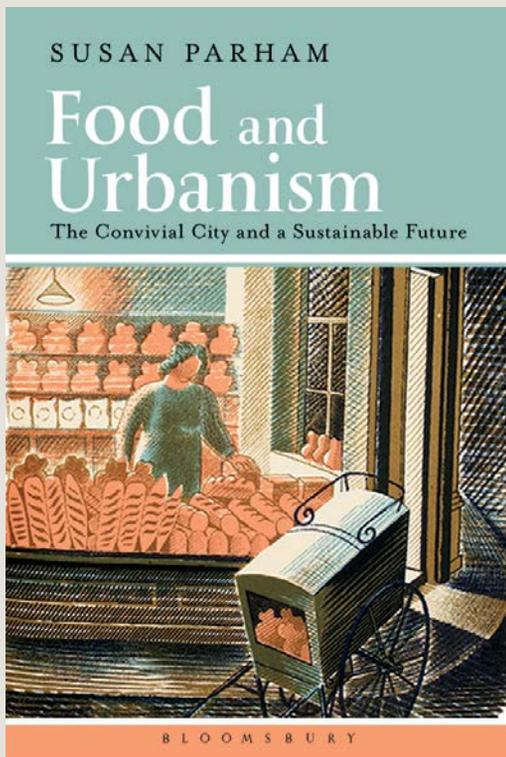
Here's a conundrum. When is an innovative approach not new? The answer lies with urbanist Dr Susan Parham who believes that the future of feeding the planet is rooted in what we already know.

In her new book, *Food and Urbanism*, Parham explores the relationships between different urban spaces and the production and consumption of food – both in a logistical sense, and the sense in which more social aspects of food can impact the development of cities. It's an area Parham has devoted herself to as part of her work as the University of Hertfordshire's Head of Urbanism at the Centre for Sustainable Communities in the U.K.

Parham argues that food has a vital role in shaping our cities' future, and that the design of new urban spaces should have considerations about food at its center. The book progresses through a range of different physical locations (starting with the table and working outward in scale through to the peri-urban area and region as a whole), and considers their relationships with food. For example, from the agoras of ancient Greece, to the permanent market structures of the middle ages, and finally decline in the 20th century, markets have been highly significant as trading places and as civic hubs. Parham observes the market's 21st century revival – from those fueled by the modern appetite for local, fresh produce (such as the famous Borough Market in London), to a particular working class wet market

in Hong Kong, which she calls an 'unacknowledged success story in a neoliberal urban context' as an engine of job creation also providing new access to good quality food for poorer residents. This ability to think holistically about all urban space and food – where considerations about social and cultural issues are also relevant – is, argues Parham, essential for a sustainable and convivial future. Our recent experience globally suggests this is not just a technical challenge where simply inventing new ways to grow or process more food is the solution.

Now that cities are home to over half of the world's population, and set to grow dramatically in the next couple of decades, we need to adapt to this change and one of the major considerations is – how do we develop our cities so that we can feed everyone? Parham suggests that perhaps the answer simply lies in thinking carefully and logically about the urban places we occupy, how those physical environments have intermingled historically with food culture and processes, and how we can make those relationships as effective as they can be.



Food and Urbanism  
by Susan Parham is  
published by  
Bloomsbury

# What is it about disaster movies?

When it comes to portraying disasters in film, it seems we can never get enough. Film writer **Mat Black** asks what keeps us coming back for more?



Perhaps it's the lavish special effects, or watching superstars being tested almost to destruction? Or maybe it's our simple human fascination with the notion of apocalypse and other people's misfortune? Whatever the reason, disaster movies have always been big hits at the box office.

Ever since the very earliest days of film making, the disaster movie has been right up there in the popularity stakes. Just four years after the first film studio opened for business, came the British-made silent film "Fire" (1901) about escaping from a burning house. Not long after that the sinking of the Titanic was immortalized in "Atlantis" (1913), then in the 1920s we had the story of "Noah's Ark", in the 1930s came "The Last Days of Pompeii" – and so it continued, through hurricanes, earthquakes, floods, fires, plane crashes, giant gorillas, alien invasions, tsunamis and catastrophes of every conceivable shape and form.

Numerous theories have been expounded on the lure of the disaster

movie, but one with particular resonance suggests that movies enable us to play out our greatest fears (from the comfort of our cinema seats) while also reflecting the state of global affairs. Take the particularly disaster-prone 1970s as an example. Starting with a cyclone that killed 500,000 people in East Pakistan (which became Bangladesh in 1971), this decade careered through the fall of Saigon and ended with the Iranian revolution in 1979, all via Watergate, the global oil crisis and more besides. Against this backdrop, the crop of multiple award-winning, box-office-busting disaster movies spanned from the story of the terrorist hit plane in "Airport" and the capsized ocean liner in "The Poseidon Adventure", through to the zenith year of 1974 with "The Towering Inferno", "Earthquake" and "Airport 1975". The momentum continued with "The Cassandra Crossing" featuring terrorists armed with deadly diseases, "Avalanche" and then "Hurricane". Appropriately

enough, as the appetite for this genre waned, the decade wrapped up with "When Time Ran Out."

So what's in store for us today? Fitting for our times, look out in 2016 for "London Has Fallen" based around a plot to assassinate world leaders attending the prime minister's funeral. The hype is already growing for the sequel "Independence Day: Resurgence" – described as delivering a "global spectacle on an unimaginable scale," and then later on comes "Geostorm", where the failure of climate-control satellites threatens to unleash a worldwide storm.

As a final thought, and echoing the innovation and resilience theme of this first edition of IQ, I propose that the lure of the disaster movie could come down to two things – innovation in the ever-more elaborate storylines and special effects, and our belief that no matter what is thrown at us, we have the amazing ability to always seek and find answers, solve problems and demonstrate human resilience.

# U.S. and Chinese cities partner for climate-smart innovation

In advance of the COP-21 climate talks in Paris, a meeting of superpowers in Los Angeles produced consensus that climate change is the most critical issue of our time, and that the U.S. and China can lead the world in climate innovation, writes conference correspondent **Jeremy Seymore**

**Presidents Xi of China and Obama of the U.S. established a framework to share learning and best practices**



Photo courtesy of the LA Mayor's Office

It is probably no surprise that the world's two largest economies account for more than one third of the global carbon greenhouse gas emissions, and that most of that carbon comes from cities – cars, factories, buildings, and heat and power generation. Most discussions about global climate change end up with the question about what China and the U.S. will do to reduce emissions? This makes noteworthy the recent agreement by 29 top U.S. and Chinese cities, states, and provinces to exceed the historic commitments made by their parent countries.

As part of the agreement on working together on carbon reduction, Presidents Xi of China and Obama of the U.S. established a framework to share learning and best practices between these two great nations at the city and regional level.

**Smart talking:**  
At the summit's Green Buildings and Infrastructure session, Mayor Carlos A. Gimenez, of Miami-Dade County, Florida, talks with Jie Teng, Vice Mayor of Shenzhen (left), and Josh Sawislak, AECOM's Global Director of Resilience.

This effort was brought to fruition in Los Angeles in September (2015), at the two-day U.S.-China Climate Leaders Summit. The forum was attended by key governors, mayors, and business leaders from both countries, including a large delegation from AECOM, which served as one of the major corporate sponsors of the event along with Goldman Sachs, Warner Bros., Bank of America, and Bloomberg Philanthropies. More than 200 Chinese officials and business leaders met with over 300 of their U.S. counterparts during the two-day event. A new global climate agreement was announced during the keynote address, where 18 U.S. cities and states and 11 Chinese cities and provinces pledged their commitment to reduce emissions, establish carbon reduction targets and

detailed actions that exceed ambitious national targets previously submitted to the UN in advance of the global climate negotiations (COP-21) scheduled for Paris in December 2015.

In his welcoming remarks, Los Angeles Mayor and local host Eric Garcetti noted that China and the U.S. were uniquely positioned to be a model for climate-smart technology and planning. Not only are there the intellectual capital and other resources to solve these problems, but as the major generators, these two countries have a moral imperative to do so. Both nations sent climate and national leaders as well as top officials from major cities and regions. Vice President Joe Biden and Special Representative for Climate Change Xie Zhenhua, led the U.S. and Chinese delegations, respectively. On the local side, mayors and senior officials from Beijing, Guangzhou, Shenzhen, Los Angeles, Houston, and New York City, joined governors and industry leaders in two full days of presentations and panel discussions. In his closing remarks, Vice President Biden said that climate change was the most critical issue of our time and Special Representative Xie said that China and the U.S. can lead the world on climate-smart innovations.

Innovation is easy to talk about, but harder to deliver, as any entrepreneur will tell you. As delegates met in small groups and participated in breakout sessions on planning, finance, green buildings, and urban resilience, a Tesla electric car, loaned by the Los Angeles Police Department and set up as a police cruiser, reminded them that innovation requires thinking outside business as usual. Most of the panel discussions presented examples of how to drive innovation. AECOM's innovation leader and cities visionary Jason Prior talked about how the need to bring divergent communities together in planning for the London Olympics created opportunities to think beyond just the games. Josh Sawislak, AECOM's global director of resilience, spoke on the nexus between low-carbon planning and preparing for the impacts of climate



Smart city: One of the projects featured in Jason Prior's presentation was the Samsung Smart City. Just south of Samsung's semiconductor plant at the historic city of Xi'an, China, the company is developing the 500-hectare city which will house more than 2000 high-tech companies. Samsung and AECOM conceived this pilot project to set new standards in sustainable urban systems including water, waste, transportation, energy and technology.

change. Resilience to those impacts, he noted, helps make the business case for upgrading older infrastructure and designing for the future with inbuilt flexibility to adapt. Tim Feng, from Chinese developer Vanke, discussed how the firm now uses prefabricated building materials to significantly reduce the carbon footprint of construction and create more efficient and thus lower-carbon building operations.

Innovation is a process, not a specific design element. It requires creativity and some tolerance for mistakes. This is difficult in our culture of quality and cost efficiency, but the concepts are not mutually exclusive. As the local and corporate leaders discussed, a good project is only good if it contributes to the challenges we all face together and continues to prove its value as the

world around it changes. China and the U.S. have made a step in this direction by bringing together top government and business leaders to share ideas and look for opportunities to collaborate. Not to rest on their laurels, the two countries will bring these ideas to the Paris meetings in December and have already begun planning the next climate leaders' summit, scheduled for next year in Beijing.

06



# I N S P I R E

"Like every child who has ever played on a beach, I know that sand is not one thing but many. Grains of mica would glitter on the surface, where I wrote my name with a finger. My plastic spade would cut down through alternating layers of darker and lighter sand, with the crispness of soft brown sugar or the thickness of molasses."

Jean Sprackland, poet, who used to live near Blackpool  
Strands: A year of Discoveries on the Beach published in the U.K. by Jonathan Cape