

POLICY PAPER

How can cities become more resilient?

Improving flood management
through better governance,
private sector partnerships
and open data

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MAIN POINTS

- The health of the world economy is increasingly dependent on well-functioning cities. However, climatic changes and new population patterns are making them increasingly vulnerable to shocks (e.g. flooding) and stressors (e.g. sea-level rise). Robust and timely policy actions, such as finding creative new ways to incentivise cross-institutional cooperation, are needed to address this challenge.
- This paper highlights four complementary approaches for attaining longer-term resilience: getting the basics of sound governance within city operations right, ensuring effective responses in close coordination with neighbouring jurisdictions, designing win-win partnerships with the private sector, and harness the power of open data sharing to improve decision-making.
- For each recommendation, successful interventions will require context-specific designs based on consultations with all stakeholders, resulting in deeper understanding of the local policy and socioeconomic environments. Rigorous impact evaluations are needed.



Residents evacuate their goods during the massive flood that hit the low settlements in Jakarta in 2018.

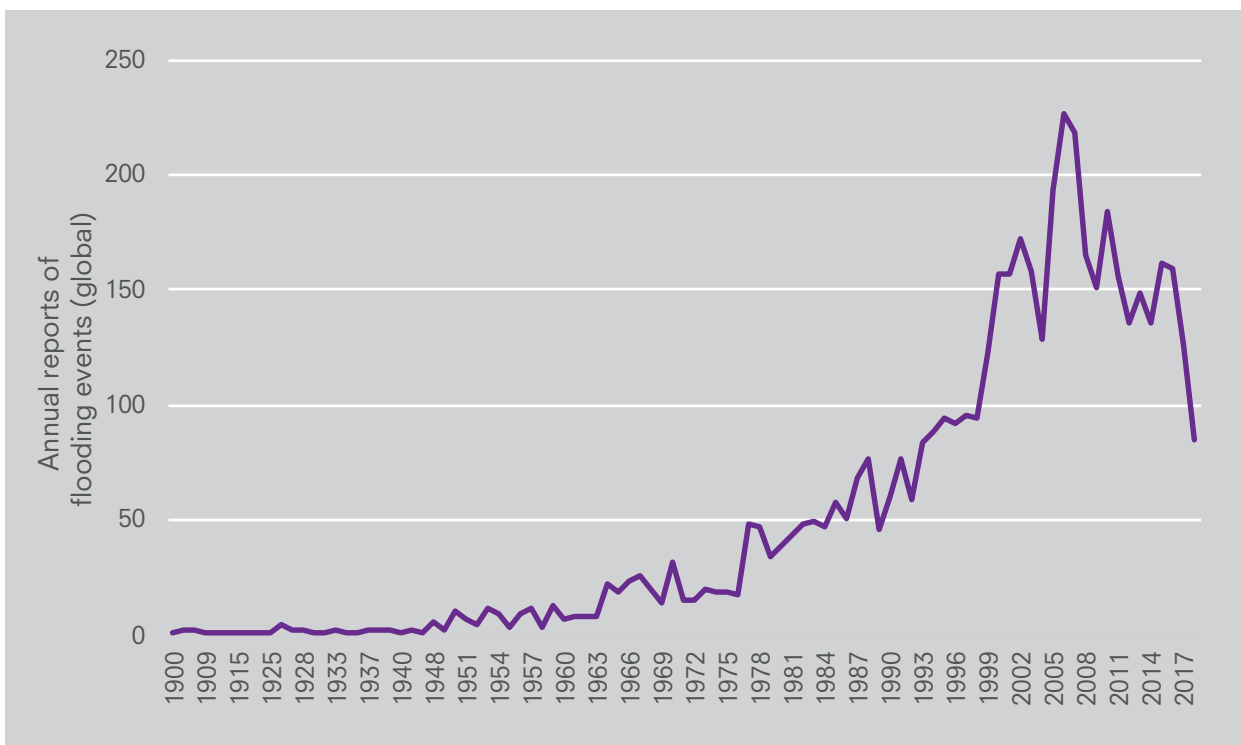
Photo by Edi Ismail/
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Introduction: why urban flood management matters?

As cities' share of the global GDP and population increases, their centrality to the stability of the world's economic system and human wellbeing becomes ever more critical. The resilience of cities and their constituent system is thus a serious global challenge. It requires improved urban governance, better intergovernmental coordination, engagements with the private sector, and open data sharing supporting rigorous impact evaluations of existing interventions. In 2017 alone, 55 flood events resulted in insured losses of over \$2.1 billion, with major losses in Hurricanes Harvey and Irma concentrated in cities. Over the last 50 years, the number of flooding events around the world, including in cities, has grown dramatically.

In 2017 alone, 55 flood events resulted in insured losses of over \$2.1 billion

Figure 1: Annual reports of flooding events (global)



Source: emdat.be

Resilience¹ is defined by Ahern (2001) as the “capacity of systems to reorganise and recover from change and disturbance without changing to other states” which could include shocks such as flash flooding and stresses like rising sea-levels require specific responses.² One of interest is robust governance systems that provide adequate authority and resources to the most capable entities. The historical need for water has resulted in most major cities situated either coastal or on the banks of major rivers. Consequently, they are increasingly vulnerable to both volatile weather events such as hurricanes and slow-moving threats like extraordinary glacial melting.³ In other cases, somewhat preventable manmade causes like industrialisation and over-motorisation are causing air pollution and smog that cripples urban economic activity. Both the costs of mitigating their impacts and direct losses are substantial enough to warrant them becoming a top public policy priority. However, in reality, only a handful of mostly large cities have adapted actionable definitions of resilience.

Somewhat preventable manmade causes like industrialisation and over-motorisation are causing air pollution and smog that cripples urban economic activity

In resource constrained environments, short-term reactionary responses are more common than longer-term preventive investments, both in soft institutional and hard infrastructural ways of improving resilience. For example, flood prone cities are more likely to undertake occasional cleaning of smaller waterways, which often become dumpsites, rather than improving solid waste removal and promoting civic sense among residents. Academic and policy literature confirms that only a few concerted efforts have been made to develop city resilience plans. Yet, these could be an effective strategy for mitigating challenges outlined in the remainder of this paper. Furthermore, as the poor have the least robust social protections and tend to reside in low-lying areas⁴, they will continue to be disproportionately vulnerable to flooding, unless rectifying measures are taken. Disaster recovery, reconstruction and resilience programs have provided billions of dollars in various short term, often reactionary activities. However, unless the economic case is made more effectively, the majority of cities around the world will not take preventive measures to avoid losses from floods or other shocks and stressors.

1 Ahern, J. (2011). From fail-safe to safe-to-fail: Sustainability and resilience in the new urban world. *Landscape and Urban Planning*, 100(4), 341-343.

2 Mercy Corps' (2017) definition of shocks is the “Sudden onset, high-impact events, usually of a limited duration. These include dangerous natural phenomena, human activities or conditions that may cause loss of life, injury or other health impacts; property damage; loss of livelihoods and services; social and economic disruption; or environmental damage” and stresses are the “Slow onset events or changes (e.g., land degradation, erratic rainfall, persistent conflict, price instability) that undermine development outcomes. Stresses are lengthier disruptions that can be high impact (similar to shocks), but generally occur over a longer period.” Source: Levine, E., Vaughan, E., & Nicholson, D. (2017). Strategic Resilience Assessment Guidelines. Portland, OR.

3 Deppisch, S., & Schaerffer, M. (2011). Given the Complexity of Large Cities, Can Urban Resilience be Attained at All?. In *German Annual of Spatial Research and Policy 2010* (pp. 25-33). Springer Berlin Heidelberg.

4 Hallegatte, Stephane; Bangalore, Mook; Vogt-Schilb, Adrien. 2016. Assessing Socioeconomic Resilience to Floods in 90 Countries. Policy Research Working Paper; No. 7663. World Bank, Washington, DC

Well governed cities are resilient cities

Key messages

- Establishing the basics of sound local governance, i.e. accountable, transparent, fiscally and administratively autonomous institutions, are pre-requisites for improving resilience.
- City governments operate in deeply entrenched siloes, perpetuated by officials' professional backgrounds and fiscal and administrative systems linked to higher levels of government. However, improving resilience, by definition, requires cross-functional coordination.
- This can only be ensured through robust buy-ins from local political leaders, who could create incentives for departments to work beyond traditional domains of influence. This would create value for the entire system.

Urban environments are highly complex and effective functioning depends on interdependencies between public service delivery systems, natural ecosystems and social dynamics of diverse populations.⁵ The breakdown of a single part of this could result in cascading failures, which even in high capacity cities, rapidly deplete their ability to stage an effective response. Urban flooding events are therefore exacerbated by poor governance. For example, non-adherence to zoning laws, resulting in illegal buildings in riverbeds or inadequate emergency response mechanisms, worsen the outcomes of flooding events. Well-known cases like the 2005 Mumbai, India rains or the 2012 Hurricane Sandy in New York, U.S.A represent multisystem failures. Solving them requires both multidimensional thinking and well-coordinated responses.

In typical urban local governments, city functions are highly specialised into essential services like water and transport provision. Many of these are controlled by authorities other than the city's leadership. For example, in many South Asian cities, provincial governments establish public or semi-government corporations with independent boards for providing regional water and sewerage services. This is done to achieve private sector like operational efficiency and circumventing slow-moving bureaucratic public systems, thus moving toward specialisation and economies of scale. However, for cities grappling with resilience challenges, which are inherently cross-functional, the existence of these operational challenges makes it impossible to plan and execute wide reaching resilience enhancing programs. These siloes are well-entrenched, running deeper than city operations or funding streams, and deeply impacted by key personnel's professional and political backgrounds.

Urban flooding events are therefore exacerbated by poor governance ... Well-known cases like the 2005 Mumbai rains or the 2012 Hurricane Sandy in New York represent multisystem failures

⁵ Johnson, Neil. 2009. Simply complexity: a clear guide to complexity theory. Oneworld publications.

The basic tenets of good local public management, particularly matching responsibilities with functional authorities, are equally applicable to resilience building as they are to improving the delivery of any given public service. Cities with poorer underlying governance structures, for instance, lacking accountability, not having administrative discretion and not allowed to set tariffs, are much less likely to become resilient regardless of the scale of resource investments. If a city's executive leadership does not have the power to hire, dismiss or effectively manage staff at public service delivery units, who are responsible for delivering all elements of a resilient city, it is impossible to expect that city to have an integrated resilience plan. Even if they did, during a flood or other shock event, implementation would be extremely difficult in the absence of a consistent working relationship.

Therefore, to improve resilience and flood management, city leaderships must demonstrate considerable initiative, clearly identifying the so-called "resilience dividend"⁶ for each line department and city governance as a whole. Unless an internal buy-in takes place, the uptake of resilience building initiatives will remain uncertain. For instance, cities receiving external funding may undertake activities with donors, but will lack proper ownership and sustained focus beyond the life of the funding agreement. Having senior political leaders' support for the resilience agenda is therefore critical. Only then will major resilience programs like 100 Resilient Cities (100RC) and Bloomberg Cities of Service effectively target and engage with urban leaders for capacity building and advisory services.⁷

In many cities participating in such programs, urban planning processes for example do not fully consider resilience building, which often requires additional investments. For example, cities with major waterways must consistently crackdown on trash dumping in densifying local communities, which could require improving solid waste removal services and raising the public's awareness of risks. They must also design inclusive planning and governance processes that take into account viewpoints from a wide range of stakeholders, particularly citizens.⁸ Even in the absence of such reforms, the process of creating urban resilience strategies generate rare cross-departmental and inter-jurisdictional conversations, which could stimulate wider institutional de-siloing. The case for building resilience should be made in clear economic terms, i.e. studies should be undertaken to estimate return on investment in the form of avoided losses and benefits from growth enabling infrastructure. The existing academic and programmatic literature however appears devoid of rigorous empirical evaluations quantifying the so-called 'resilience dividend' in concrete economic terms.

The process of creating urban resilience strategies generate rare cross-departmental and inter-jurisdictional conversations

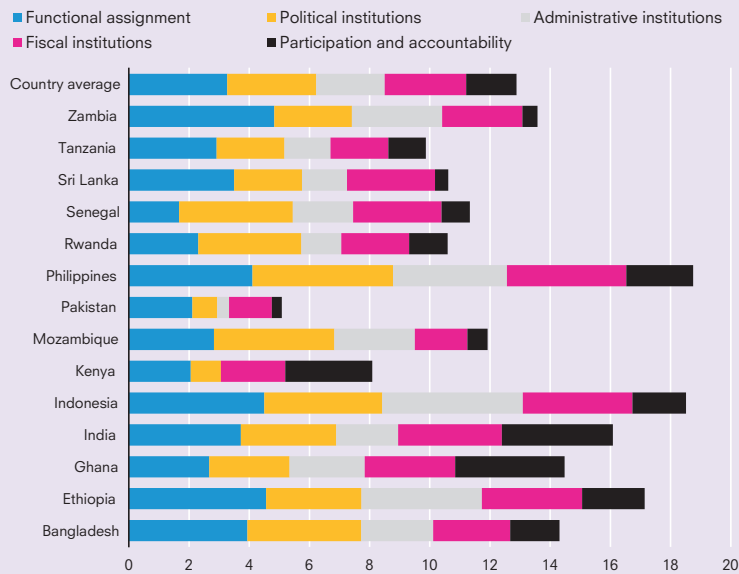
6 Roden (2014) defines this as the difference in the outcomes between the scenario with a resilience approach and without." Source: Roden, Judith. 2014. *The Resilience Dividend: Being Strong in a World Where Things Go Wrong*. PublicAffairs. New York, NY.

7 Ernst and Young (2017). *Why it's time for cities to get real about resilience*. EY report, New York, NY. https://www.ey.com/en_gl/government-public-sector/why-it-s-time-for-cities-to-get-real-about-resilience

8 Birkmann, J., Garschagen, M., Kraas, F., & Quang, N. (2010). Adaptive urban governance: new challenges for the second generation of urban adaptation strategies to climate change. *Sustainability Science*. 5(2), 185-206.

BOX 1: WHAT KEEPS CITIES FROM EFFECTIVE PUBLIC SERVICE DELIVERY?⁹

Institutional dimensions of urban service delivery performance, average scores by country



Scores on x-axis are on a point scale of 20 with four points for each of the five categories listed below

The following five factors play a critical role in determining the effectiveness of an urban local government in delivering public services.

- **Effective functional assignments:** the extent to which local governments' responsibilities match legal authority, such as planning and executing capital investments.
- **Dynamic local political leadership:** the level of political space available to local leadership, and their dynamism and responsiveness in responding to the citizens' demands
- **Administrative autonomy:** local authorities' powers to hire and fire key local staff, approve their own budgets, and determine their own administrative structures.
- **Financial autonomy:** the ability to set service fees, transparency of annual budgeting, powers for raising capital for public investments, and adverse effects of dependence on fiscal transfers.
- **Accountability to and participation of citizens:** the responsiveness to the electorate's needs through institutionalised systems for participatory planning, complaint handling, and performance management.

⁹ Boex, Jameson, Ammar A. Malik, Devanne Brookins, and Benjamin Edwards. "Dynamic Cities? The Role of Urban Local Governments in Improving Urban Service Delivery Performance in Africa and Asia." Urban Institute, July 19, 2016. <http://www.urban.org/research/publication/dynamic-cities-role-urban-local-governments-improving-urban-service-delivery-performance-africa-and-asia>.

Improving inter-governmental coordination

Key messages

- Natural ecosystems around cities in general, and those experiencing rapid growth in particular, are disturbed by expansions of the built environment. Rainwater drainage systems are particularly affected by modern infrastructure and illegal construction or dumping in waterways. Negative externalities from this simultaneously affect multiple jurisdictions, resulting in the classic tragedy of the commons dilemma.
- Medium and smaller sized cities, particularly those that are part of larger metropolitan systems, must find ways to coordinate activities to create more sustainable outcomes. This too requires reforming governance systems in coordination with provincial and national level authorities, including through the creation of metropolitan regional government committees.

As shocks, such as urban floods and stresses, like sea-level rise, by their very nature simultaneously affect several jurisdictions, neighbouring local governments within larger metropolitan regions must coordinate responses. For example, even if a single town makes significant investments in improving solid waste management in neighbourhoods adjacent to waterways, the metropolitan region's resilience to flooding would not improve until upstream and downstream localities did the same. However, for both technical reasons like inconsistent budgetary systems and political factors such as party rivalries, such coordination is difficult to accomplish.¹⁰ In addition to horizontal coordination among local governments, varying dependence on fiscal transfers from provincial or national authorities can create further complications.¹¹ The required institutional change, whether for resilience enhancing activities or otherwise, requires several key environmental elements:

- 1 Willing internal and external to city government stakeholders;
- 2 Broad participation and buy-in from within city government for change;
- 3 Top leadership's unravelling support for changes;
- 4 External support structuring;

¹⁰ Nelson, K. L. (2012). Municipal choices during a recession: Bounded rationality and innovation. *State and Local Government Review*, 44(1S), 44S-63S

¹¹ Kimble, D., J. Boex, and G. Kapitanova. (2012). "Making Decentralization Work in Developing Countries: Transforming Local Government Entities into High." Urban Institute Center on International Development and Governance Policy Brief: November.

As shocks, such as urban floods and stresses, like sea-level rise, by their very nature simultaneously affect several jurisdictions, neighbouring local governments within larger metropolitan regions must coordinate responses

- 5 Institutionalising change and incorporating new habits into daily operations; and
- 6 Ensuring “subsystems” or departments of organisations are aligned with the overlap structure.¹²

CASE STUDY: MUMBAI’S CHALLENGE OF POOR PLANNING AND REGULAR FLOODING

A combination of poor flood planning, lax enforcement of land-use regulations, inadequate storm water drainage system and more intense rainfall events has resulted in frequent urban flooding in India’s financial capital. Major events have occurred in 2005, 2007 and 2017, each showing similar patterns in terms of the lack of early warnings, extraordinary amounts of rainfalls and a complete standstill of transport services and subsequently, all other economic activities. Despite their predictability associated with the annual monsoon season, authorities’ failure to address it provides a rare peak into underlying governance issues. The city’s fragmented governance system and the (perhaps) related lack of political willingness to create a holistic resilience strategy exacerbates this challenge. The inner-city’s low-income neighbourhoods boast slums often built on waterways which clog the city’s natural drainage system, forcing water to backup into low-lying areas across the city. Unless the city’s ecosystems services are restored, particularly as extreme weather events become more likely, Mumbai’s residents will remain highly vulnerable.

Similar to inter-departmental coordination failures within city governments, cross-jurisdictional coordination is also extremely difficult. A major reason for this is due to unclear payoffs for cooperation. For example, the Mayor of a small, resource-constrained town upstream from a major metropolitan area has in itself little incentive to fully enforce anti-dumping regulations within their jurisdiction. However, the creation of a municipal area governance council, led by the major urban hub’s government and supported by provincial or national authorities, could help alleviate this problem by incentivising good behaviour, such as a more collaborative attitude. As major cities like Washington DC, U.S.A or London, U.K. hold national and global stature, maintaining their full functionality offers benefits to interests well beyond local communities. Government and other local stakeholders (e.g. small businesses) are often willing to cost share in risk mitigating investments, provided there are transparent and well-functioning institutional apparatuses for coordinated action.

¹² Fernandez, S., & Rainey, H. G. (2006). Managing successful organizational change in the public sector. *Public Administration Review*, 66(2), 168-177

CASE STUDY: TANZANIA'S INNOVATIVE USE OF LAND TITLES AS INCENTIVES¹³

A major impediment to household, neighbourhood and city-level resilience is illegal construction, which is highly correlated with incidence of urban poverty and vulnerability to disasters. As informally settled areas by definition are outside the gambit of land-use or public safety regulations, and are generally built in areas with worst coverage and quality of public services, residents are highly vulnerable. To reverse this trend, in Dar es Salaam, Tanzania, the government introduced an innovative approach for discouraging settlements in flood prone areas: offering land rights to households who choose to relocate to lower flood risk areas in other parts of town. This policy targeted non-title bearing property owners living in illegal settlements, who are most likely to respond to such incentives even if formal title comes at the cost of longer commute time or the need for putting down payment. This shows that land title reforms, when introduced smartly, could serve as a low-cost policy option for cities dealing with urban flooding risk.

In Dar es Salaam, Tanzania, the government introduced an innovative approach for discouraging settlements in flood prone areas: offering land rights to households who choose to relocate to lower flood risk areas

For smaller cities and towns around major global cities, the spill over impacts could create both positive and negative externalities - infrastructure investments and congestion, respectively. In cities where informal housing is common, the promise of legal title could serve as a strong incentive for low-income residents to relocate to less vulnerable areas. However, relocation creates burdens of cross-jurisdictional coordination between neighbouring municipalities and creates practical challenges for residents. For example, workers would require public transport services in areas where existing networks may not be operating for lack of demand. In places having diversity in ethnic composition and political viewpoints, changes in local demographics would likely create tensions between communities, especially when incumbent majorities feel threatened by migrants. Moreover, for many residents, emotive connections with particular neighbourhoods can be overwhelming, making mass relocations an impractical and unpleasant prospect.

Hence, the success of this approach will also require greater community participation in local decision making, which in most cities in Asia and Africa is uncommon. One opportunity is hosting many consultation sessions in order to seriously consider addressing citizens' concerns. Similarly, neighbouring cities must work together. Only with this coordination will there be internal consistency across the various city plans. This brings possibility to allow them to pool resources to achieve economies of scale - turning new projects into reality.

Neighbouring cities must work together. Only with this coordination will there be internal consistency across the various city plans

¹³ Collier, Glaeser, Venables, Blake and Manwaring. (2017). "Secure, legally enforceable and marketable land rights for urban development" *IGC Cities that Work Policy Brief*

Partnering with the private sector

Key messages

- Public capacities and resources alone are inadequate for responding to the resilience challenge, thus the private sector’s ingenuity, financial resources and technical skills could support cities. Through creative new partnership designs, win-win situations can be created where cities, private parties and citizens all benefit.
- However, private sector engagements come with high reputational and performance risks for governments, who unlike companies are accountable to the general public who may perceive privatized service delivery as benefiting more affluent segments of society.
- Past attempts at achieving this show that for-profit companies are willing to invest in building a marketplace for resilience offerings for cities, provided they clearly identify future returns.

The sheer scale of the urban resilience challenge, particularly in terms of damages from flooding, makes it very difficult for public resources alone to stage an effective response. The non-government sector both suffers from, and increasingly, must be an effective responder to the risks posed by urban disasters and shocks. Several corporations for example are long-time procurement partners of city governments, transferring knowhow to counterparts or simply supplying essentials needed for disaster response. However, while in theory the alignment of private and public interests appear straightforward, forging win-win partnerships between disparately motivated parties in resource constrained environment is extremely difficult. For example, even after working with several cities on resilience strategies paid for by a major program implementer, one of the largest management consulting companies was uncertain whether cities could mobilise own funds to procure their services.

In most economies, the private sector would not buy-in to this model unless they see a clear business case. In part due to this reason, governments must carefully consider ways to nudge the market to create lasting company-city business relations by reducing barriers. For example, unless the company maintains an existing business network in a city, working there could present daunting start-ups costs, which could be reduced by the use of local intermediaries. Companies must also be prepared to be fully transparent in sharing details of the partnership’s financial scale, even if it is a small amount. Strengthening this market thus requires three steps:

Governments must carefully consider ways to nudge the market to create lasting company-city business relations by reducing barriers

- 1 Overcoming information asymmetries through greater information sharing;
- 2 Providing due diligence to partners; and
- 3 Undertaking monitoring and evaluation, as well as rigorous research to repurpose research findings into ongoing policy discussions.

BOX 2: CREATING MARKETPLACES FOR RESILIENCE SERVICES¹⁴

A critical element in the 100RC program's theory of change is the idea that under the correct set of incentives, private companies would become effective resilience partners to city governments. This could range from pure buy-and-sell arrangements such as supplying shelters post-disaster, to more knowledge intensive relationships that could create more lasting capacity building on both sides. The program hoped to create a virtual marketplace where city-clients and private sector service providers could come together to forge mutually beneficial business arrangements. The program's accompanying interventions, such as cities' resilience strategy development or capacity building within city governments, combined with the foundation's analysis of white spaces in the private sector, were thought of as necessary elements in the success of this model. Given the global scope of the program, proponents believed that after initial foundation-funded engagements with cities, relevant private service providers like insurance companies would continue investing in similar activities with other cities, thereby kick-starting a new trend in the private sector of targeting cities as clients. The program enlisted over 120 entities as platform partners, giving them a foot in this door, and close to a dozen as strategy partners hired to support cities in producing resilience strategies. While these are still early days for the program to demonstrate the success or lack thereof of this ideal, success will be determined by evidence that cities and companies continue working together beyond the life of the program.

Instead of direct public sector support, strengthening private markets to respond to flooding and other resilience challenges is an arguably more sustainable approach. However, this relies on the extent that private companies have incentives and synergistic expertise for this to emerge naturally. This, in turn, is predicated on the resources and sophistication of urban government clients, the consumer base of the local economy and the company's own readiness to engage in the city, country or region long-term. Market analysis reveals that few private companies have created fresh products or services targeting cities' resilience needs. They are instead focusing on customised applications of existing offerings for local government clients.

¹⁴ 100 Resilient Cities (2017). 100RC: Catalyzing the Urban Resilience Marketplace. New York, NY

Open data sharing

Key messages

- Effective disaster responses in the short-term and resilience-building in the longer-term require evidence-based policymaking, which in turn depends on real-time and high-quality data about people and systems.
- Open data sharing, even within city government departments is important. Combined with positive incentives for evidence-based policymaking, both can significantly improve the potential for location- and time-specific targeting of early warning services and infrastructure for mitigating impacts.
- Without the right permissions, incentives and technical capacities, the collection and sharing of administrative or crowdsourced data sets would simply not occur.

Effective policy-making depends on the quality, timeliness and relevance of the evidence-base supporting it. The worsening impacts of climate change in the form of urban flooding and other resilience challenges, coupled with the perpetuation of smartphone throughout society and greater sharing of administrative data could have tremendous potential in building this evidence. Unfortunately, in reality, city departments often find it challenges to share micro-data even with own peers in city governments, let alone limited circulation to outsider researchers, or making them public. More than administrative data, this problem is more complicated with datasets owned by private companies where government has at best only regulatory authority over it. A major example of this is Call Record Data (CDR) which provides granular information on static and dynamic population densities – this information is proprietary and potentially highly invasive. For these reasons, even in high technical capacity and well-resourced cities in the developed world, data sharing for analytics poses significant challenges.¹⁵

Given resilience-building's inherent necessity of cross-functional and inter-jurisdictional coordination, open data sharing along with quality assurance and standardisation of administrative datasets is even more crucial. For example, data on official land-use patterns using administrative and satellite imagery must be readily accessible to authorities planning storm water drainage systems. This can only be ensured through ongoing engagement, standardised sharing protocols and buy-in from leaderships of concerned departments. Given the availability of inexpensive and high quality satellite imagery, coupled with the perpetuation of millions of data-generating, web-enabled electronic devices,

Effective policy-making depends on the quality, timeliness and relevance of the evidence-base supporting it ... the perpetuation of smartphone throughout society and greater sharing of administrative data could have tremendous potential in building this evidence

¹⁵ Kingsley, G. T. (2017). A Broader View of the Data Revolution and Development Agenda (Research Report). Washington D.C.: Urban Institute. Retrieved from <https://www.urban.org/research/publication/broader-view-datarevolution-and-development-agenda>

researchers are simply circumventing administrative data systems to undertake applied policy research. With powerful new tools such as machine learning and remote sensing, processing of large datasets has become inexpensive, which creates greater value for money.

CASE STUDY: CROWDSOURCING FLOOD MAPPING – PETAJAKARTA.ORG

In Jakarta, Indonesia, urban flooding regularly causes major disruption to social and economic lives. But like in other cities, authorities have consistently failed to create effective early warning systems, institute adaptation and orchestrate effective post-disaster response. Out of this frustration grew this project, which first began through group chats among friends on social media and has since become an elaborate, multi-city online platform supported by MIT, USAID and others. By exploiting Twitter's popularity in urban Indonesia, the PetaJakarta application collect real-time, location-specific flooding reports from across town, which is then combined with administrative data and uploaded onto a flood map. Its popularity and utility is such that it has since emerged as the city's early warning system allow citizens to make more informed travel decisions and authorities to better target assistance during times of crisis. Moreover, it has succeeded in turning flood response from top-down to bottom-up, driven by citizen feedback by harnessing the power of smartphone and social media technology. This open data platform has also given researchers unprecedented insights into the city's storm water drainage system, social responses to disasters and the efficacy of response. But on the flip side, smartphone penetration and social media usage is more common in areas with higher socioeconomic populations, which would likely skew data away from the most vulnerable parts of cities.

The reasons for poor data sharing and standardisation, even in relatively high capacity middle-income countries, are complex and multidimensional. They range simply from lack of resources at the hands of authorities charged with data management, to agencies proactively hiding data for fear of reprisal in case analyses reveal subpar performance, or worse, corruption. In other cases, data collection or analysis might simply be unaffordable or owned by private companies exercising proprietorship. A useful framework for understanding open data for improved policymaking is to consider three factors: permission, incentive and institutionalisation – without which personality-independent data sharing would become a reality.¹⁶ Institutionalised open data policies and willingness to share requires both changes in standard operating procedures and the mindset regarding data sharing. The incentive must be changed from not-sharing to sharing.

A useful framework for understanding open data for improved policymaking is to consider three factors: permission, incentive and institutionalisation

¹⁶ Edwards, B., Greene, S., & Kingsley, G. T. (2016). A Political Economy Framework for the Urban Data Revolution (Research Report). Washington D.C.: Urban Institute. Retrieved from <https://www.urban.org/research/publication/political-economyframework-urban-data-revolution>

CASE STUDY: USING AIRTIME TRANSFERS TO IMPROVE DISASTER RESPONSE¹⁷

In the aftermath of the Lake Kivu region earthquake of 2008, which resulted in 43 deaths and 1,090 injuries, analysis of data on mobile airtime transfers over Rwandan mobile networks provides unique insights into the spatial and social structures of vulnerability and post-disaster recovery. By analysing over 9.2 million interpersonal airtime transfers, including around 362,000 within 48 hours following the tremor, researchers were able to identify households with and without robust social support networks, as assessed by incoming transfers. By using anonymized call data records, they analysed the social network structures of all subscribers living close to and further away from the epicentre. This two-pronged approach enabled them to identify, with spatial precision, households requiring direct assistance from government or humanitarian agencies.



People make their way through the flooded streets after a water pipeline burst in suburban Mumbai, India in 2010. Photo by Trupti Patkar/Barcroft India/Getty Images.

¹⁷ Source: Blumenstock, J. E., Eagle, N., & Fafchamps, M. (2016). Airtime transfers and mobile communications: Evidence in the aftermath of natural disasters. *Journal of Development Economics*, 120(C), 157–181.

A forward-looking perspective to approaching resilience

This brief has highlighted several key approaches for revisioning the urban flood management and resilience challenge based on generalised findings from various cases around the world. In the real world, lessons learnt from one city may not apply to others, hence recommendations should not be applied to any city without thorough consultations with local stakeholders. The details of every city's governance system, sociocultural and economic circumstances create vastly varying outcomes, i.e. the same set of inputs are unlikely to create similar outcomes.

In the last five years, several urban resilience building programs have been designed and implemented by multilateral agencies, foundations and non-profits, besides dozens of initiatives undertaken by governments themselves. The approach moving forward should involve a more systematic assessment of their successes and pitfalls, which could be undertaken by engaging with individual programs, their evaluators or building a strategic relationship with the Resilience Measurement Community of Practice, established in 2016 by the Rockefeller Foundation. Researchers and program implementers continue grappling with the technical challenge of consistently applying the definition of resilience, resulting in objectively measurable data points for further investigation.

However, despite several programs and ancillary services, not to mention new literature on urban resilience emerging every year, a major intellectual challenge has been the nonexistence of quality impact evaluations providing credible causal evidence on the link between any resilience-building activities and impact on people's lives. Without a clearer and more rigorously produced case for the economic returns of investments in improving resilience, local and higher level governments will not undertake needed reform. Serious efforts must be made to ensure that such studies, focused on specific subcomponents of resilience building, are undertaken and debated.

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