When non-climate urban policies contribute to building urban resilience to climate change: lessons learned from Indonesian cities

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Glossary

Autonomi daerah	regional autonomy
Gotong royong	spirit of joint action
KTP (Kartu Tanda Penduduk)	resident identity card
Kelurahan	sub-sub-district, or village, made up of RT (below)
Kecamatan	sub-district
Kota (or Kebupaten)	city
Kebupaten	district
Musrenbang	annual participatory budgeting process
Nguwungke Uwong	a people-centred approach
PDAM (Perusahaan Daerah Air Minum)	state-run water supply enterprise
Perdah	by-law
PWS (Paguyuban Warga Strenkali)	the Strenkali People's Movement
Rukun Tetangga (RT)	a grouping of around 20 households
Rukun Warga (RW)	a grouping of several RT

Contents

Abstract

As in many Asian countries, cities in Indonesia face multiple threats from climate hazards, among them sea-level rise, flooding and coastal abrasion. In struggling to respond to these challenges, as well as the effects of rapid urbanisation, some Indonesian city governments have developed interesting policy innovations that may offer lessons about vulnerability reduction. These city governments have taken advantage of recent decentralisation legislation, giving them more flexibility to craft social policies that respond to the specific context of their citizens and needs. This research presents several cases that demonstrate examples of innovative policies that have increased water provision to urban poor residents, reduced the vulnerability of riverbank settlements, and introduced technology in gathering and sharing vital data to increase public access to information. Examined through a resilience framework, the cases reveal how in an era of decentralisation and increasing climate risk, some city governments have adopted an open-minded and responsive approach and introduced flexible and inclusive policies that have led to successful reductions in social vulnerability. The research contributes to efforts to document lessons about policy design and implementation and provides conclusions about why these policies have been successful in bolstering resilience and reducing vulnerability.

About the author

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1   Introduction

1.1   Background

Widespread flooding in Jakarta in February 2013 threw into relief the growing challenges that Indonesian cities face due to climate change impacts. Over 14,300 people were displaced, sometimes for weeks, and approximately one billion dollars losses were estimated due to disruptions to the city's businesses and damage to people's homes (Kompas Metropolitan, 2013). With sea-level rise, flooding and coastal abrasion continuing to pose threats to many cities throughout the country, Indonesian local governments are increasingly being asked for solutions for reducing their vulnerability to this relatively new threat. At the same time, cities across the world are seeking solutions for policymaking that helps build resilience to climate change impacts.
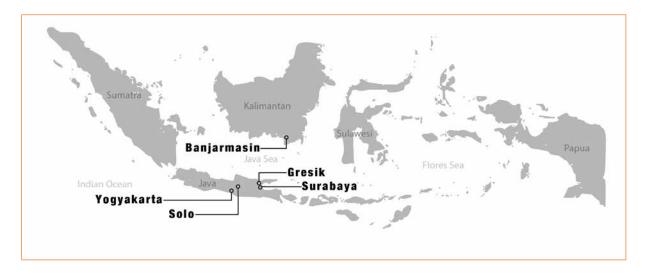
Indonesian cities present a unique opportunity to inform such policymaking initiatives because a number of governance mechanisms have created conditions for cities to experiment with different, and sometimes successful, approaches. One of these governance mechanisms is governmental decentralisation, as reflected in the *autonomi daerah* (regional autonomy) law of 1998 by which government decision-making was shifted to district and city levels, which is a key to providing opportunities for locally conceived policies to be implemented. For many years, Indonesia was ruled through a vertical hierarchy, which resulted in distinct administrative and territorial units. These start at the *Rukun Tetangga* or RT level (a grouping of about 20 households) followed by the *Rukun Warga* or RW (a grouping of several RT). RT are organised into *kelurahan* (sub-sub-districts), *kecamatan* (sub-districts), *kota* or *kebupaten* (cities or districts), provinces, and then the national level. While significant power has now been vested in the hands of *kebupaten* government, there remains confusion over overlapping, and sometimes competing, jurisdictions. While decentralisation has succeeded in regionalising power, thereby creating opportunities for innovative local governance to happen, there are still problems associated with the incompleteness of the process. Decentralisation is not evenly applied throughout the country, so opportunities are varied, and it is unclear whether good practice and innovation are transferable in other local contexts, given the dependence on local political conditions. This is relevant to resilience because large-scale impacts of climate change require action at many different levels of government; such administrative issues continue to frustrate attempts at coordinated action.

1.2   Purpose and structure

This paper will use seven case studies in six Indonesian cities to highlight how local urban development approaches have contributed to reducing vulnerability to climate change, though they were not designed with climate change adaptation in mind. These city cases bring together a range of responses to situations in which the physical and social wellbeing of citizens was threatened. Not all vulnerability reduction responses came from government acting on behalf of local communities; in some cases, initiatives were community-driven and in others non-governmental organisations (NGOs) were responsible for facilitating social change. Three cases look at local government and community-driven initiatives to increase access to water in the cities of Banjarmasin, Gresik and Solo (section 2). Two cases look at different responses

to urban poor riverbank settlements and ways in which the governments of Solo and Surabaya sought to relocate them (section 3). Lastly, we investigate how resilience can be built, as in Jogja and Solo, through creating public information access that empowers citizens to respond to disasters or advance their development needs (section 4). The case studies will be used to draw out lessons for other cities in building resilience to climate change impacts and provoke reflection about how social development and good governance initiatives can serve as entry points into building climate change resilience (section 5).

Map showing case study sites

1.3   Methodology and scale

Our research was conducted through interviews with government officials, community residents, civil society leaders and the staff of non-governmental organisations, as well as through the analysis of government documents, data, local regulations and newspaper articles. While climate change impacts are experienced over wide areas, in Indonesia the 'community' scale is of great importance due to the central role that it plays in society. Community wellbeing is prized above that of the individual, with decision-making and action often privileging groups of households over a single family unit. Likewise, policymaking in Indonesia places a high value on consensus-based approaches. For the purposes of this paper, a community is thus defined as a group of households and individuals who experience similar issues and threats and are connected by their physical proximity and a singular climate change threat. Communities can be recognised at the scale of RT and RW levels, or even at the *kelurahan*, or sub-sub-district level.

1.4   Theoretical framework

Vulnerability is a multi-dimensional term, defined in both physical and social measures. Physical vulnerability refers to the amount of potential damage that can be caused to a system by a particular hazard (Allen, 2003). Social vulnerability on the other hand is determined by factors such as poverty, inequality, marginalisation, access to health and housing quality (Blaikie *et al.,* 1994). When a hazard interacts with social vulnerability, an outcome is produced, and generally this is measured in terms of physical or economic damage or human mortality (Brooks and Adger, 2003). The nature of social vulnerability depends on the nature of the hazard to which the human system is exposed (Brooks and Adger, 2003). It is also important to remember that different groups are likely to experience hazards differently, depending upon each variable that defines their social vulnerability (e.g. access to health; poverty). As such, it is important to have a clear picture of who are the vulnerable parties and to what are they at risk. In the below cases, urban poor communities are

usually exposed to multiple layers of physical and social vulnerability, and climate change impacts serve to expose and aggravate these vulnerabilities.

Resilience is defined as 'the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organisation, and the capacity to adapt to stress and change' (Intergovernmental Panel on Climate Change, 2007). In this sense, resilience is defined by the behavioural changes and the *mobilisation* of capacities within communities and systems. An emphasis is placed on what communities can do for themselves and how their capacities can be strengthened, rather than concentrating on their vulnerabilities to specific hazards, or individual/community needs in an emergency (Twigg, 2007). Community or system resilience can therefore be understood as:

1   Capacity to absorb stress or destructive forces through resistance or adaptation.

2   Capacity to manage, or maintain certain basic functions and structures, during disastrous events.

3   Capacity to recover or 'bounce back' after an event (Twigg, 2007).

Beyond the community level, resilience is also defined in terms of the functioning of social networks and public service systems of a city (Campanella, 2006). As this paper focuses on urban resilience, it draws on urban-specific frameworks that have arisen out of experiences in Asian cities (Da Silva *et al.,* 2012; Brown *et al.,* 2012). In particular, Da Silva *et al.* (2012) highlight three components of urban systems: knowledge networks, institutional networks, and infrastructure networks. These 'socio-technical' networks shape the functioning of an urban area. The authors go on to identify characteristics of a resilient system; of particular relevance to the case studies presented in this paper are: **flexibility** (ability to change and adapt), **redundancy** (capacity to accommodate increasing demand), **resourcefulness** (capacity to mobilise resources), **responsiveness** (ability to reorganise and re-establish functions) and **capacity to learn** (ability to internalise experiences and learn from them).[1] Thus, in considering the case studies with regard to their implications for building resilience, the presence of these resilience characteristics within the case studies, and of the urban networks in which they operate, will be examined here.

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1   *The other two characteristics are safe failure and dependency on local ecosystems, which are of particular relevance to physical characteristics and features within an urban area.*

2   Water Supply

2.1   Background

Access to water helps to build climate change resilience because it is necessary for societies to remain healthy and for human life to thrive, and water supply systems are part of a city's infrastructure networks. In Indonesia, water is provided by the state-run but district-managed enterprise called PDAM (*Perusahaan Daerah Air Minum*), thus a decentralised government institution. PDAM does not have the capacity to reach all citizens, and is often felt to have inconsistent service quality to those it does reach. In response to water need, two things have taken place: PDAM improves the quality of service, usually by institutional reforms and investment; or community-initiated responses have had to make up the shortfall of this vital resource.

By looking at various responses to water needs, both from the side of government and from civil society and community initiatives, we can learn lessons about the measures that have been successful in reducing vulnerability regarding access to water supply. These examples display the characteristic of redundancy, in trying to accommodate demand. In the cities of Banjarmasin and Solo, for example, PDAM has introduced reforms that have increased service coverage despite challenging circumstances. In a period of decentralisation, where many district-run enterprises are 'on their own' to manage their resources and invest them in needed infrastructure, this can shed light on how city governments are finding ways to cope with increasing demand and resource management, demonstrating the necessary flexibility and resourcefulness in governance systems to do so.

From the community side we will look at a few villages in Gresik, East Java, as well as some urban poor neighbourhoods in Solo. In both cases, community members have self-organised and taken on responsibilities for water delivery services that the state was not able to provide. This indicates how communities build resilience by responding to challenges of a weakened state, particularly in newly expanding urban peripheries, by developing autonomous and semi-autonomous water delivery methods. However, it can also indicate where their capacity is simply limited and unable to cope with growing demand.

2.2 Case 1: PDAM reforms to expand service, Banjarmasin City

In 2001, Banjarmasin's PDAM was struggling to keep up with the demand from citizens for water, had an inadequate infrastructure and projects to rectify the situation had proven inefficient and financially unfeasible. In 2001, PDAM's service coverage barely reached 50 per cent of the population – and the company was plagued by some 600,000 billion US dollars of debt (focus group discussion). Insufficient water provision resulted in increased vulnerability of the urban population to waterborne diseases when people resorted to using polluted river water for their water supply.

At this point, two strategic decisions made by PDAM set in course a dramatic change in the water delivery service. The new director, Zainal Arifin, first introduced a series of management reforms that changed the mindset of the institution

from a project approach to a programmatic one. Second, PDAM drew up a business plan and recruited new staff. The business plan laid out the need to increase the cost of water in order to start to gain profits and pay off debts. To ensure that this was indeed implemented, the director brought on board the mayor and the city legislature to approve the business plan and the corresponding increase in tariffs. These would be borne by the public.

PDAM decided that it needed to state its case to the public to convince them of the necessity of raising prices. In 2002, PDAM set about communicating its financial situation and infrastructure shortage with the corresponding business plan offered as a remedy. A number of forums, neighbourhood meetings and radio talk shows were held to raise awareness, in which PDAM spoke openly about its strengths and weaknesses, and publicised its recently published financial report. 'PDAM made a big effort to improve the way they communicated with the people,' Fajar Desira, the Technical Director of PDAM at the time, told a focus group discussion. 'With a participatory approach… people will better understand our situation.' This inclusive approach was an important way for the company to transparently demonstrate the need for increased revenue, and is cited as an important step towards gaining acceptance.

As a result, the city legislature raised the water tariff (by 45 per cent), but not quite by the 70 per cent that PDAM had requested. This was a political concession in light of impending local elections, when parliamentary members were concerned about their reputations (Fajar Desira, focus group discussion). Because PDAM is a public company providing a public service, the negotiation between taking a business approach and considering social and political dynamics has been a compromise. But its status as a public institution also meant that the national government was able to invest in the system and help offset the debt burden. As a result, PDAM has been able to extend the service coverage to a 98 per cent of the city, boasting the highest service of any Indonesian city.

While population growth, decreasing river water quality and competition over water resources with neighbouring municipalities mean that Banjarmasin's PDAM will continue to face challenges, the increase in supply coverage from 50 to 98 per cent represents a significant achievement.[2] This can be attributed to effective management and leadership of the water company, and to its leader's ability to foster good relations, not only with the mayor but also with the city legislature and with national government agencies that could finance water projects.

2.3   Case 2: Village initiatives to meet water demand, in Yosowilangun Kelurahan (sub-sub-district or village), Gresik (Kebupaten)

Peri-urban growth in many Indonesian cities is occurring at an explosive pace and this creates high demand for public services like water (McKinsey, 2012). While urban centres have more capacity for responding to these needs, in fringe municipalities that are less well equipped, urban development is often an individual or community pursuit. Gresik is a growing district that lies in the metropolitan area of Surabaya; as its population increases, the PDAM district-run water company has struggled to provide consistent and quality water to its villages. This case looks at the households in the Manyar sub-district, where 61 per cent of the land consists of salt ponds for fish farming, and population has grown at 2.89 per cent compared to the Indonesian rate of 1.89 per cent (Badan Pusat Statistik, 2010). Manyar's rapid growth is turning the agriculturally based economy and the villages into urban neighbourhoods.

The rapidly expanding growth in Gresik has created a supply challenge for PDAM, because laying pipes and building treatment plants to service new populations requires investment. Usually PDAM prefers to supply water only to housing estates where developers are willing to install piping (World Bank, 2006). As a result, villages are often wait-listed for years and have to subsist with groundwater wells or by purchasing water from vendors. Sometimes they will connect to PDAM customers and pay a high fee for the service.

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2   *While the figure of 98 per cent coverage for the city includes the provision of water to informal settlements it should be noted that many of the poorest communities received subsidised water for free through water kiosks. The poorest communities of the city were not all capable of paying the cost increases that came with the extension of the system.*

Yosowilangun, in Manyar sub-district, was once a rural village but has become increasingly urbanised as the Surabaya metropolitan area has spread. New housing developments sprouting up around Yosowilangun have diminished its water supply: first the stream that supplied the community dried up, and then the communal well was unable to support demand (Spencer, 2010). Small-scale private providers stepped in to create deep-water wells, but have had to go increasingly deeper in order to reach groundwater reserves. In 2004, the Yosowilangun village government built a deep-well system and thus became the largest provider in the village, supplying about 120 households (Spencer, 2010). Initially, the village government sought funds from the Manyar sub-district government for digging but claimed that the bureaucracy was too slow and progressed independently; there was little outside financial support. When the well was completed, the village government effectively served as a water provider, dealing with maintenance and shortages. Recently, it has discussed installing meters to be paid for by residents to regulate water use and generate revenue.

In one RT of Yosowilangun, a forward-thinking RT leader convinced residents to dig their own well because the existing service was insufficient and proposed a cost-sharing loan to pay for a 107-metre deep well, pump and community piping. The community took out a loan collectively and was successful in paying back the instalments by amassing the US$75 fee for service connection and monthly tariff. Additional customers were not charged a connection fee (as they would be with PDAM) but instead paid for access, as well as for their household pipes and the monthly tariff. This reduced the overhead cost for new households and has allowed the network to expand quickly. There are currently 59 households connected.

These two cases in Gresik indicate that a lack of capacity in formal state institutions to supply water creates the need for informal service mechanisms, drawing on the resourcefulness of local communities. Community-level leaders have stepped into this gap – people who are able to organise residents into successful providers, despite lacking technical abilities. However, there are many limitations to such an approach. For example, villagers are unfamiliar with the technical services necessary for water provision and are not easily connected to surrounding areas, or to higher levels of authority that might better manage resources and potential conflicts. The village-level structures of governance are ad-hoc, and with growing demand it is unclear whether they will be able to respond to increasing levels of conflict and resource management challenges. While such a community-led approach offers us some lessons about the importance of participatory forms of urban service provisions that satisfy immediate needs and reduce vulnerability in the short term, it is unlikely that it can offer a systemic solution to vulnerability issues for large urban areas. It lacks the state's technical capacity to manage water as a resource and also the financial capacity needed to create a sustainable service for the long term.

2.4   Case 3: PDAM and public works find new ways to extend service in several Rukun Warga or RWs, Solo

In Solo there are various examples of the ways in which city departments, such as the Department of Public Works, and PDAM, have extended water supply services, often employing community participation as a means of bridging service delivery gaps to dense unplanned settlements that have arisen as a result of growth. Below are cases from two different neighbourhoods, Mojosongo and Semanggi, which demonstrate non-traditional water supply mechanisms in practice.

Mojosongo is a very large neighbourhood in the north of Solo where most residents are newcomers who have been resettled there from flood-prone areas of the city. Mojosongo is a hilly and dry area of Solo, making it a difficult place to access water. While in the west of Mojosongo, PDAM service reaches as high as 76 per cent thanks to a large national housing project, in the rest of the neighbourhood the water company offers a much more limited service. It is not possible to create surface water wells with such dry soil, so deep-water wells have been dug here by the Department of Public Works and are self-managed by the community. There are five self-managed deep-water wells servicing an estimated 5 per cent of the population (approximately 700 households), largely in resettlement areas.

Self-management of deep-water wells in Ngemplak Sutan, RW 29, Mojosongo
RW 29 is a resettlement community, recently created to house families that were moved from different parts of the city during urban projects, such as the relocation of riverbank dwellers from areas of risk. This community uses deep-water wells dug by the Department of Public Works. The management of this system is different than in areas serviced byPDAM

because the community is entirely responsible for the wells' management, installation of pipe connections, determining and regulating costs and ensuring proper maintenance. In RW 29 the community has regulated the price for installation, and charges for water use. This money is then used to service electricity bills for the pump and maintenance fees (Widodo, personal interview).

Community-mediated management in Mipitan, RW 29, RT 06, Mojosongo

RW 29 also hosts a different kind of water supply system that arose from community initiative: the Social Master Meter. Because this RT could not access the deep-water well supply, it approached PDAM to request a connection. PDAM could extend pipes to the community but would require payments be made collectively and the management service be conducted by residents. For this, a 'Social Master Meter' was installed and individual meters connected to it to gauge consumption in each house. The community leader is responsible for serving as an intermediary in the community, collecting money based on the meter readings (Sukir, personal interview). PDAM thus acts as an interface with the community as a collective entity, rather than serving individuals. This system ensures a high level of self-organisation and supports a sense of community in a newly established resettlement area.

Community-collection and management in RW 23, Semanggi

Semanggi is a high density, urban poor neighbourhood located in the southeast of Solo along the banks of the Bengawan River, which is vulnerable to flooding and has only been settled in recent years due to migrant influx. There are three main types of water supply that people use in Semanggi: private wells, PDAM piped water, and public hydrants. Public hydrants are stand-alone reservoirs or tanks that fill up containers and buckets for residents to use domestically. Public hydrants are serviced by PDAM and connected to the public mains.

PDAM has worked with community residents, who feel that they need PDAM assistance, because 'the ground water here is salty and a bit polluted', on an innovative approach to implementing a community-managed water supply system (Supriyanto, personal interview). In RW 23, households access water from the communal hydrant and between them collect the money to pay the monthly fees. To do this they created a residents water committee and every month one person per RT is required, every day, to collect the money from the other RTs. This responsibility rotates between the five RTs of RW 23. They have a target amount of around US$5 that must be collected daily, and have fixed prices for different units of container. If the money collected exceeds the target, the extra goes towards maintenance and other social activities in the RT such as *gotong royong*[3] and donations to the sick and to families where a member has died.

2.5   Conclusions about provision of water

Overcoming limitations of water supply and management to extend service and ensure its sustainability can serve to indicate how to build resilience of infrastructure networks. The different cases can help us consider the various ways in which state institutions, such as PDAM, and community organisations have been able to adapt to the situation and overcome challenges. There are three main lessons from these cases about water provision:

1   **When they are flexible, state institutions like PDAM can collaborate with citizens and community organisations and adapt to their needs and limitations.** In a few of these cases, service coverage was increased by PDAM sharing some of the burden of supply with community members and organisations, thus demonstrating the characteristic of resourcefulness. The key to creating a shared management arrangement was PDAM's ability to be flexible and work with the community, recognising its limitations, but also acknowledging what it could do. In Solo, PDAM was able to extend water to households that were previously marginalised from the service by instituting individual agreements with RTs about how to manage payment for water hydrants. The addition of a community water source with joint management is an example of strengthening resilience by offering a variety of options to accommodate people living under different conditions, thereby expanding the supply network.

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3   *Gotong royong is a Javanese term that literally means 'hold together'. The term refers to any activity in a community that is implemented by all members of that community in collaboration.*

2   **Shared management responsibilities work best when state institutions can support the community by offering technical support.** For a resilient and inclusive service to be supplied, a partnership agreement must establish appropriate and feasible responsibilities for the community and PDAM. One aspect of resourcefulness as a component of resilience is this delegation of responsibility in a way that makes use of the strengths of both the community and the water company, and also supports institutional networks in the process (Da Silva *et al.,* 2012). The social capacity of the community is well suited to tasks like money collection and conflict resolution while PDAM is best suited to the engineering challenges of water supply. When both the community and public institutions demonstrate flexibility and a desire to find workable solutions they can assume complementary roles based on which tasks they are most able to carry out efficiently.

3   **Those processes that are consultative and transparent generally lead to better outcomes, which can build resilience.** State institutions are much more likely to succeed when they can demonstrate willingness to communicate transparently and to find institutional arrangements that may be creative and innovative. In Banjarmasin, the PDAM found ways to consult the public on its decision to raise tariffs and sought to build awareness among local parliament members; this was necessary to find a way for it to reduce its debt and extend service to more customers. In Solo, PDAM shared responsibilities with the Department of Public Works, so that relocated communities could have access to water, despite PDAM's service limitations; both the water company and the Public Works Department also demonstrated an openness and willingness to develop solutions with community groups that worked best for them. Thus, when state institutions are responsive, engaging in dialogue and communicating with citizens to find solutions, there is a greater chance that policies can be developed that better understand the issues and mobilise the necessary resources to solve them. One institutional challenge that PDAM faces in these examples as a result of decentralisation is how to retain control and maintain integrity of the service while involving more non-state actors in its management. Though these cases demonstrate that infrastructure networks can benefit from strengthened institutional networks, it is not yet clear what the ideal median might be to efficiently balance community support with technical management.

3   Vulnerable riverbank settlements

3.1   Background

One of the urgent issues related to climate change that Indonesian cities are facing is vulnerability reduction of poor settlements located along urban waterways. These are vulnerable not only from a physical perspective – increasing volume of rainfall and shortened seasons mean that flooding is becoming more frequent and severe – but are also socially vulnerable.

The struggle of urban riverbank communities across Indonesia is part of a struggle for land and their right to be recognised as legitimate citizens of the cities. For the authorities, full recognition of rights is often only conferred to those citizens with local documents (Kartu Tanda Penduduk or KTP), and those dwellings with land tenure and building permits. Poor migrants who occupy land may not be considered legitimate city residents, regardless of how long they have lived in the city, and despite having legal papers of a neighbouring municipality.

Riverbanks become a site for migrant poor and urban labourers because the land belongs to the state and is usually easier to occupy than private land. These settlements rarely have public services, are more difficult to consolidate, and thus can concentrate poverty because of the relative security of tenure. The policy responses of local governments can be instructive in terms of climate change resilience because the flooding of riverbank settlements is such an urgent issue. In many cases, relocation of those settlements is deemed necessary, especially where flooding is seasonal and can cause serious damage to houses and claim human life.[4] The decision to relocate communities demands sensitivity, as such a process in Indonesia brings to mind memories of government use of force. Hadi Sutrismo, the head of the community working group explains, 'In the beginning, people rejected the relocation programme because they are traumatised from the Suharto regime when evictions were common and there was no compensation' (personal interview). As such, local governments have to recognise the burden of history and attempt to engage with communities to build trust, dialogue and understanding.

A case from Solo, Central Java, demonstrates a situation in which relocation was well handled by local government and where the displaced population was generally satisfied with the outcome (Sukir, Hendi, personal interviews). Understanding how the government introduced and implemented this policy can help shed light on the different facets and approaches necessary to ensure that this type of process is successful. The other case, however, presents mixed results. In Surabaya, East Java, conflicting city and provincial policies resulted in community resistance; the community is still vulnerable and the government unsure how to proceed.

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4   *In the 2007 floods in Solo, 6,368 houses were affected, 25 per cent of them located on riverbanks (Government of Surakarta, 2012).*

3.2   Case 4: Strenkali Riverbank Movement, Surabaya (City)

Paguyuban Warga Strenkali (PWS), or the Strenkali People's Movement, is a civil society organisation made up of various community groups and residents' associations united by their desire to continue living along the banks of the Wonokromo River in the city of Surabaya, East Java. Their story is one of resistance and struggle as they have repeatedly been warned of eviction from their homes by local government due to the threat of flooding and pollution supposedly caused by the families. These communities are mostly made up of poor migrants to the city but occupation of the riverbanks has been ongoing, in many cases for over 20 years. The experience described below is a story in two parts: the first of successful negotiation and collaboration between citizens' groups and government; the second of a stand-off and miscommunication. The case documents the community's struggle and interaction with government, and demonstrates a cautionary example of how governments may mismanage relations with such riverbank communities.

In May 2002, the Municipal Government of Surabaya sent an eviction notice to the people of the Bratang community, one of six riverbank communities that have settled along the Wonokromo River. The riverbank communities were claimed to have contributed to the pollution of the river and that their waste was reducing the river's capacity, resulting in rising water levels and potential flooding. As a result of this notice, the communities along the river who shared similar locations and a lack of legal tenure, decided to organise themselves into the civil society organisation PWS. Emboldened by contacts with other NGOs, they approached the Minister of Public Works about the possibility of developing an alternative solution to eviction, and were successful in setting up a joint-body with a university and an NGO to study possible options (Some *et al.,* 2009). The result of the study was heralded as a breakthrough, and the report was disseminated to the provincial parliament and the community at large as it put forward an alternative scheme that could limit pollution and avoid the relocation of the community.

While the municipal government wanted to enforce a national legislation stipulating that dwellings be located 12–15 metres back from the water's edge, the new report from PWS proposed moving the settlement back 3–5 metres. This would permit the construction of an access road, the installation of septic tanks to prevent river pollution, and tree planting efforts to protect the riverbanks against erosion. The provincial parliament (under whose jurisdiction the management of riverbank areas fell) reviewed both plans and concluded that the social costs of eviction would be too high, and supported the 'people's model,' the report that PWS had promoted. As a result, the provincial parliament in October 2007 drafted a by-law, or *Perdah*, to govern the riverbank settlements. This was an encouraging step for the riverbank community and something of an exception in terms of community collaboration with provincial government. As Whisnu Sakti Buana, a member of the provincial government said:

> There was a special difficulty in trying to come to an agreement between the government and the villagers, but we had faith it could happen if we directly involved the villagers. This is the first time in Indonesia that we made a regulation with the villagers. This is the first time we made a regulation with three parties – it is usually just government and parliament.

(Some *et al.*, 2009)

The new policy stipulated that the community enact physical changes to their settlements, most significantly withdrawing their homes from the water's edge and installing sanitation, but it also required the government to dredge the river and implement other river maintenance measures. And while this served to bring the community together in the spirit of joint action, or *gotong royong*, action was not so forthcoming from the government side (Gatot Subroto, personal interview). In fact the city government was never so convinced about the *Perdah* and in April 2009 issued another call for eviction, based upon an earlier regulation stipulating a building permit; as far as the city government matter was concerned, that this was a matter for it, not the provincial government. Despite further attempts to bring different stakeholders to the table, the city government held firm, and continued to press for the eviction of the communities. In April 2009 a meeting brought together the Provincial Department of Water, NGOs and local government officials, in an attempt to overturn the city government's notice. But days later, in May 2009, the city government dismissed this attempt and ignored requests from the community and the provincial legislature.

While the current mayor, Rismaharini, is actually open to supporting PWS and the riverbank community (she has agreed, for instance, that they have the right to occupy the land, but not be granted outright tenure), the community still feel uneasy about their future: 'We have *gotong royong* for improving our environment, and we have spent our own money. Rismaharini recognised that, but we still feel uncertain. When will it be over? We've been struggling for more than 10 years and we are tired' (Barata Jaya Community, focus group discussion). This constant siege mentality and the inconsistency of the political and legal situation has meant that development efforts for these communities have not progressed continuously over the last 10 years and underdevelopment persists, demonstrating challenges that may hamper the progress of institutional networks necessary in urban systems.

3.3   Case 5: Relocation programme, Solo (City)

In November 2007, seasonal rains brought large-scale flooding to the Bengawan River flowing through Solo, resulting in damage to 6,368 homes (Government of Surakarta, 2012). Given the high cost of providing emergency services and the more than US$100,000 in damages caused by the flooding, Solo's mayor, Joko Widodo, decided that it was best to relocate those in areas of high risk to safer locations. This relocation programme has been considered a success given that to date over 1,200 houses have been relocated and those families that have moved generally feel satisfied with their new locality and living conditions (Hasta Gunawan, personal interview).

Relocation was a complicated policy for the Solo government to implement because settlers were reluctant to sacrifice their often strategic locations for ones at a distance from their jobs. In addition, many were not Solo residents but migrants from outside the city. Mayor Widodo and his government employed a people-centred approach, referred to as *Nguwungke Uwong*,[5] to engage with the households and present his plan for them. Rather than call members of the community to his offices, Mayor Widodo went to meet the riverbank residents in neighbourhood community centres, attending 24 different meetings (Hendi, personal interview). Through such extensive outreach he listened to locals and also set up a multi-tiered community engagement approach (at the city, neighbourhood and sub-neighbourhood levels), forming working groups. These working groups consisted of community representatives who raised awareness by collecting and disseminating information, verifying community data, looking for alternative lots of land, and presenting their opinions to government. This can be regarded as an effort to strengthen institutional networks locally.

Anecdotally, we know that the mayor used a similar approach in a previous negotiation with informal traders who had occupied central areas of the city, meeting with them on 54 different occasions. By meeting with the riverbank settlers at their level, as he did with the traders, often sitting and eating with them and talking to them in a plain and helpful manner, he was able to pave the way for negotiation.

Eventually a standardised compensation measure was agreed upon in which households would be given cash grants to buy new land (equivalent to US$1,200), build new houses (US$800) and also to build a shared public infrastructure (US$150) (Government of Surakarta, 2012). Community members were encouraged to find their own plots and negotiate the price themselves with the owners, and were encouraged to create groups of their neighbours and move together. Moving together, they were able to maintain a sense of continuity and social stability. Perhaps the most significant offer made by the city government was the guarantee that people would be awarded land tenure for their new plots, which persuaded them that a move would grant them recognition as legal owners of the land. The local government also sought to persuade riverbank dwellers by creating an 'urban forest', a public park that would occupy the low-lying riverbank area. The relocation policy thus formed part of a broader strategy to reduce vulnerability, and increase public green spaces, and also help to develop other parts of the city that hitherto had been undeveloped.

The relocation of these communities over five years has resulted in the successful transfer of 70 per cent of the 1,571 families considered at highest risk. The scheme is well regarded by those who were relocated because they were able to move to communities not too far from where they once lived, with adequate access to services and public amenities,

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5   *Nguwungke Uwong is a Javanese term literally meaning 'humanise humans' and is understood as a way of treating all people, especially the poor, with dignity and respect.*

and they have been able to acquire the vital asset of land tenure. There were, however, those who preferred to remain in areas of risk, believing that the compensation was insufficient. But, importantly, all families felt that they had a choice. According to Mr. Hendi, the Sub-working group leader in Pucang Mojo, 'This is not eviction or coercion because Jokowi [Mayor Widodo] said to us, "it is up to you all to choose to move… or stay with the danger of flooding"' (Hendi, personal interview). The new 'urban forest' park has been created along the Bengawan River, providing a public green space amenity to citizens and reducing the vulnerability of those families that continue to inhabit the exposed riverbanks.

3.4 Conclusions about vulnerable riverbank settlements

Given the prevalence of flooding in Indonesian cities, and the opportunities that decentralised policymaking can yield in terms of introducing progressive vulnerability reduction policies, these two cases offer some interesting lessons about the values of citizenship rights, community engagement and the confusing situation of overlapping political jurisdictions, and hence insight into how building institutional networks (or lack thereof) may influence the wellbeing of city residents. It should be added that, while the cities of Solo and Surabaya both chose to adopt relocation strategies, this is not always the best or only option: in many instances, residents accept and have adopted means of living with a degree of risk. In such cases, relocation may increase the vulnerability of households in other ways, for example by breaking social ties and moving people away from their sources of income.

1   **When socially vulnerable communities are respected as legal citizens, physical vulnerability can be reduced through dialogue and engagement.** One of the ways in which the mayor of Solo succeeded in relocating riverbank communities who had previously felt disenfranchised was to offer them secure land tenure. This is a primary concern of the untitled poor for whom land tenure is essential for access to a whole range of other rights and services. The prospect of moving to another location, even one further away, therefore represented the high return of becoming legalized citizens. The mayor also made a point of recognising those people who had migrated from a different city or municipality and thus were not Solo citizens, welcoming them as contributors to the economy of Solo. This more open recognition of citizenship is different from the attitude adopted by most mayors of Indonesian cities and is a clear example of resilience due to resourcefulness (Da Silva, *et al.,* 2012), as well as demonstrating the important role that local champions can play in driving a particular agenda forward. Through the adoption of a more flexible interpretation of citizenship, the mayor was able to open the door to several alternative solutions by demonstrating a willingness to adapt to the situation, building a basis for productive institutional networks.

    In Surabaya, the new mayor, Rismaharini, is beginning to recognise the existence and legitimacy of the urban poor by offering to expedite the process of legalising migrant citizens to receive city residency and land occupancy rights (Pak Warsito, personal interview). By doing so, she is recognising the importance of dealing with the poor on more equal terms. If an inflexible policy of marginalisation is pursued, then the results would likely be resistance and further marginalisation, which would decrease the possibility of a favourable outcome, with implications for the vulnerability of local populations and for institutional networks within the city.

2   **Mayors can build better relationships with their citizens by seeking to establish trust and extend outreach.** In both Solo and Surabaya, the legacy of years of authoritarian government has left the riverbank communities feeling marginalised and victimised. In order to re-engage with communities, each mayor adopted a different approach. In Solo, Mayor Widodo recognised the need to overcome a lack of trust and skepticism felt by communities more used to harsh treatment than consultation and negotiation. The mayor's extensive engagement with the community and his respectful communication strategies recognised the necessity of not only offering terms, but doing so on a more equal footing, meaning that that the community was won over, and trust established, leading to the success of the Solo relocation process. It required patience, outreach and a dedication to rebuilding relationships, all of which proved to be criteria for negotiation and which contribute to wellbeing within an urban system (Da Silva *et al.,* 2012). As in the example of PDAM–community consultations on water in Banjarmasin, the establishment of open and transparent dialogue is crucial to building resilience to climate change impacts by creating responsive and resourceful institutional networks.

The example of Solo contrasts with the evolving process experienced in Surabaya, where dialogue has yet to establish trust between government and citizens. Today, community leaders exhibit a mixture of antagonism towards and distrust of city government when they discuss the city's 2009 decision to evict them, contradicting the 2006–2007 city by-law. The lack of community engagement or consultation in 2009 led to confusion and a feeling of betrayal. More information, and the willingness of both parties to engage in open dialogue, would very likely have led to a better outcome than what has been achieved so far.

3   **Governments and communities find greater success when they seek flexible solutions to relocation processes, are prepared to compromise, and integrate community ideas**. Conversely, when local governments prescribe only one possible outcome, there is less chance that the sides will reach an agreement. In the Solo and Surabaya cases, significant gains were made when riverbank communities were involved in finding creative solutions. In Solo, the government recognised that it was best to allow the community members themselves to choose where they wanted to move to and with whom. Significantly, this demonstrates an open-minded approach by government not to impose a pre-formulated solution and expect that everyone would follow. Increasing the number of options satisfied the preferences of different stakeholders in the relocation process. Community members themselves were then empowered, by a cash grant transfer, to make their own decision and find the land and the group size that best suited their needs. In this case a willingness to adopt flexible solutions and being resourceful in the way they were implemented has contributed to reducing the vulnerability of at-risk populations.

In the Surabaya case we see the conflict between the willingness of provincial government to be flexible and to understand the situation of the riverbank settlements, and the city government's projected rigidness and inflexibility. The community refused to accept the city government's position, protesting, sometimes violently – government inflexibility can lead to community inflexibility too.

It is instructive that civil society organisations and NGOs played key roles in both processes to help mobilise community participation and raise awareness. These organisations can provide communities with technical and legal support that helps them to better negotiate outcomes. Positive institutional networks, where possible, can therefore contribute to more resilient housing systems.

4   **Outcomes of relocation processes are heavily influenced by local political processes.** The political context of each city is relevant when we consider how the policies were formulated and how they were implemented. In Solo, the implementation of the riverbank resettlement policy despite opposition from members of the community and legislature essentially passed without too much difficulty. Mayor Widodo's success in implementing the vendor relocation programme resulted in the public, and his own government staff, being able to trust him.

However, the Surabaya case demonstrates a different set of political circumstances, one in which city government and provincial government were essentially at odds with one another. At the time (2008–2010) the Governor was from the Partai Demokrat and Mayor Bambang Dwi Hartono was from the PDIP party. Because of the overlap in city and provincial jurisdiction as a result of decentralisation policies, the provincial government was able to influence the policies of the city government, often in contradiction. Although decentralisation can create opportunities for flexibility (as in the case of PDAM and water supply in Solo), it also brings about the possibility of competing institutional agendas, as each level of government responds differently to climate change issues. The result in Surabaya was a disjointed set of actions that resulted in resentment at both levels of government. Compromise, such an important factor in determining whether policies can be implemented effectively, is heavily influenced by the political landscape.

4   Public information systems

4.1   Background

Resilience can be increased in many ways. One that has been widely accepted is making information accessible to the public to support decision-making and to supply general information, for example about issues of vulnerability and public services. Increasing access to information can support households, communities and entire cities by empowering them to make more informed decisions about planning and respond to changing environments. Knowledge networks are therefore a component of resilient urban systems, alongside institutional and infrastructure networks (da Silva *et al.,* 2012).

Two cases in Central Java demonstrate how information systems have been designed to serve communities by supplying information that directly corresponds to their needs. In the Jalin Merapi case, the information supports vulnerability reduction since it serves as an early warning system and a disaster response system for rural communities close to the Merapi volcano, the most active volcano in Indonesia. The second case is from Solo where an NGO-initiated project created a participatory, crowdsourced mapping programme that gathered data about public services and demography from each of the city's 51 neighbourhoods. The two cases are similar in that they are civil society initiatives that offer insight as to how information can best be gathered and communicated in ways that can be used to build resilience.

4.2   Case 6: Jalin Merapi, Boyolali, Klaten, Magelang and Sleman Kebupatens, Yogyakarta Province

Following the 2006 Merapi eruptions, the villagers in the surrounding area most affected decided that they needed an effective information system. Out of this need was born the Jalin Merapi, or Jaringan Informasi Lingkar Merapi (Merapi Information Network Circle), a civic society-initiated project. Jalin Merapi links community members so that they can send and receive information about volcanic activity as it happens. The system serves as both an early warning system and a post-disaster information system. Its effectiveness is clear when the impact of the 2006 and 2010 eruptions are compared.

In 2006 the Merapi volcano erupted and displaced villagers in the area nearby. Despite the existence of a national government observation station (BNPB) near the volcano, no information was initially made available to villagers nearby about volcanic activity. The observation station data went to Jakarta before being re-routed, and could not be distributed quickly enough to the villagers in this steep rural area – people could only watch national television news to be informed of the situation. What information the government put out about the evolving crisis the community members felt was self-serving, designed to present a positive picture of its response, but did little to serve them.[6] One example of the deep sense of mistrust that the government generated followed the evacuation of the area; the villagers were told by the government

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6   *This sentiment was powerfully summed up by Sukiman, the Coordinator of Jalin Merapi, in a personal interview: 'The national government always comes to disaster areas requesting a big ceremony and an expensive lunch. This has hurt our people because the government not have a sense of the disaster.'*

that they could move back from the refugee camps to their homes, but when they did so it turned out the signal was premature and the biggest eruptions cost many of them their lives.

The story was very different in 2010, after the Jalin Merapi network was established and could coordinate the dissemination of information to the communities. Despite the much greater eruptions the abundance of information made available gave sufficient warning and resulted in limited damage considering the scale of the disaster (Sukiman, personal interview). The ability to learn from the 2006 experience makes up an element of the local communities' resilience.

The Jalin Merapi network collects information through crowdsourcing and connects people from the 62 villages that surround the Merapi volcano using mobile phones, radios, walkie-talkies and even social media such as Twitter and Facebook. In the event that the Merapi volcano threatens to erupt again, the villagers will notify each other and feed information to the three community radio stations, which will constantly update the situation. The information gathered from these different sources can be verified and actions coordinated in real time. Other support for the system comes from the NGOs CRI (Combine Resources Institute) and Pasag Merapi, which are helping to train villagers in the use of mobiles and walkie-talkies, disaster management and evacuation techniques, and in organising themselves so that they will be better able to coordinate their actions in an emergency. Given the rapidly shifting situation that volcanic activity presents, the system not only offers interactivity but is quicker than the government radio service.

One of the biggest challenges that Merapi communities face in the event of an eruption is the need to save property and assets, such as cattle. In 2010, information channels through Jalin Merapi spread news of the evacuation to member of an off-road vehicle club who were able to rescue villagers and help bring their cattle to safety. The system also enabled coordination of transit sites, the delivery of logistics, and the deployment of emergency workers in locating trapped villagers.

Jalin Merapi was created to disseminate information to villagers in the event of an emergency, but it has had a much wider impact. Community members, NGOs and the radio stations have helped raise awareness for the need to plant trees in some of the most devastated areas and to build further village capacity. The network has significantly expanded and it seems that its scattered and informal organisation has helped it to grow organically (Sinam, personal interview). Now there are five community radio stations involved, as well as a number of NGOs and universities that contribute to the network.

4.3 Case 7: Solo Kota Kita, Solo City

Solo Kota Kita (Our City Solo), is a community information system that makes neighbourhood-level information available to citizens for each of the city's 51 neighbourhoods. The project was designed and implemented by a local NGO called Yaysan Kota Kita, or Our City Foundation. The information collected by Solo Kota Kita is designed to support the annual participatory budgeting process, the musrenbang. The government in 2002 introduced the musrenbang process in order to allocate small neighbourhood grants, in the region of US$10,000 – 15,000 a year, through a democratic deliberation process at the Kelurahan level. This is one of the only ways that citizens in Solo can be involved in discussing and prioritising local investments for neighbourhood development. It can help reduce vulnerability by providing information about community needs and helping to build consensus around these priorities by facilitating discussion, at the same time providing an avenue for the resourcefulness of local communities.

Solo Kota Kita presents information in the form of a 'Mini Atlas', or neighbourhood profile, which helps citizens understand the levels of public services and identify where issues exist in their communities. The Mini Atlases are designed to make information easy to understand by unskilled or illiterate people. The Mini Atlases, which are poster sized and colourful, are displayed in city community centres and information kiosks as well as being distributed to neighbourhood organisations and leaders. In addition, Solo Kota Kita makes the information available to the public online,[7] adding more information about city public services and conditions. So little local information is provided by the government, the Mini Atlases are a valuable resource.

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7   See http://solokotakita.org/en/ for an example Mini Atlas.

The information gathered and presented in each of the 51 neighbourhoodsis collected through a crowdsourcing technique in which community leaders from each of the city's nearly 3,000 RT units are asked to submit basic information about their surroundings – the number of households in the RT, for example; the number of households that use PDAM water; the number of children not attending school; who has land tenure. All this is put into a database and mapped using GIS (Geographic Information System). Where available, official government data are also utilised and mapped, such as the number of households receiving poverty subsidies. In general, government data are not made available at the RT and RW levels, so the Solo Kota Kita project collects much of the data itself.

Solo Kota Kita is largely a civil society initiative, but important early steps were supported by the mayor of Solo, Joko Widodo, who helped to provide the initial credibility that allowed the project to get on its feet. Official support from the mayor paved the way for collaboration with different levels of local government, including the neighbourhood leaders. While funding has largely come from development aid organisations such as USAID, UN Habitat and the Ford Foundation, Solo Kota Kita has also been locally sponsored and used by the city government to support policy design and governance projects. In 2010, a regulation was passed stating that musrenbang meetings should utilise Mini Atlases to facilitate discussion, and other poverty reduction policies have used the database and maps to focus on impoverished areas of the city.

> I think community data should be accessible not just to city government, but to residents, who also need to know what is going on in their RT and neighbourhood. During musrenbang, people can use data to understand the real conditions in their neighbourhoods. What they propose in musrenbang should be based on real needs and actual conditions – not just speculation. Information is absolutely important.
>
> (Mayor Joko Widodo, personal interview)

Transparency and accountability have become the hallmarks of Mayor Widodo's government in Solo and the Solo Kota Kita project serves to support his initiative by ensuring that relevant information about this city is made accessible and comprehensible to the public.

4.4 Conclusions about community information systems

Building resilience often depends upon providing access to information that can help citizens make educated decisions about ways to avoid harm and improve their own resilience through knowledge networks. This is equally true for city governments, which can use information to improve the quality of planning and the design of resilience building policies, such as providing urban poor neighbourhoods with needed basic services or implementing policies that reduce their exposure to risk. The two cases of Jalin Merapi and Solo Kota Kita provide source material for reflecting on emerging alternatives for gathering information so that it is relevant to meeting the needs of those who require it.

1   **Crowdsourced information gathering is quicker than one-way, government-based information sources, is more easily understood and is more up to date.** The success of these two cases seems to be linked to the public's expressed need for more relevant information than what was available, namely government data or news. Crowdsourcing, which adopts a more participatory and inclusive approach to gathering and sharing information, seems ideal for both community data gathering and also emergency situations, as are new media such as Facebook and Twitter. Social networking channels are more accurate because they provide a greater variety of viewpoints. Because government channels suffer bureaucratic delays or provide data that are simply not relevant, alternative forms of collecting and disseminating information have sprung up quickly and proven popular. The diverse availability of responses to a problem increases the likelihood that demands for information can be met, increasing capacity for dealing with emergency situations (Twigg, 2007).

A potential danger of crowdsourcing is that the sheer amount of information available can obscure what is relevant and credible, and what is not. In addition, there is still only limited Internet access in village areas and so, while different ways of accessing information increases, many are still deprived of the means for accessing it.

2 **Civil society organisations play an important role, serving as data intermediaries and are well suited to introducing technology.** Technology clearly has an important role in managing and making information accessible so that the public is able to reach better decisions and increase their resilience to climate change. Government, mired in bureaucracy and procedures, is not agile enough to meet all civic demands for information. But NGOs and civil society organisations like the community radio stations near Merapi are well suited to this role because they are smaller, often independent and more in tune with innovations. Solo Kota Kita is an example of an NGO using web-based GIS to display information that was collected by government but never mapped because it lacked the capacity to do it. NGOs and civil society organisations also have the advantage of often being more trusted than the government. After the premature government calls to evacuate in 2006, for example, the Jalin Merapi communities did not trust information that was coming from government, and claimed it was not accurate anyway. Credible, up-to-date and accurate information allows people to make better decisions and be more resilient during and after a hazardous event (Twigg, 2007). Access and use of information also allow for networks and institutions to learn and develop, and this is an important element in building resilience (Da Silva *et al.,* 2012). Both the government and civil society organisations share the need for accurate information in order to be able to improve systems and thus, in the process of developing knowledge networks, are also strengthening local institutional networks.

3 **Demand-driven availability of information is most relevant and resonant for communities**. Information not only should be *available* to people, it must also be relevant to allow them to make better decisions and respond to crises –as it did in the case of Merapi, where timely updates served to guide people to evacuation routes, informed them about risk, and helped them to locate supplies and to protect themselves and their belongings. In Solo, the city's annual participatory planning cycle, which asks citizens to prioritise their planning needs, helped to generate a need for information that would help citizens understand the issues. The dearth of publicly available information increased the value of Solo Kota Kita.

A system of gathering information from the community ensures that the needs of the community are clearly communicated, rather than when needs are stated by a secondary or tertiary source. A two-way communication network can reduce vulnerability by clearly expressing needs first-hand and giving people a sense of agency that will encourage participation in the future. The system gains strength from the responsiveness of the system, which helps address community needs more rapidly, and by being accessible to large numbers of participants, increases its robustness and utility (Twigg, 2007).

5   General conclusions that can support building resilience to climate change

This paper began by identifying a number of characteristics of resilient systems that contribute to building resilience in urban areas, and the socio-technical networks that mediate human wellbeing within an urban system and the services provided by surrounding ecosystems (Da Silva *et al.,* 2012). While the role played by institutions and governance mechanisms is pertinent to all the cases, the sets of cases were particularly relevant to infrastructure networks, institutional networks, and knowledge networks respectively. Among the resilience characteristics identified, flexibility, responsiveness, resourcefulness and a capacity to learn are especially important to the Indonesian context given the particular nature of how communities function, the governance opportunities offered by decentralisation, and the social challenges that are faced in urban areas. The case studies explored above are source material for informing ways in which cities can build climate change resilience through a variety of governance mechanisms, and they demonstrate the ways in which these characteristics are important.

One lesson to be gleaned is that while vulnerability has an obvious physical dimension, it should be addressed through a range of different dimensions. The people who are vulnerable to climate change are often the urban poor who live and work in situations of physical *and* social vulnerability; as such their needs are substantial and immediate. When seeking responses to riverbank communities living in areas of risk, for example, the cases indicate that where city leaders have presented viable alternatives, offering tangible gains, citizenship rights, housing and security, there has been a much more favourable outcome. Thus, it seems that reducing vulnerability is most successful when considering not only reducing exposure to physical hazards, but also livelihoods, citizenship issues, and housing needs. Developing knowledge networks and institutional networks can play an important part in this. Meeting the development needs of the vulnerable is thus an important feature of successful strategies, and helps provide tangible results that are meaningful to people (Forsyth and Ayres, 2009).

In the same way that providing development opportunities proves helpful in reducing vulnerability, so is adopting inclusive and participatory governance approaches. This requires city governments to be responsive, flexible and resourceful. The cases indicate that in instances when city governments adopted a more inclusive approach, involving citizens through making information publically available, engaging in community outreach, and even taking steps to legalise migrants, conditions were created that led to more successful resilience outcomes. This may be because when people believe their needs are being represented they are generally more satisfied with the outcomes. Alternatively, it may be that a greater diversity of needs being heard allows more solutions to be generated, or a combination of the two. Greater inclusion may also build community–government trust, which provides the governance foundations for resilience to be strengthened. In Banjarmasin, PDAM was able to increase water supply because it was open and transparent in its appeals for increased tariffs. It is likely that this openness generated a sense of trust that allowed reforms to take place, and the service to be improved. In the case of riverbank housing relocation in Solo, Mayor Widodo's ability to create an inclusive process allowing non-residents to be considered citizens convinced people to work with the government because they felt they were not only being represented but respected. Such creative solutions can be found through a commitment to dialogue and openness, requiring city leaders to be flexible and resourceful. While local champions can therefore play a key role in driving a particular agenda (Carmin *et*

al., 2012), some questions to consider are whether the influence of Mayor Widodo's success can be emulated, whether his approach has been institutionalised, and whether there is a systematic legacy in Solo. If Mayor Rismaharini is able to follow through with her own inclusive policies, perhaps this is a sign that Mayor Widodo's example has created a model for other cities to adopt. As it stands, however, we do not know if he has left a lasting impact upon local government communication with communities in Solo or if his success is the result of a unique leadership.

Another feature of successful institutions and communities in building resilience is the capacity to adapt and display resourcefulness. The cases indicate that when governments and communities are willing to be creative in finding and adopting solutions, they display qualities that can lead to enhanced climate change resilience. For example, some governments have been willing to find flexible solutions to challenging situations, like increasing water supply to the urban poor, or are willing to make compromises in their negotiations with communities, as in offering housing grants to relocate to safer locations. Also, when governments are willing to value community and civil society initiatives, new solutions can be adopted that contribute to community resilience and empowerment, such as the use of publically available information or community crowdsourced radio to transmit information. However, challenges can arise from having too much information, a reliance on sources such as the Internet that are not yet widespread, and questionable reliability of information. The involvement of civil society organisations and other stakeholders as resources that offer technical capacity may enhance existing government and community initiatives, leading to a greater likelihood of resilience in the face of hazards.

Finally we learn that decentralisation is an important factor in creating opportunities for improved governance and resilience, but that it is not without its shortcomings. In Indonesia, the capacity of local governments to institute flexible and innovative policies that build resilience stems from decentralisation laws that empower them to find local solutions to address situations of vulnerability. Decentralisation is providing the conditions for responsive policies to be developed because new leaders can emerge who are able to use creative methods and better respond to popular needs. However, pitfalls still remain since decentralisation is not a finished process and there remain areas of confusion between different hierarchies of government that create the possibility of political impasse due to competing agendas and overlapping jurisdictions. Whether or not these cases are emblematic of what is going on throughout Indonesia would be important to research further, in order to ascertain how relevant they are. It is unlikely that decentralisation is occurring evenly throughout the country, but it is likely that local politics always affect the success of implementing policies that build resilience.

In the end, the crisis provoked by the flooding in Jakarta in February 2013 was handled through the deployment of the national military, which restored calm and provided the manpower to rescue trapped communities and return the city to normal. But the sight of the national armed forces in the streets begs the question of whether city governments in Indonesia are indeed capable of dealing with climate change impacts, and what alternative resources they may have at their disposal for responding to these large-scale and unpredictable events. The findings of this research suggest that there is an important role to be played by local governments that can adopt flexible and resourceful approaches, working closely with citizens and civil society organisations, and that are committed to dialogue and seeking compromise with urban stakeholders (Da Silva *et al.,* 2012). Resilience can be bolstered at both the neighbourhood and city scale by raising the awareness of citizens, being responsive to their needs, and including them in the formulation of local solutions that are workable and flexible. This is all the more relevant given that cities are increasingly complex and difficult places to work in, full of competing land claims, power interests, and specific contexts that offer little room for *universal* policies. Solutions that can recognise and respond to peculiarities of local contexts and political conditions will be more successful. These are often solutions that have been developed through open channels of inclusive dialogue between government and citizens, and through harnessing the opportunities presented by decentralisation.

While an urban resilience framework can aid our understanding of what characteristics contribute to building resilience in urban areas in Indonesia, it is, however, too early to determine whether such characteristics have been institutionalised or can be generalised for other cities beyond the cases cited above. The framework's emphasis on adopting flexible and participatory approaches to policymaking, the importance of resourceful and responsive city governments, rather than those adopting top-down, one-size-fits-all approaches, and valuing the contributions of civil society actors, is well suited to Indonesia's current decentralised context, and to application in an urban context. It is less clear, however, how national-level government approaches to respond to climate change hazards, such as the use of the military to respond to Jakarta's emergency flooding conditions, would fare in building local resilience, when considered through the lens of these characteristics, This would be an area for further research in order to strengthen our understanding of the socio-technical networks shaping resilient urban systems.

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