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# Urban transformations and changing patterns of local risk: lessons from the Mekong Region

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## Abstract

**Purpose** – This paper aims to fill a conceptual gap in the understanding of rapidly changing characteristics of local risk, addressing how the notion of the local might be reframed, and how opportunities for multi-scale interventions for disaster risk reduction might be identified.

**Design/methodology/approach** – The paper illustrates the significance of the systems and services on which urbanization depends – water, food, energy, transport and communications – to consider the cascading impacts at multiple scales often beyond the administrative boundaries of cities, and how vulnerabilities and risks are distributed unevenly across different groups of people.

**Findings** – The process of rapid urbanization in the Mekong Region represents a fundamental transformation of ecological landscapes, resource flows, livelihoods and demographics. In addition to the location of urbanization, it is these transformative processes and the critical dependence on inter-linked systems that shape the overall picture of urban disaster and climate vulnerability.

**Research limitations/implications** – By drawing on research and practical experience in two of the most rapidly urbanizing countries in the world, Thailand and Vietnam, the approach and findings have implications for understanding global patterns of urbanization.

**Practical implications** – The paper contributes to considering practical actions whether in terms of policy or project implementation for both the assessment of disaster and climate risk, and for actions to reduce vulnerability and promote resilience.

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This paper draws in large part on a series of vulnerability assessments conducted in Thailand and Vietnam as part of the Mekong-Building Climate Resilient Asian Cities (M-Brace) programme, with the generous support of the American people through the US Agency for International Development (USAID).



**Social implications** – The paper draws largely from social science perspectives, highlighting the dynamism of social organization in urbanizing contexts, and the implications for risk and vulnerability.

**Originality/value** – The paper draws on original research in Thailand and Vietnam that takes urbanization as the starting point for assessing vulnerability and risk.

**Keywords** Resilience, Vulnerability, Disaster risk, Urban, Climate change, Mekong

**Paper type** Conceptual paper

## 1. Introduction

This paper draws on complex systems and resilience thinking to consider the implications of urbanization for our understanding of local disaster and climate risk (Gunderson, 2001; Leach *et al.*, 2007; Tyler and Moench, 2012).

Much of the work on disasters focuses on vulnerable places, and the location of people and sectors. This has led to a focus on *hazard zones* – places defined as being exposed or vulnerable to specific kinds of disaster shocks, in which hazards are localized and event specific (Cutter *et al.*, 2008). The identification of vulnerable people has been based largely on their residence or economic activity within these hazard zones. These kinds of approaches have been hugely influential in identifying risks and responses, and as such, are hugely beneficial.

This approach towards disasters as bound by space and location has shaped approaches to the specifically local dimensions of disaster. This has led to valuable work at local organizational or administrative levels where the scope for intervention beyond more immediate community boundaries is necessarily constrained, and where there is an interest in social differentiation within a specific location. Much of the attention on local disaster and climate vulnerability, risk and adaptation has been focused at community level (Cutter *et al.*, 2008). This local-level focus also recognizes the multi-scalar dimensions of natural and social processes, but purposively focuses on location as a means for directing meaningful action. Yet, as recent experience has taught us, the complex ways in which the world is inter-connected, and the linkages between global, regional and local scales all now shape the ways in which disasters occur, and the ways in which their impacts are distributed. Even the notion of community, so long established in the notion of a shared sense of attachment to place, has become less easily applied as people move across different locations and into different social arenas, and at different scales where residence – whether in the village or neighbourhood – is increasingly differentiated (Cannon, 2008).

As the world becomes increasingly urban, there is growing attention to the risks and hazards associated with cities. The emergence of cities, and the processes of urbanization that transforms their relationships with rural landscapes and economies also transforms the nature of vulnerability to shocks and crises. It is no longer possible to regard cities solely as discreet locations, nor within cities to consider “communities” of people simply as neighbourhoods. Increasingly cities, and the people within them, are inter-linked with other cities and people, in scattered locations, often across regions or even across the globe. The ways in which people in cities organize themselves in cities is less determined by location of residence than by the nature of employment, and dynamics of class, wealth, ethnicity and gender. As such, actions for disaster risk reduction (DRR) need to be better shaped by an understanding of the process of urbanization and its implications.

In developing a conceptual approach towards urbanization and disaster risk, this paper draws on systems-centred and people-centred analytical approaches. These approaches emphasize the increasing influence of complex infrastructure and technology systems in shaping cities and urbanization, and the increasingly complex mobility of people across different social arenas and locations (Graham and Marvin, 2001). This leads us to a framing around complex systems and transformative processes that may be partly grounded in location, but also reaches far beyond.

In discussing these issues, the paper draws on the findings of a series of vulnerability assessments conducted in Thailand and Vietnam (ISET *et al.*, 2014)[1]. We begin with an overview of the implications of urbanization for disaster risk and for our understanding of what is meant by local. The paper then moves into a discussion that considers a complex systems approach to understanding urbanization. The following section discusses a people-centred approach to understanding urbanization and risk. Finally, we conclude by considering priorities for improving our understanding of risk, and future research and assessment priorities. In doing so, the paper draws on experience of implementing urban climate resilience programmes in a number of cities in Thailand and Vietnam.

## 2. The significance of urbanization for local disaster risk

There is growing global concern regarding the implications of urbanization for disaster risk and climate change impacts. Many of the transformations brought by urbanization are now well-documented and well-established. Much of the urbanization in Asia occurs in coastal, deltaic and floodplains that are already vulnerable to climate-related disasters that are expected to intensify with climate change. The pace of urbanization and population growth is such that both the proportion and absolute numbers of the world's population residing in urban areas will increase, with the equivalent of the total current global population living in cities by 2050. While much of the attention on urban climate risks has been focused on the mega-cities, the rapidly growing second-tier cities also face numerous challenges.

The location of cities remains a key variable in their overall exposure and vulnerability to disasters. Many cities are located in places that are by their nature exposed to climate-related shocks and crises, such as the deltas, coasts and river basins. Additionally, many urban centres are located along earthquake fault lines. Clearly, place remains an important aspect of their overall hazard and risk profile. Yet, the nature of urbanization also creates a new set of vulnerabilities that transcend their own location, and is shaped by these patterns of inter-linked and inter-locked systems, and the ways in which urbanization transforms ecological landscapes and social relations.

We approach urbanization from the perspective of complex social ecological systems (Leach *et al.*, 2007), highlighting the inter-linkages and inter-dependencies of biological, physical and social processes (Adger *et al.*, 2008; Holling, 1978). In doing so, we draw on a climate resilience framework that has been applied in city-level programmes in Asia (Tyler and Moench, 2012) and applied in conducting vulnerability assessments. From this perspective, cities are not only inter-linked but also inter-locked such that shocks in one location at one point of systems can have rippling and cascading impacts elsewhere (Friend and Moench, 2013).

Cities can also be seen as hubs within networks of resources, infrastructure and technologies, creating linkages across vast geographies. The dependence on physical

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infrastructure, technologies and complex institutions is a critical feature of the way that these systems are created and maintained, and the services that they generate are accessed and distributed. Indeed “infrastructure are the key technological and physical assets of modern cities” (Graham and Marvin, 2001), increasingly linked across regional and global scales as resources, capital, labour and information move on transport and communication infrastructure between and across urban areas (Friend and Moench, 2013) or to what is also referred to as a “pan-urbanism” (Moris, 2014). Urbanization creates a critical dependence on water, food, energy, shelter, waste, communications and transport systems that are increasingly networked, multi-scale and inter-linked and inter-locked. The impacts of shocks and crises in one part of the world can be felt in different places and different times, mediated through complex livelihood patterns, creating “nested and networked vulnerabilities” (Adger *et al.*, 2008; Eakin *et al.*, 2009).

Cities, and the ways in which they are designed and built and their systems and services accessed and distributed, are fiercely contested (Swyngedouw and Heynen, 2003). Cities are often associated with a high degree of inequality in access to assets and benefits, shaped by political and economic structures and processes. Vulnerability and the impacts of shocks and crises are not evenly distributed among different groups of people (Friend and Moench, 2013).

The extent to which cities exist beyond their physical location is partly revealed by the increasingly blurred boundaries between cities and rural hinterlands. Distinctions between rural and urban are manifested in different ways; for example, members of farming households often are employed at certain times of the year (or more permanently) in urban economic sectors, with remittances flowing between the two locations (McKay, 2005). This is also revealed in the ways in which the goods and services on which urban populations depend, such as water and food, are part of global production and distribution networks, themselves sustained by global transport and communications technology and infrastructure (Friend and Moench, 2013).

Shifting demographics are an important part of patterns of urbanization. The growth of cities is directly tied to the growth in population and movements of people, but also on the constraints and pressures on rural livelihoods. Migration to cities occurs in many different forms, sometimes as a seasonal move or in response to specific shocks, in addition to the more permanent and settled migration. Significantly, for many rural people, having at least one household member engaged in urban employment is a component of “stretched” and diversified livelihoods, linking rural and urban livelihood strategies (Winkels, 2012). There are many drivers of rural – urban migration, but there is great global concern that future migration will be shaped by climate change impacts on rural areas and rural livelihoods compelling people to seek employment in the growing cities (Foresight, 2012). These trends are certainly in evidence in many parts of the world. The risks are all the greater when much of this migration is towards cities that are already straining to provide the services that urban inhabitants need, and when cities themselves are vulnerable to climate shocks and crises. The new populations that are absorbed in these ways to cities are often located in areas that are either by their nature hazardous, or hazardous as a result of the patterns of urban expansion. Critically, migrants to cities tend to have unclear legal status, and by and large, poor access to critical services whether they be shelter, water, energy, transport or communications.

There is an additional dimension to this story of urbanization and local-level disaster risk. For this global phenomenon is also intimately linked with global climate change.

Urbanization and associated land use change and industrialization contribute directly to greenhouse gas emissions both locally and globally (McGranahan *et al.*, 2007). Changes in land use that accompany urbanization alter natural hydrology, often exacerbating flood risks. At the same time, urbanization occurs in areas that are already vulnerable, locating social and economic assets in places exposed to climate change. With a greater concentration of people and assets in vulnerable space, the impacts and consequences beyond these locations of climate change related impacts likely to become all the more severe, with the effects cascading well beyond the geographical location of a specific climate event.

From this perspective, framing problems of cities, vulnerability and risk predominantly around location (and their administrative boundaries) have significant limitations.

### **3. A systems-oriented perspective – moving beyond hazards of space**

The location of cities and their expansion is clearly a critical factor in shaping risk profiles. For example, in many parts of coastal Vietnam, the constraints of land, for a mountainous country with a much increased and largely young population, offer limited options for the expansion of the urban area. In the coastal city of Hue, the new Urban Master Plan the future location of the city is targeted on the coastal floodplains to the south east of the current main urban area. This is an area that is by its geography exposed to climate-related hazards of storms and floods; however, with limited options, this is also regarded as the most viable area for urban expansion.

At a national scale, this type of urban expansion also transfers risk from one place to another, but again, with implications that stretch beyond the location of any possible disaster event. The case of Vietnam exemplifies these trends. The expansion of urban areas is largely at the expense of agricultural land. With the associated shift in land values that urbanization brings, and the speculative investment that drives much of the land-use change on the ground, the financial returns from food production cannot compete with the potential returns from real estate for housing or industrialization. Land speculation in urbanizing areas of Northeast Thailand has raised the price of formerly rice-producing agricultural land to USD30, 000/rai (equivalent to 0.16 hectares). At such a price, land is only attractive for investment in residential housing or industrial production. Recent estimates suggest that 32 km<sup>2</sup> of agricultural land in Thailand is lost to urban expansion every year; a pattern that is being repeated across urbanizing Asia (Redfern *et al.*, 2012). In effect, this means that food production land in many parts of the country are transformed to urban areas, with a greater proportion of national economic assets located concentrated in specific areas. In some cases, such areas are themselves hazardous space. As local informants in coastal cities explained the situation in Vietnam, much of the food production will, therefore, come from the main rice-growing area of the country – the Mekong Delta. Of course, it is the delta itself that is also the most exposed part of the country, and most vulnerable to the impacts of climate change. In addition to the direct risks that the locations of cities themselves face, urban populations' dependence on food produced in other locations creates an additional set of risks. At a national scale then, there is both a significant relocation of risks and hazards, and a restructuring of inter-linked risks.

The ways in which cities expand create new vulnerabilities stressing existing resource bases, but also contributing to climate change and creating new climate-related

vulnerabilities. Many cities face core systems challenges. In many parts of Asia, cities are unable to provide basic services to their populations, with sanitation rates extremely low, particularly in South Asia. The economic costs of such poor sanitation spread across the economy beyond those immediately affected (Hutton *et al.*, 2008). The wider risks of major additional crises to the already stressed public health situations, again pose risks of effects that would affect other systems.

Many of these water systems that are needed to provide sanitation services are themselves under pressure from urban expansion and land degradation. Viewed from the perspective of systems level risks, even cities that would not always appear vulnerable become a cause for concern. Even on an island with annual rainfall of over 2,000 mm and with a high level of income derived from the international tourist industry Phuket struggles to meet water consumption needs. The challenges are related to soaring demand as the number of water users, particularly from the hotels, is estimated at between four and seven times the number of registered residents, and also due to the transformations of the landscape – encroachment on upper catchments for housing estates and hotels, and the filling of natural reservoirs (ISET *et al.*, 2014).

Addressing many of these constraints for urbanizing areas with growing populations requires ever more complex infrastructure, and institutions to manage this scale of complexity. The dependence on infrastructure and technology characterizes that contemporary urbanization also creates new risk and vulnerability profiles that are often poorly understood. It is this level of infrastructure dependence that characterizes contemporary urbanization (Graham and Marvin, 2001), even though for many cities in Asia, much of the infrastructure is inadequate or absent.

There is something additional about the dependence on infrastructure and technology that characterizes cities, and the risks associated with infrastructure failure, where systems and location come together in new risk profiles.

Much of the settlement in expanding, flood-prone cities is in space that is by its nature hazardous, but by virtue of infrastructure development is perceived as being less at risk. For example, major cities that have expanded into flood zones, such as Hanoi, are protected by a series of embankments that allows settlement within the zone of their protection. But such settlement is also based around assumptions that the infrastructure is designed to accommodate a broad range of risks. This widely documented levee effect (Pielke, 1999; Tobin, 1995) whereby a false sense of security derived from hazard protection infrastructure acts as an incentive to settle hazardous areas – has been argued to be a factor in the ways in which disasters such as Katrina and Fukushima have played out. Yet, it is the failure of these infrastructure systems and the institutions that maintain them – rather than the direct impact of a disaster – that can have the most devastating effects.

Recent events of less devastating impacts are harbingers of what might be to come. For example, recent prolonged power outages in northern India, but also the Thai tourist island of Koh Samui point to the potential consequences of failures in energy systems. These kinds of infrastructure and technology failures have long been identified as posing significant future risks (Ahern, 2011), but there are several aspects of these specific cases that are worth discussing here. Many cities in northern India, with large populations and weak administrations are unable to provide the most basic and critical services to the majority of people – water, sanitation, shelter and energy. The failure of these systems has a range of effects. In the case of energy, already limited public

services, such as hospitals, are a particular cause for concern. With growing attention to climate change and rising urban temperatures and the implications for human physiology and health, the failure of existing systems and the services they provide has huge implications.

This level of dependence on complex infrastructure systems is set to increase. Many other cities now look to even more complex infrastructure solutions to emerging resource constraints in the face of growing demand for resources, and climatic variability. For example, Udon Thani has ambitions to become a regional economic centre, expanding the area and size of the city, and attracting industry. Yet, it faces limitations of water supply to meet existing, let alone, future demand, while also facing longer dry seasons, and more variable precipitation in the rainy season. One option is to transfer water from the Mekong River. As with river basin transfer schemes around the world, the plan faces enormous financial, logistical and political challenges and may well not be feasible. While these kinds of solutions are unlikely to go ahead, they demonstrate the tendency to look towards larger, more complex infrastructure solutions to emerging problems associated with urbanization, which themselves create a greater dependence on infrastructure.

This is clearly an area where hazard of location and risk of infrastructure failure come together, demonstrating the importance of the infrastructure systems and the location itself. Confidence in the long-term safety of infrastructure systems can also encourage an unrealistic assessment of risk. This phenomenon is a common feature of many cities, with large-scale expansion of residential and industrial areas within dike systems. However, when such defences do fail, the impacts can be all the greater (Ahern, 2011).

The risks of system failure are often poorly considered in the way risks around urban expansion are assessed. For example, the urban Master Plan for Hue in central Vietnam, under which the city will expand along the coastal floodplain, has made a critical assumption about the functioning of key infrastructure (ISET *et al.*, 2014). The effective functioning of upstream reservoirs, designed for both flood protection and energy production is recognized as being important for the coastal development. However, the Master Plan for the coastal development is based on the explicit assumption that such infrastructure will not fail even though the reservoirs were designed for extreme climatic conditions that have already been surpassed, and when the reservoirs have had to go through poorly planned emergency release, and thus inundated the downstream areas. While managing to avoid complete failure of the dams, the ways in which the emergency releases were carried out, and the consequences for the urban areas downstream, indicate the potential for greater failures in the future.

The experience of Udon Thani in North East Thailand provides an interesting contrast to this relationship between urban expansion and infrastructure dependency (Srisawalak-Nabangchang and Wongchanchao, 2000; Chairob, 2013). The province of Udon Thani is largely dependent on one reservoir system for all its water needs – domestic use, irrigation and industry. Udon Thani's urban expansion means greater demand, but also involves the encroachment and conversion of alternative or supplementary natural water bodies, further intensifying the dependence on the sole reservoir system. Udon's greater dependence on water infrastructure and its complex institutional arrangements are a core part of its vulnerability. This is a very different

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type of pressure and shock from the more obvious direct risks associated with transformations of landscape.

Urbanization and the growth of cities transforms individual households and communities, creating new occupational opportunities, but in many cases, altering the range and type of assets on which households and communities have depended. It is a complex process. For example, Lao Cai in northern Vietnam has grown on the back of regional economic links to China. Lao Cai plays a central role in the processing and trade of agricultural products that come from the smaller towns around the larger city, and thus it is intimately linked to its rural areas. A large part of the agricultural production of the rural areas of Lao Cai province is consumed within the city of Lao Cai and nearby areas. A key part of the economic transformation of the area is related to the large mining industry – largely focused on apatite and copper. The combination of expansion of urban infrastructure, particularly road networks, and of the mining industry has encroached on agricultural land, thereby requiring relocation of rural households. Often, this has been in areas with less productive land. With additional impacts from the mining industry, the viability of agriculture is much reduced. The expansion of Lao Cai can thus be seen as contributing to a transformation of agricultural livelihoods as much as the expansion of physical area. This livelihood transformation and the transformations of the ecological landscape creates a whole new set of risks and vulnerabilities in a region that regularly experiences flash floods and landslides ([ISET et al., 2014](#)).

Increasingly, it is global and regional drivers and processes such as regional economic integration that are creating new landscapes. This is most apparent in the region defined as the Greater Mekong sub-region (GMS), an area that brings together southern China, Thailand, Vietnam, Laos, Cambodia and Myanmar in an emerging economic sub-region that aims to foster communications, trade and movements of labour. Many of the secondary cities that we see growing in the GMS are doing so on the back of investments in East–West and North–South transport and energy networks. Such networks not only link economic opportunity but also create pathways for the distribution of impacts ([Friend and MacClune, 2013](#)).

#### **4. A people-oriented perspective – nested vulnerabilities and cascading impacts**

The changing nature of patterns of risk and vulnerability that characterize urbanization can also be seen from a people-centred approach. Urbanization creates new patterns of social organization within and between cities, and between people in cities and other locations. Access to critical systems and services is highly differentiated. This section considers the implications of risk and vulnerability across networks of people, arguing for a more politically nuanced approach.

Viewing urbanization through a lens of networked and system dependency suggests the scale of linkages, fragilities and vulnerabilities. When these become actualized around specific system failures, whether or not these are brought about by specific events, the impacts on people are shaped by existing patterns of system access, as well as location of shocks. It has cascading impacts on people spread beyond specific locations. Urban vulnerability and poverty is largely shaped by patterns of access to critical urban systems and services, and the quality, reliability and costs of the systems and services. Much of the work on urban poverty and vulnerability has focused on the

end point of such services, such as the water taps and pipes, with less consideration of the broader systems on which these services depend.

Access to critical services is largely shaped and differentiated by economic and social circumstances. In many urban contexts, people are caught in exploitative social relations (Wood, 2003), bearing disproportionately higher costs for access to lower-quality services (Mitlin and Satterthwaite, 2012). From the perspective of people's access, these can be described as "dualistic systems" (Graham and Marvin, 2001). In terms of transport, the sheer price of "public" transport determines access, often not only with a stark contrast in comfort and convenience but also in terms of risk. The raised Bangkok Mass Transit System in Bangkok is largely unaffordable for the bulk of working people in Thailand, who rely on a ground level and more congested system. These differentiations become more apparent in access of more critical systems. Access to domestic water for many people in many Asian cities remains largely dependent on natural water bodies. People in Can Tho continue to use the main river systems for washing, whereas migrant Burmese workers in Phuket spend a higher proportion of their relatively low incomes on accessing domestic water through "informal" systems, with no access to solid waste disposal.

The ways in which vulnerabilities are nested is most clearly revealed from the perspective of changing livelihoods. There is a growing body of research that focuses on the transformations of formerly rural livelihoods, with household resource portfolios diversified, so that at least some members of "agricultural" households are engaged in off-farm employment located in cities. This diversification of household livelihood strategies and migration has been a feature of rural livelihoods in Thailand for several decades, corresponding directly with Thailand's own pattern of urbanization and industrialization (Rigg, 2005).

There is a new, more clearly regional pattern of labour migration, specifically encouraged under GMS economic integration. There is an added irony in that much of the labour is absorbed within the growing Thai construction industry, with many labourers coming from Myanmar and Cambodia. The total number of foreign labourers in Thailand is difficult to assess, but some estimates suggest there are as many as 3 million (Pholpirul and Rukumuaykit, 2010; HRW, 2010). These labourers are building the housing estates, condominiums and hotels that are core features of Thailand's regionalized and globalized economy. While construction work is by definition dangerous, their own living conditions also expose them to a range of risks – with camps located in hazard-prone marginal land (often public land that has been encroached on), in poor shelter and limited access to water and electricity. An additional, yet poorly researched aspect of such vulnerability, relates to their exposure to high outdoor temperatures during their working day, and the high night time temperatures of their accommodation, caused by both urban heat island effects and climate change.

Overseas migrant labourers are often in a precarious position by virtue of their legal status, employment and their location. From the perspective of these "stretched livelihoods", the linkages between rural and urban locations and livelihood strategies can be drawn. Both opportunities and risks can be shared between the two, but this becomes especially important given the sheer scale of the rural household dependence on the remittances that come from urban migration. For example, in countries such as Nepal and the Philippines, remittances from overseas migrant labour are significant contributions to national gross domestic product (GDP).

The shocks that urban people experience will be felt much further afield by the rural households to which their remittances make an increasingly important contribution. Moreover, the very condition of the urban areas, and the added climate risks, creates a whole new set of potential vulnerabilities that need to be factored into how we understand and act on urban poverty and vulnerability. The linkages work in the opposite direction too. Crises in rural areas – for example, in food production or prices – can have enormous impacts on urban populations, often in different parts of the world (Friend and Moench, 2013; Adger *et al.*, 2008).

There is an added dimension of vulnerability and risk, when we consider that migrating away from natural disasters, and climate change, is itself a driving force for many migrants (Foresight, 2012). The extent of such migration is expected to grow, and is widely seen as a necessary adaptive response to climate change impacts, but in itself, it creates a whole new set of risks.

Recent events have demonstrated that with such inter-linkages across livelihood strategies and locations, the impacts of a specific disaster may spread to other people and locations in previously unimagined ways, and indeed may not be felt at the location of the event itself to the same degree of intensity. For example, during the floods in Thailand in 2011, where migrant workers might have been able to cope with the direct impacts of inundation of flood waters, questions remain as to the effects of the loss of income due to the closure of the factories in which they worked, and the subsequent economic impacts that not only hit them directly but also the rural households in Cambodia and Myanmar who depended on their remittances.

The 2004 Indian Ocean tsunami also demonstrates the ways in which vulnerabilities are linked beyond the direct location of the disaster itself, with impacts not solely determined by wealth or class (Rigg *et al.*, 2008). An example is the case of Phuket, an international tourist destination that, as a province, is the second highest contributor to national GDP after Bangkok, where there is a high degree of dependency on domestic and foreign migrant labour. The 2004 tsunami has been presented as a transnational disaster, affecting tourist and migrant labour households across the world. As Phuket has grown – currently with an estimated 300,000 migrant workers (more than the registered population of the island) and an estimated 12 million plus international tourists from many different countries, and a range of investments from small-scale business to multi-nationals – a whole range of potential cascading vulnerabilities emerge.

This dependence on urban systems, and the highly differentiated, dualistic patterns of access, is a missing link in our understanding of urban poverty and vulnerability (Friend and Moench, 2013). Such a people-centred approach is a necessary complement and counter balance to the systems-oriented approaches. While systems-oriented approaches rightly point to complexity and the inter-linked, inter-locked dimensions of urbanization are less able to accommodate concerns around distribution, equity and justice (Friend and Moench, 2013). Indeed, the greatest social risk with the systems-oriented approaches is that it places greater emphasis on the system level, without considering who benefits and loses from this system. Access to current urban systems, particularly water, energy, transport and waste, is characterized by high levels of inequality, with the risk that such inequality might intensify.

## 5. A new theory of urban risk and vulnerability

Urbanization obliges us to reconsider actions to reduce vulnerability beyond the physical location of cities, and in so doing, to reconsider what we mean by the “local”. In considering local dimensions of DRR, the focus is thus on the process of urbanization, rather than on the physical location of cities, or the administrative unit of the city or municipality. This is not to reject the importance of place as a key determinant in disaster risk and vulnerability, but to also argue the growing importance of more multi-scale, systems-oriented approaches.

Urbanization highlights the need to focus on systems and not only on locations of risk, and how system fragility, whether in the physical design specifications or in institutional arrangements, creates additional vulnerability. The people most vulnerable to impacts of disasters and related shocks may well not be those located nearest the events. This argues the need for more sophisticated, nuanced mechanisms for assessment of vulnerability and risk.

The ways in which the impacts of events will be felt will likewise be mediated by the ways in which systems and services are accessed, and system fragility and failures distributed. Disaster preparedness will increasingly need to look at such systems rather than purely location, whether in terms of the physical design, but also in terms of the institutional mechanisms that determine their operation and maintenance, and the distribution of services and benefits.

For the DRR and climate communities, a critical feature of the inherent dependence on critical urban systems will be the need to consider risks associated with failure. Building mechanisms for such infrastructure systems to fail safely will be an additional component of urban DRR.

Those most vulnerable to the impacts of disasters will likewise need to be reconsidered. While it is an oft-stated truism that the poorest people are often the most vulnerable to disasters (and climate change), this is only a partial assessment influenced by an incomplete understanding of the nature of urban poverty and vulnerability. Increasingly, there is a need for assessment and measurement of poverty and vulnerability that goes beyond location (of residence and employment) or of income and expenditure. Refining assessments of poverty and vulnerability to include an understanding of how people access systems and services – and doing so beyond the point of delivery of such services – and the implications of poor quality, disruptions of failure, will be a necessary feature of sustaining people’s ability to access the benefits of such systems.

Critically, this perspective argues the need to look at DRR mechanisms, such as social protection, beyond the location of the disaster itself. This requires moving beyond site-level protection to landscape-scale protection, risk reduction measures will increasingly need to be designed to support more mobile and scattered “vulnerable households”. This clearly represents an enormous governance and institutional challenge, and is an area that requires further improved understanding.

### Note

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