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The Urban Transition of Environmental Disaster Governance in Asia

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The Urban Transition of Environmental Disaster Governance in Asia

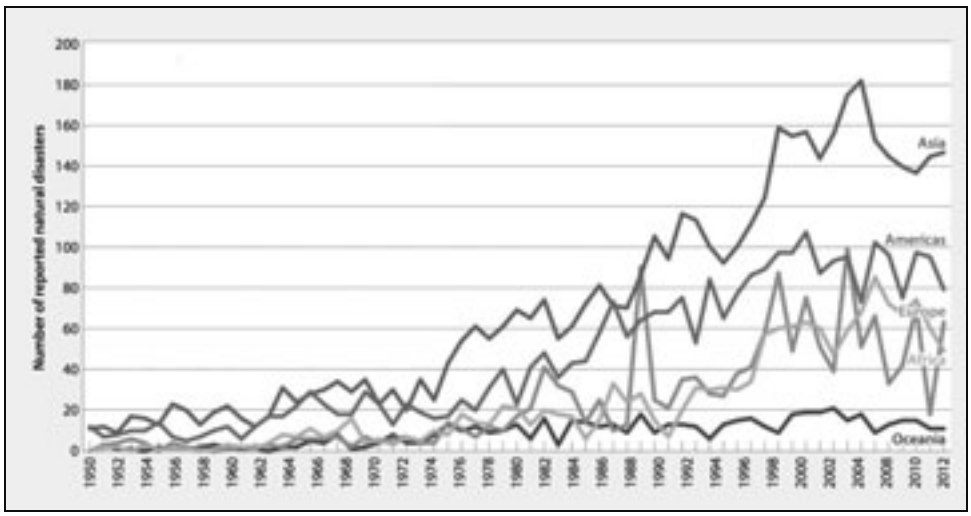
ASIA'S URBAN TRANSITION AND DISASTER GOVERNANCE

> *Exposure to hazards has multiplied as urban centers grow and people and economic activities expand into increasingly exposed and hazard-prone land. Rapid urbanization expands exposure to hazards, and it also increases people's vulnerability, especially among the poor*
>
> (UNISDR/UNESCAP 2012:xxii)

The human and economic costs of environmental disasters in Asia are rising (Figure 1).[1] Between 2000 and 2012 an estimated 1.6 billion people in Asia were affected by environmental disasters (Jha and Stanton-Geddes 2013). While about 40 percent of all environmental disasters in the world occur in Asia, 88 percent of people affected reside in this region (ADB 2013).

Although the sources of registered increases are manifold, many are increasingly related to Asia's accelerated urban transition that began in earnest in the 1970s. From a level of less than 20 percent in 1960, Asia is approaching the 50 percent urban mark today, and by the latter half of the 21st century it will have completed a historic transformation from agrarian to urban-based societies (UNISDR/UNESCAP 2012; ADB 2013). From 1980 to 2010, cities in Asia added over one billion people to their populations, and another billion will live in cities by 2040 (UN 2011). Major urban regions in Asia are each annually adding hundreds of thousands of new residents to their populations. These city regions and the distant spaces they bring into their orbit are becoming increasingly vulnerable to disasters (Jha and Stanton-Geddes 2013).

Figure 1. Numbers of Disasters by World Region 1950-2012



Source: Asia Development Bank (2013), "Disaster Risk Management in Asia and the Pacific" (Manila: ADB, Issues Paper, April), Figure 1.

[1] The United Nations (2013) finds that direct economic losses over the past 3 decades in middle and low income economies alone totaled more than $300 billion. However, actual costs of disasters are much greater than reported figures indicate (UN 2013). In terms of flooding, from 1970 to 2010 the number of people impacted by annual inundations more than doubled from 30 million to 64 million in Asia. In Asia 21 million people were displaced by natural disasters in 2012 (DMC 2013; UNISDR/UNESCAP 2012).

Relationships between risks of environmental disasters and urbanization are well known. Global climate change, for example, is closely linked with urban-industrial growth. In 2012, 98 percent of all displacements of people worldwide were from climate change and related extreme weather events (DMC 2013). While highly industrialized countries of Europe and North America have been the principal sources of climate change, Asia's urban-industrial growth is now becoming a major contributor as well. Its major cities also rank among the most environmentally degraded in the world (UNESCAP 2012).

Similarly, disaster-linked transformations of nature in the form of massive deforestation, mega-dams constructed in riparian regions, and mining of energy resources and construction materials are all associated with rising demand for natural resources for building cities and fueling their economies. As communications and transportation spread through expanding urban systems, capacities to organize rural regions in even remote locations to serve urban demands expand, which also transforms and can undermine traditional modes of environmental stewardship and local livelihoods.

More recently, cities are being portrayed as "engines of economic growth" substantially replacing agriculture as a national economic base, but are also becoming the major recipients of high impacts of environmental disasters. As mega-urban regions in Asia approach and even surpass the 30 million population threshold, imagining a major disaster hitting any one of them immediately raises the specter of unparalleled human suffering and economic costs well beyond the affected city region through the compounding of disasters with effects that move through an emerging global system of cities.

In sum, the idea of an isolated environmental disaster that is contained within a relatively small area appears to be passing into history. Instead, we can now say that environmental disasters are occurring within an urban matrix of interrelated impacts or effects. Five effects of Asia's urban transition serve to underscore the profound changes underway in the understanding and the effectiveness of responses to disasters. They include agglomeration and the formation of mega-urban regions; spatial polarization in high-risk zones; new forms and magnitudes of vulnerability; compound disasters; and the expanding ecological reach of cities. Together these effects call for a shift from expert-centered disaster management to participatory disaster governance as the framework for society-wide engagement in all phases of disaster experiences and responses.

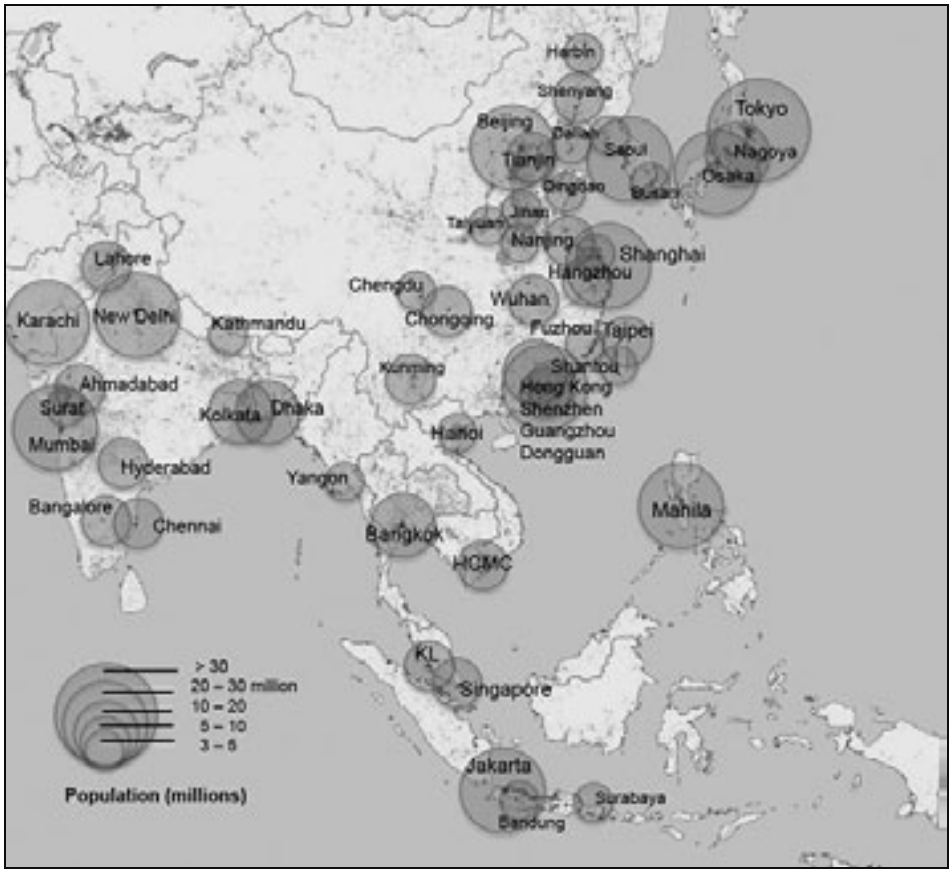
Agglomeration Effects

> *By 2025, the number of megacities in Asia is expected to increase to 21 out of a global total of 37. Growth of assets and megacities means that multi-billion-dollar disasters are becoming more widespread in the region. Population density, urbanization, and demographic profiles are context-specific factors that are likely to drive death tolls and victimization.*
>
> (ADB 2012)

> *Most Asian cities are poorly equipped to manage the effects of natural disasters, climate change, contaminated or unstable land and health pandemics. Many will need massive investments in infrastructure, public services, institutional capacity and environmental programmes if basic security, health, safety and overall conditions are to improve for the majority of urban residents.*
>
> (UNESCAP 2011:164)

Up to the 1970s, few cities in Asia were larger than one million in population. Today, and in contrast to the limited "mega-city" measurement of a city demarcated by its administrative boundary, the huge city regions that have emerged in Asia are agglomerations incorporating several municipalities and administrative areas into immense mega-urban regions (MURs) that stretch 100 kilometers or more from core central cities to form "desakota" realms of rural-urban land-use mixes (McGee 1991, Jones and Douglass 2008). Figure 2 maps the distribution of MURs in Asia.

Figure 2. Asia's Mega-urban Regions



Source: Author. Data from Table 3.

Table 1 ranks these cities within Asia and globally. It shows that slightly more than half of the largest 66 MURs in the world are in Asia. In 2013, these MURs include 7 that are larger than 20 million in population. The 35 MURs together have a total population of 451 million people. Almost all are in areas of high disaster risk.

The sheer size and human density of these agglomerations take the understanding of environmental disasters into new realms of complexity never experienced before. Responses now require large-scale infrastructure beyond the capacities of disaster victims to mobilize themselves, or at the community level. Responses now require cooperation among millions of people and capable, committed governments to be effective. As such they become part of the politics of governing cities. A flooding disaster, for example, is no longer only a matter of canal dredging or repair, but now includes all forms of urban services, transportation, housing, and land-use controls. It also inherently leads to contestations and demands for social justice over land, welfare, livelihoods and urban ecosystems.

Table 1. Population of Asia's Mega-urban Regions (2013)

Asia Rank	World Rank	Country	City	Population (millions)
1	1	Japan	Tokyo-Yokohama	37.2
2	2	Indonesia	Jakarta (Jabotabek)	26.7
3	3	South Korea	Seoul-Incheon	22.9
4	4	India	Delhi, DL-HR-UP	22.8
5	5	China	Shanghai, SHG	21.8
6	6	Philippines	Manila	21.2
7	7	Pakistan	Karachi	20.9
8	11	China	Beijing, BJ	18.2
9	12	China	Guangzhou-Foshan, GD	17.7
10	13	India	Mumbai, MAH	17.3
11	14	Japan	Osaka-Kobe-Kyoto	17.2
12	18	India	Kolkata, WB	14.6
13	19	Thailand	Bangkok	14.5
14	20	Bangladesh	Dhaka	14.4
15	24	China	Shenzhen, GD	12.5
16	28	Japan	Nagoya	10.2
17	32	China	Tianjin, TJ	9.3
18	33	India	Chennai, TN	9.2
19	35	India	Bangalore, KAR	9.0
20	37	Viet Nam	Ho Chi Minh City	8.8
21	38	China	Dongguan, GD	8.6
22	39	China	Chengdu, SC	8.4
23	40	China: Taiwan	Taipei	8.4
24	41	India	Hyderabad, AP	8.2
25	42	Pakistan	Lahore	8.0
26	44	China	Wuhan, HUB	7.4
27	46	China	Hong Kong, HK	7.2
28	47	India	Ahmedabad, GUJ	6.7
29	48	China	Chongqing, CQ	6.6
30	49	Malaysia	Kuala Lumpur	6.6
31	50	China	Hangzhou, ZJ	6.6
32	59	China	Nanjing, JS	5.8
33	60	China	Shenyang, LN	5.6
34	65	China	Xi'an, SAA	5.3
35	66	Singapore	Singapore	5.3
TOTAL				451.2

Source: Demographia World Urban Areas. 9th Annual Edition March (2013), "Largest Urban Agglomerations in the World". *www.demographia.com/db-worldua.pdf.*

Asia's urban transition is a complex of mega-trends that appear in varying combinations in time and space. These trends include: shifts from agrarian to urban-centered economies that involve multiple types of increases in the appropriation of natural resources; demographic changes now beginning to move toward chronic rural depopulation and slower-growing and aging societies; the emergence of new urban classes and the rise of civil society with pushes for political reform; global climate change that is both raising sea levels and melting the Himalayan glaciers from which most continental Asian rivers flow; new forms of communicable diseases that can be quickly diffused through urban systems; and enhanced technological capacities and scales of projects that transform cityscapes and countryside alike. When animated in specific settings the interactions among these trends create new, still rapidly changing and often unstable social, political and economic contexts for responses to disasters.

In the case of the events in Japan in 2011, for example, disaster relief had to cope with an aging society with heavily depopulated rural regions, towns and villages that were already experiencing economic downturns and declines in basic services. It also had to cope with the compound effects from earthquake, tsunami to nuclear meltdown. With urbanization, disasters can thus be seen a creating vortices of multiple disjunctures in already dynamically changing and turbulent processes. Responses to these dynamics necessarily require flexibility and collaborations across social divides that go beyond both sector approaches and disaster management as professional activities reserved for experts. In involving access to land, scarce resources and, more broadly, the right to the city, they become matters for public consideration.

Somewhat paradoxically, more economically advanced cities experience the highest costs of environmental disasters due to the high value of their infrastructure and assets (Jha and Stanton-Geddes 2013). In Asia, for example, Japan has the highest exposure of produced capital in absolute terms and the third highest in relative terms in per capita GDP, while smaller economies, including Hong Kong and Macau have high levels of relative risk. At the same time, however, these cities are shown to be more capable of responding to disasters. Studies show that cities with high levels of poverty and poor infrastructure are least able to effectively respond to disasters, including small repeated disasters, which have cumulatively debilitating impacts. This again turns attention to issues of inequality and their connections to disaster impacts and recovery.

These observations show the complex interrelationships between the economic vitality of a city, the costs of disasters, and the capacity for resilience in disaster situations. Beyond specific contexts, all cities have to contend with agglomeration effects that raise the potential for high impacts of disasters, which today involves millions of people in one urban setting. In all cases, too, the real cost of disasters are greatly understated when only measuring near term mortality, infrastructure costs and business losses incurred in a disaster event. "Invisible risks", longer-term compounding of impacts, and social costs that cannot be given monetary value are also in need of accounting, which calls for an open public sphere of disaster governance (Jha and Stanton-Geddes 2013, UNISDR/UNESCAP 2013).

Spatial Polarization in High-Risk Coastal Zones and Riparian Regions

> *The increase in concentrations of people and growth of assets in hazardous areas is the single largest driver of disaster risk and greatest challenge for managing disaster risks.*
>
> (Jha and Stanton-Geddes 2013:17)

> *From 1970 to 2010 the average number of people exposed to yearly flooding in Asia has more than doubled from 29.5 million to 63.8 million and the population resident in cyclone-prone areas has grown from 71.8 million to 120.7 million…Exposure to disaster risk is growing faster than our ability to build resilience*
>
> (UNISDR/UNESCAP 2012)

As Figure 2 and Table 1 one suggest, the expansion of MURs is occurring in a larger process of continuing spatial polarization of urbanization in coastal regions and river basins that encounter high risks of environmental disasters. Of the 35 largest cities (MURs) in Asia listed in Table 1, 25 are located in coastal areas. Available evidence shows that they continue to accrue larger shares of national populations over time (Jones and Douglass 2008), with most of this growth now in smaller cities located in zones spreading beyond the metropolitan core. The rising risks in these urbanizing regions are not only related to global climate change but also to failures of large-scale attempts to control nature for human uses and the resulting deterioration of ecological conditions in these MURs (Douglass 2010).

The coastal shift of population is most dramatically seen in the case of China, which since the early 1990s has witnessed an unprecedented surge in migration from inland provinces to the major MURs of Beijing, Shanghai and the Pearl River Delta (Figure 2). Elsewhere in the Himalayan regions of Asia, unusual weather events, melting glaciers and large infrastructure projects such as highways and mega-dams are creating high-risk zones of landslides and flooding for cities that are expanding in that region. In the Mekong River Delta, Can Tho, which now has a population of about 3 million people, potentially faces total inundation from global sea rises in this century. Cyclonic winds such as typhoons pose equally high risks to coastal city regions. Approximately 80 percent of the risk from cyclonic wind events is concentrated in Asia (UN 2013). Coastal MURs such as Jakarta and Manila have entered an era of chronic annual flooding for which no sufficient remedy is in sight.

Table 2. Migration as Share (%) of Population Growth of MURs in Asia

Country	1970s	1980s	1990s	2000s	2010s*	2020s*
East Asia	**45**	**58**	**64**	**68**	**72**	**76**
Cambodia	33	24	40	53	57	59
China	45	65	72	76	80	86
Indonesia	53	62	67	66	63	61
Malaysia	45	44	44	41	35	34
Philippines	35	46	48	43	38	37
Republic of Korea	65	65	54	48	61	85
Thailand	41	40	34	47	67	75
Viet Nam	29	28	44	57	65	72

*Projected. Source: UNESCAP 2012.

Spatial polarization of Asia's urban transition is propelled by very high levels of rural-urban migration, most of which come from heartland rural regions. In many countries that are reaching mid-point in their urban transitions, MURs are experiencing annual population increases of one-quarter to close to a million new residents annually. Table 2 shows the

contribution of migration to this growth. It indicates that from one-third to as much as 86 percent of urban growth is from migration. South Korea represents the interesting case in that as national fertility rates fall below replacement level, which they have in all the higher income economies of Asia, negative population growth for the country reaches from rural areas into cities. As a result, migration either from rural areas or among cities becomes the only means by which a city can grow. Thus, in South Korea in 2020 urban growth will be slower than today, but is nonetheless expected to occur with an 86 percent contribution from rural-urban migration. This is occurring in a setting in which rural areas have been chronically shrinking in population since the 1980s. Along with spatial polarization, these demographic shifts have resulted in half of the national population of South Korea now living in the Seoul Capital Region.

Where migration fuels rapid urban population growth, even the most well prepared governments are hard pressed to provide sufficient environmental and other urban services and housing in the face of huge annual increases. In many MURs the deficits are wide and continue to grow along with widening income inequalities. Such high levels of population growth through large-scale migration has resulted in very large numbers of people settling in slums and informal settlements in sites with exceptionally high risk of disasters, including flooding and industrial accidents. While the share of urban populations living in slums in Asia is decreasing in some countries, the numbers of slum dwellers in Asia as a whole continue to remain very high. In 2010, an official estimate of 470 million people were living in slums in Asia (Table 3).

Table 3. Urban Population Living in Slums 1990-2010 (millions)

Population at Mid-Year	1990	1995	2000	2005	2007	2010
East Asia	160	177	192	195	194	190
South Asia	180	190	194	192	192	191
Southeast Asia	69	76	82	84	84	89
Total Asia	409	443	468	471	470	470

Source: UNESCAP 2011:260

Many slums are locating along canals and in other high disaster risk sites. When disasters such as flooding occur, they are also the first to be evicted to make way for canal widening and flood management needs. This syndrome of channeling poor people to high risk areas and then evicting them to make way not only for flood control but also for corporate mega-projects along coastal areas has become a chronic feature of the political economy of environmental disaster management in many cities in Asia and elsewhere. These processes add to other new vulnerability effects.

When global climate change and predicted sea rise are fully added to risks involved in the coastal orientation of Asia's urban transition, scenarios can be bleak. Some predict the eventuality of mass evacuations from the huge urban agglomerations appearing in coastal areas within this century (Satterthwaite et al. 2007). Climate change is expected to reduce clean water supplies and productive agricultural areas, such as those in the Mekong Delta. Altered rainfall patterns will affect food production and supplies to cities, with serious implications for food security as desertification also enters the equation in countries such as China and India (Douglas 2009). One-fifth of Asia's global GNP is also concentrated in urbanizing coastal regions.

Although many governments have attempted to redirect urbanization away from growing mega-urban regions, none has had significant success. Agglomeration economies are powerful, and reasons to locate in coastal areas where access to world markets and other linkages are highest are too compelling when contrasted with incentives to relocate business to inland and peripheral regions. As such, approaches to disaster risk reduction will have to focus on these city regions where they are.

Vulnerability Effects

> *Increasing disaster risks in Asia-Pacific are driven by the twin challenge of increasing exposure of its people and economic assets, and the inability of the most vulnerable groups to cope with disasters*
>
> (UNISDR/UNESCAP 2012)

The most rapid urbanization is proceeding in some of the least prepared countries that have huge and widening deficits in public urban infrastructure such as drainage, disaster-resilient housing as well as public services that is needed to minimize disaster risks. When combined with the density of urban settlements, vulnerability increases become large and diverse. While disasters are known to disproportionally affect poorer and marginalized people (Neumayer and Plümper 2007), urbanization can compound vulnerability in deeply profound ways that recast the question of who the most vulnerable are when environmental disasters occur.

Reinterpreting earlier work by Sen (1981), vulnerabilities in the city can be seen in part as entitlement failures. Broadly, urbanization represents a shift in entitlements to the means of preparing for, adapting to, and recovering from disasters. Whereas in more remote rural regions, people might have direct access to collecting or growing food, taking water, or directly accessing other resources while also drawing upon reciprocal relationships among kin and community, in the city residents are increasingly dependent on access to money and government assistance when disasters occur. When jobs are lost due to a disaster and governments or other sources of aid are not sufficient, disasters worsen their plight.

Expressing a similar concern about the ways in which urbanization impacts vulnerability, UNESCAP (2012:41) states that "vulnerability in urban environments is further heightened by significant structural changes that families undergo in urban settings." These changes include declining extended family structures and support that increase the vulnerability of people, especially children, the elderly and the disabled. As discussed under governance below, among the more promising efforts to improve disaster resilience are those that work with poor communities to cooperatively support their members. In part, these can be seen as efforts to compensate for diminished capacities within urban households.

At a broader urban level, changes in the production and ownership of urban space are also having new vulnerability effects on lower middle and poorer urban households. From the late 1980s onward, major cities in Asia entered a still continuing era of corporatization of urban spaces. Mega-projects have been particularly intrusive in land development schemes that have pushed low-income residents out of their neighborhoods in core urban areas and into ever more precarious disaster prone locations.

In peri-urban areas, gated housing enclaves and vast private cities with no forms of public governance have displaced small farmers, and in the city aggressive privatization of public spaces and the rapid displacement of locally owned enterprises with global franchises have added to a proletarianization process in which wage work for the majority has steadily replaced family and

small-scale enterprises. Petty commodity production in the form of street vendors continue to exist, but even these activities require some capital and can be very difficult for poorer members of urban society to enter other than as disguised wage workers or piece workers. For those with very low incomes who are compelled to live in slums in high-risk flooding or other disaster prone areas, their vulnerability increases due to a lack of access to capital, land and other resources. In many MURs in Asia these people number in the hundreds of thousands, if not millions.

In these contexts, recovering from a disaster confronts great difficulties as well. This is underscored in research findings showing that in the two years after Cyclone Nargis in Myanmar, average debts of laborers and fishermen more than doubled (Jha and Stanton-Geddes 2013). Similarly, in Pakistan while almost all small shops were able to re-open within 6 months of the 2010 flood, the majority found themselves operating at a loss due to a complex interweaving of post-disaster dynamics. The bottlenecks included disruption in supply chains and lifelines, deepening stress on family and community, draining of personal savings needed to restock supplies, and loss of trained staff (Asgary et al. 2012). Decline of small business incomes multiplied into declines in employment and the overall vitality of the economy. Businesses that recovered and were able to do well did so through strong familial and social networks in their local areas.

In higher income economies, vulnerability is taking a new turn toward depopulating cities and towns, rapidly aging populations, and shrinking supplies of labor available for mobilization in disaster situations, as in the case of the Great East Japan Earthquake and tsunami in 2011. While younger survivors might simply migrate from the affected areas, the many senior residents became dependent upon government and other social support for an indefinite period of time in settings with depressed economies. The compounding of disasters in this area makes returning to normal life a continuing problem.

One of the complicating factors in assessing who is vulnerable is that answers to this question can vary substantially depending on the position and background of the person making the assessment. As noted by Bankoff and Hilhorst (2009), taking action about disaster risks and impacts involves individual calculations about the prevailing social order and social relations, which are experienced differently by those with little social power compared to those in power. People directly impacted by a disaster can and often do have views that differ from government officials, for example. For these reasons, vulnerability assessments need to be part of a governance process in which different voices can be heard and mechanisms exist to resolve competing claims that arise over this question. Thus, proactive approaches call for the inclusion of many actors in open and transparent public deliberations rather than solely through professional disaster management teams alone.

Compound Disasters, Disaster Incubation and Network Effects

> *The increase in occurrence of multiple large disasters is an inevitable consequence of increases in the population and spatial density in existing urban centers, greater reliance on technological solutions to maintaining growth and development in hazardous environments and the fragility of social, economic, and risk management systems. There is a need to recognize that compound disasters are a result of a series of component disasters in communities that in their aggregate overwhelm existing abilities to respond*
>
> (ADB 2013:5)

> *The socio-political aspects of risk assessment and risk governance are pronounced in the case of cumulative risks from multiple stressors*
>
> (Assmuth et al. 2009:3943)

The combination of agglomeration effects and nodal importance of MURs in an emerging global system of cities in an era of near-instant communications and fast transportation result in profound compounding ripple effects that extend far beyond a specific disaster moment or location. How to include these potential network effects in disaster governance is one of the greatest challenges of today. Compound disasters are multiple sequential disaster events that produce increasingly more serious impacts than do single disasters occurring independently (Kawata 2011).[2] Huge urban agglomerations that have large densely settled populations, economies dependent on global networks of production and consumption and that are dependent upon steady supplies of environmental resources are particularly vulnerable to compound disasters.

Within cities, population growth has put ever greater pressure on both physical and social support infrastructure. Even a moderate technological or environmental hazard can trigger progressive failures in infrastructure, basic services, fuel supplies and housing that cascade into multiple disasters. The 2011 Great East Japan Earthquake and tsunami that triggered the Fukushima nuclear accident is a clear case of compound disasters that not only had different forms of immediate impacts but also extended well beyond the particular events themselves.

These disasters also reveal what is being called "disaster incubation" (Mulvihill and Ali 2007). As originally proposed by Turner (1976), this phenomenon refers to the accumulation of disaster risks that are often out of view and unreported in rural and ex-urban areas but which are crucial for the functioning and well-being of cities, including MURs. As city systems create extensive core-periphery structures between MURs and more distant towns and cities, undesirable infrastructure and services, such as toxic waste sites or nuclear power plants, are typically deployed to peripheral regions where capacities to oversee these installations are often weak and not placed under local supervision. Such was the case of the Fukushima nuclear power plant, which involved a decision to construct the facility much closer to sea level than the original plans had specified. In the context of the 2011 disaster that had no historical precedent in Japan, this decision, which was made to lower construction costs, unintentionally incubated a compound disaster following from the earthquake and tsunami.

Flooding, which has became the most pervasive and frequent form of disaster in Asia, also results from and creates compound disasters that include disaster incubation dimensions. As urbanization reduces impermeable surfaces, drainage is reduced, raising the potential for flooding. Global climate change adds to this through unusually severe weather events of heavy rain and high winds that are on the increase. Land subsidence from over drawing groundwater, antiquated canal systems, large-scale deforestation of uplands, and loss of spaces for natural drainage all add to the incubation of flooding disasters. Nicholls *et al.* (2007) found that of the 136 port cities worldwide that are exposed to once-in-a-century coastal flooding, 50 are in Asia. Six of the 10 major port cities most at risk (in terms of exposed population) of flooding and inundation are Ho Chi Minh City, Guangzhou, Kolkata, Mumbai, Osaka-Kobe and Shanghai (UNESCAP 2011:182).

Table 4 lists the 20 largest cities in the world ranked in terms of size and assessed in terms of preparedness for flooding. It shows that of the 11 in Asia, all except Tokyo, Osaka, and to a lesser extent Seoul, are "critically unprepared" for floods. A major reason for the difficulties in being prepared is the interlocking of disaster dynamics that attend agglomeration effects and the human involvement in incubating the subsequent compound flooding disasters. East and Southeast Asia account for about 40 percent of the total number of floods worldwide over the past 30 years (Jha

[2] The impacts of the Eyjafjallajökull volcanic ash clouds in Iceland in 2010 was one of the most spectacular incidences of an environmental disaster affecting a globalized world as air traffic in most European countries was shut down for six straight days, costing airlines US$1.7 billion in revenues and shutting down .

and Stanton-Geddes 2013). High risks of flooding are expected to reach over 400 million people living in cities in Asia by 2025.

Table 4. Preparedness for Flooding in the Largest Cities in the World

City	Flood and Storm Risk
Tokyo	Very well-prepared
Seoul	Could be better prepared
Jakarta	Critically unprepared
Delhi	Critically unprepared
Mumbai	Critically unprepared
Mexico City	Could be better prepared
São Paulo	Could be better prepared
New York	Could be better prepared
Osaka	Very well-prepared
Shanghai	Critically unprepared
Manila	Critically unprepared
Hong Kong-Shenzhen	Very well-prepared
Los Angeles	Could be better prepared
Kolkata	Critically unprepared
London	Could be better prepared
Moscow	No high risks
Cairo	Could be better prepared
Buenos Aires	Could be better prepared
Dhaka	Critically unprepared
Beijing	Critically unprepared
Karachi	Critically unprepared
Rio de Janeiro	Could be better prepared
Paris	Could be better prepared

Source: GreenAsh (2013), *Natural Disaster Risk Levels of the World's Largest Cities.*

Beyond the scale of individual cities, one of the most prominent themes about urbanization is that it creates networks of cities that include rural as well as urban linkages. From the mid-1980s, for example, urban studies have been fascinated with the appearance of global (or world) cities and global city networks that articulate the global corporate economy. This system can also articulate and accentuate the impacts of disasters. For example, the spread of SARS was city-to-city on a potentially global scale as it traveled from Hong Kong to Toronto in just a single day.

Spatial network effects of environmental disasters are now endemic among global firms. Toyota lost $1.2 billion in product revenue from the 2011 Japan earthquake and tsunami due to parts shortages that caused 150,000 fewer Toyota automobiles to be manufactured in the USA and reductions in production of 70 percent in India and 50 percent in China (ADB 2013). Likewise, the Philippines, Thailand, and Indonesia also experienced a 10-20 percent decline in automobile assembly due to parts shortages from Japan.

Network distribution systems are now global, linking suppliers in Asia with assembly and sales throughout the world. An environmental disaster that disrupts these supply chains would have global impacts (ADB 2013). In 2010, Indonesia, Malaysia, the Philippines, and Thailand taken together were among the most dependent economies on parts, components, and industrial materials from Japan (imports 22% and exports 18%) (METI 2011). In addition to the disasters in Japan in 2011, the flooding of Bangkok in the same year resulted in impacts beyond the estimated $212 billion in direct costs as they worked through supply chains and markets beyond Thailand. Thai exports in electronics fell by nearly 50 percent, which also led to declines in production in Japan.

As a key dimension of globalization, urban networks have the effect of tremendously reducing the time it takes for the effects of an environmental disaster in one location to impact other locations. This annihilation of space with time is one of the most important aspects of the urban matrix of environmental disasters. Global supply chains are based on the belief that no major disruptions in them will occur. At another level, dependence on higher income countries as markets for exports from Asia was also affected by disasters in those countries. Increases in the frequency of environmental disasters in Asia will undoubtedly increase the vulnerability of supply chains and production networks to sudden economic downturns.

In a related manner, environmental disasters can also lead to a loss of network position that can last many years or even become permanent. In the case of the Great Hanshin-Awaji earthquake in Japan in 1995, Kobe Port, which was already declining in its global position, experienced devastating ripple effects from the destruction of container shipping berths, warehouses, bridges and utilities. Jobs were lost that were never recovered as this event worked to spur the ascendance of Busan and ports in China over Kobe. Prior to 1995, Kobe was the sixth largest port in the world. Even though the port was reconstructed over the next two years after the earthquake, by 1997 it had fallen to 17th place, and it fell further to 47th position in 2010 (ADB 2013). Reductions in harbor dues and mounting costs of recovery were like “pouring water into a bamboo basket” by disappearing without filling the port with renewed business.

Compound disasters, disaster incubation and its boomerang effects, and local-to-global networks impacted by even a seemingly remote disaster event together present a formidable challenge to disaster preparedness, adaptation and resilience. The expanding environmental resource reach of cities and resulting impacts on local and global ecologies further complicates this challenge.

Expanding Natural Resource Reach and Ecology Impact Effects

> *The unprecedented rates of urban population growth over the past century have occurred on less than 3% of the global terrestrial surface; yet the impact has been global, with 78 percent of carbon emissions, 60 percent of residential water use, and 76 percent of wood used for industrial purposes attributed to cities. Land change to build cities and to support the demands of urban populations itself drives other types of environmental change*
>
> (Grimm et al. 2008:756)

> *Planet Earth can offer a nominal 1.7 global hectares per head (ghph) of habitable land to support the needs of the human race. Now in most Asian cities, the average ecological footprint is in excess of five hectares per head, indicating that current consumption patterns are unsustainable. Although the footprints of Asian cities tend to be smaller than those in developed countries, they are on an upward trend, a phenomenon that is not without consequences for the global environment*
>
> (UNESCAP 2011:168)

Asia's urban transition does not mean that rural or remote areas are not part of the emergent urban matrix of disasters. To the contrary, urbanization entails an expanding appropriation of natural resources to feed, fuel and supply urban demand. One measure of this expansion is the ecological footprint of a city, which indicates, "the area of productive land and aquatic ecosystems required to produce the resources used, and to assimilate the wastes produced, by a defined population at a specified material standard of living" (Rees 1996). Variations among cities are substantial. Singapore, for example, has a reported ecological footprint 7.1 global hectares per head (ghph) compared with Taipei's 4.75, Tokyo's 4.25 and Seoul's 4.20 (Ng 2008). Asia is in general much lower than the U.S. and Europe, but rapid urban population growth implies steady increases in the ecological footprints of cities accompanying Asia's urban transition.

The ecological footprint measure underestimates the real impacts of cities on local, regional and the world's ecologies (Schneider et al. 2009). For example, mega-dams that change the course of rivers and transform downstream ecologies do not fully register in ecological footprint measures. Nor does pollution from strip mining or toxic industrial spillage. The tendency of urbanization to occur along rivers and coastlines makes Asia's urban transition a major contributor to disasters related to severe riparian and ocean pollution and eutrophication. In all of these ways, the actual impacts of urbanization on ecologies near and far remains largely unaccounted for, even though they are identified in countless case studies.

Taking all of these urbanization effects together provides sobering scenarios about the future. However, cities are also sites of social, economic, political and technological capabilities to respond to disasters. Taking advantage of these capacities will require far-reaching innovations in governance at local, city region and transborder scales.

GOVERNANCE AND DISASTERS

> *The exercise of governance greatly influences the nature of socio-economic vulnerabilities and the extent of people's exposure to hazards*
>
> (UNISDR/UNESCAP 2012)

> *A more resilient city is one with inclusive decision-making processes in the realm of planning, open dialog, accountability, and collaboration. It is one in which people and local stakeholders, including the private sector, various social groups, communities, civil society and grassroots organizations participate…A more resilient city is one with less social inequalities and a fairer distribution of resilience resources*
>
> (Jabareen 2013:223-224)

Substantial evidence has accumulated to show that improving governance capacities is crucial for a locality to gain resilience in facing environmental disasters. Governance can be defined as a process of public decision-making that includes civil society as well as state and business interests (UNDP 2012).[3] Assmuth et al. (2009:3943) go further to emphasize that the turn toward governance as a focus for disaster risk reduction includes a shift in the balance between state intervention and social

[3] UNESCAP (2011:209) defines governance as "the sum of the many ways individuals and institutions, public and private, plan and manage the common affairs of the city. It is a continuing process through which conflicting or diverse interests may be accommodated and cooperative action can be taken."

autonomy by embracing the change from regulation, with the state acting in "multi-actor participation and negotiation and from technical management to legal, institutional, social and economic contexts".

In other terms, governance focuses attention on the processes of society-wide engagement in responding to actual or potential disasters. Studies find that inclusive decision-making processes in planning, open debate, accountability, and collaboration are best able to mobilize knowledge and resources for longer-term as well as immediate responses (Healey 2007; Bulkeley 2010; UNESCAP/UNISDR 2012). Conversely, where governance institutions are weak, efforts for successful recovery are likely to be seriously impaired.

The emerging role of cities in disaster governance is already being acknowledged (Bulkeley 2010). As national populations increasingly urbanize, cities become the locus of both private and public life and can also become a political arena in which contestations over social and environmental justice can best be resolved through participatory public decision-making (Healey 2007, Healey and Upton 2010; Friedmann 2011). However, as important as these trends are, approaches toward environmental disaster preparedness and recovery remain poorly connected with the developmental roles of governments in Asia. The United Nations (2013:3) finds, for example:

> Although increasingly risk management and reduction is mentioned in governmental development policies, plans and strategies...it is not treated as a truly multisectoral concern, and the institutional and legislative arrangements for disaster risk reduction are weakly connected to development sectors.

In addition, the capacities of city governments to create and use a governance system that can flexibly adapt to "uncertain and unpredicted conditions" is novel, with most continuing to rely on master planning and regulatory routines (Mirfenderesk and Corkill 2009:152). The great uncertainty attending disasters is too complex to be effectively addressed by conventional approaches. Fixed rules typical of bureaucratic forms of government are likely to fail in disaster situations because they are based on assumptions of high levels of predictability rather than being able to respond to ruptures in the status quo (Baker and Refsgaard 2007).

Given these observations, the task at hand is to begin to build new types of disaster governance capacities into local political institutions. This would require a fundamental shift in urban governance at the city level along with substantial transfers of power and financial capacities from central to local governments. As stated by the United Nations (UNESCAP 2011:209), "participatory local governance is one of the tenets of sustainable development and to be effective calls for a political 'space' which only decentralization can provide".

Although decentralization in the form of devolution of political power to local levels is a perennial theme in Asia, it has only begun to make progress over the past two decades in most countries (Bahl 2005, World Bank 2005, Laquian 2005). Indonesia has among the most devolved systems of governance in Asia, although it has only been in place for slightly more than a decade and is still very mixed in local government performance (Firman 2010). China is also using decentralization to improve environmental governance, with new environmental institutions and practices of local environmental policymaking involving private companies and citizen organizations leading to improvements in accountability (Mol 2009). At the other extreme are the many countries that continue to have highly concentrated government systems operating from capital cities, with localities taking "post office" administrative roles rather than possessing political decision-making authority (Douglass 2013).

In addition to more concerted political energy devoted to effectively devolving state power, innovations in local governance are also needed. In acknowledging "the immense progress made in many countries in East Asia to decentralize authority", Jha and Stanton-Geddes (2013:35) find that "inadequate capacity to implement disaster risk management efforts at the local level remains high" and that "most preventive measures are embedded in the design and construction of infrastructure or other sectoral spending" rather than in community engagement.

To be effective for disaster planning, decentralization would need to include incentives to move away from many current patterns of response. Among the more important are anti-corruption mechanisms to inhibit an aid-dependency syndrome encountered in many disaster relief episodes.[4] The dynamics of disasters require all actors to be participants in producing knowledge, mobilizing resources, and collaboratively taking action. For longer-term recovery and resilience, these innovations cannot be deployed only at the moment of urgency but instead need to be continuing elements of governance. It also needs to be flexible in quickly adapting to changing circumstances that cannot be well predicted in advance (Mirfenderesk and Corkill 2009).

Engagement with affected populations and flexibility in effectively adjusting to suddenly changing circumstances need to occur at the geographical scale of the problems at hand, as such disaster governance can be expected to operate at multiple scales. As was discovered in the aftermath of Hurricane Katrina in New Orleans in 2006, cross-scale linkages, each matched to the size and needs of the disaster, proved to be among the most important dimensions of much needed innovations in resilience in the face of the disaster (Baker and Refsgaard 2007). Participatory planning among organized actors that promoted trust to engage in coordinated responses was crucial for long-term recovery, as was institutional flexibility in situations of uncertainty, high levels of confusion and unpredictability in moving understandings of problems into remedial actions. One important but often neglected scale is that of neighborhoods and smaller urban spaces.

Neighborhoods

Given the context of most Asian cities previously described as being unequal in access to what Friedmann (1992) calls the basis of social power, which includes housing and living incomes and what Nussbaum (2002) refers to as capabilities, disaster governance needs to include an intentional focus on the urban poor, marginalized people, and the otherwise most vulnerable in the spaces in which they live and earn incomes. Including social and environmental justice is paramount, and for this reason, neighborhoods and their social institutions need to be included in any approach toward disaster governance. This would mean, for example, that instead of automatically turning toward the relocation of poorer households from flooded areas, governments would work with affected communities to first try to find ways in which people and their livelihoods, traditions, and social relations can stay intact by remaining in these sites.

Because disasters impact poorer members of society more than others, and because recovery is generally the most difficult for these people as well, such efforts would play "a central role in shaping a city's resilience" (Jabareen 2013:224). Governance in this context goes beyond disaster

[4] Cohen and Werker (2008) find that some governments not only underinvest in disaster prevention if they know that they will be bailed out; they also create a racket effect of not preparing for disasters as a way of rent-seeking from humanitarian aid coming with a disaster. Rampant corruption lies at the root of these practices. Devolution of power to local forms of participatory governance is found to be an important, though not sufficient, means to limit these practices.

recovery as an infrastructure and emergency service project to include broader policies toward empowering people to regain livelihoods and secure social spaces for living (UNISDR/UNESCAP 2012). If such efforts are not successful, environmental disasters can lead to downward spirals, lessening resiliency into the future.

Where they are successful, research finds that environmental degradation that contributes to natural hazards is often reduced. The UNDP (2013) reports that new initiatives for "community-driven development" (CDD) programs in Indonesia, Laos and the Philippines are successfully enabling communities and local institutions to take the lead. In addition to CDD initiatives, the government of Indonesia passed the Disaster Management Law in 2007 that gives citizens rights to protection from and during disasters. The law is implemented through fines and jail sentences to law offenders. It also identifies rights to information, education and training for disaster risk reduction and calls for the establishment of a new national as well as provincial disaster management agencies that allow for the active participation of non-government organizations.

Thailand's Baan Mankong program is an example of the ways in which lower income neighborhoods can become active as decision-makers in integrating disaster risk reduction and preparedness into their social and economic lives (Boonyabancha 2005, Archer 2010, UNDP 2013). A Bangkok community exposed to repeated flooding, Baan Mankong residents worked with government to improve infrastructure and houses, which meant raising them onto stilts, while also investing in flood preparedness, including establishing a fund to which neighborhood members contribute $1 per month that is made available to families in need when flooding occurs. As the 2011 flood came to Bangkok, the community organized itself to prepare sandbags, open a disaster center at the uphill temple with a kitchen to provide food, and stockpile basic medical equipment. Volunteers from the community staffed the disaster center. Because they were from the community, they readily understood the situations of families in need.

The Baan Mankong approach is an important case of what disaster governance can accomplish at the smaller urban scales of the neighborhood. Its approach stands in contrast to the more general pattern of slum clearance and relocation by governments and advisors who use sector approaches and disaster management understandings to prioritize canal clearance over trying to sustain the social fabric of neighborhoods and livelihoods.

The City Region Scale

While many of the most serious impacts of disasters are experienced at neighborhood or community scales, the incubation of compound disasters typically occurs at the scale of the city region. In Asia's MURs the dynamics at play that lead to flood disasters include (EEPSEA 2009, Alcamo 2009, Bates et al. 2008, Marcotullio 2007, Firman 2010):

- Land subsidence from over drawing groundwater;
- Saltwater intrusions into underground water supplies;
- Deforestation in upland areas;
- Massive increases in non-porous ground cover;
- High population densities and loss of open spaces;
- Growth of low-quality settlements along waterways;
- Uncontrolled dumping of waste into waterways;
- Infrastructure failures.

The location of most MURs in coastal areas adds the additional challenges of sea rises and heightened vulnerability to extreme weather events. Together these phenomena comprise a multi-stranded assault on urban ecologies that requires a regional scale approach to address.

The search for a form of governance that can integrate planning at the city region scale is a long-standing one (Freire 2006, Laquian 2006). Solutions are wide-ranging, including the establishment of consolidated metropolitan planning authorities, federations of local governments, and bilateral functional agreements to share specific services and infrastructure between contiguous countries (Vogel et al. 2010). Several metropolitan regions, such as Beijing, Hanoi, Osaka, Seoul, Shanghai, Tianjin and Tokyo have been placed under unified governance by expanding their physical boundaries to absorb other cities and rural districts into them. In the cases of Beijing, Shanghai and Tianjin for example, the central government created single unitary governments headed by mayors appointed by the national government.

The Tokyo Metropolitan Region is also a consolidated form of MUR governance. It has been able to implement a comprehensive development plan encompassing its core 23 wards within Tokyo City and parts of the prefectures of Saitama, Kanagawa and Chiba and the district of Tama. Significant results of this consolidation have been reported in terms of traffic congestion alleviation through region-wide transportation planning (Laquian 2005). Air pollution has also been reduced.

Although many proposals have been put forth for environmental sustainability, such as those for compact cities, linear cities, smart cities, eco-cities, and, simply, green cities, these do not directly speak to issues such as how to guide urban growth in a way that minimizes the potential for flooding. In terms of disaster governance, a return to McHarg's (1995) concepts of guiding urban form in a way that best supports city region ecologies, particularly to avoid flooding, would be more relevant than many eco-city proposals are. Thus, conversion of land to urban uses would avoid steep uplands, waterways needed for natural drainage, aquifers where rain runoff can collect and be absorbed to replenish groundwater supplies, and coastal zones that are critical interfaces between land and sea ecologies.

The relationship between urban form and disaster management is gaining recognition. The new master plan for Hanoi, for example, reserves 70 percent of the land area to be open and green till at least 2030. This is made possible, in part, by the government decision in 2008 to incorporate a surrounding province and several districts of other provinces into a single consolidated municipality. Overnight, Hanoi became one of the largest cities in the world in terms of area, which now encompasses an area of 3,328 square kilometers, or three times its former geographical size and more than twice its previous population. As a master plan by international urban design teams that entails sweeping changes to the city region and has no public participation, the new plan remains controversial in that while the landscape might be flood resistant, how lower income households fit into it is not revealed in detail.

Efforts underway in the Pearl River Delta of China between HK, Macao and Guangdong to create an "Urban Cluster Coordinated Development Program" (CCDP) as a regional scale of governance take the form of a federation of local governments, in this case ones with unique administrative status and border authorities. Among the many objectives of this rescaling of territorial government is to provide open space and agreed upon environmental conditions to control overall development cooperatively. Spatial guidance for individual cities is included in the program to ensure that the development of cities is in accordance with regional spatial strategies. A principal intention of the plan is to divert development away from ecologically sensitive areas (Vogel et al. 2010).

From the 1970s in Indonesia, attempts were also made to create a super regional scale of planning with proposals for a broader spatial scale of planning for Jakarta. Coined as Jabotabek, it sought to combine Jakarta with parts of West Java as an appropriate environmental scale to coordinate planning in the emerging mega-urban region extending far beyond Jakarta's boundaries (Douglass 1991; Jones and Douglass 2008). However, neither the national nor provincial governments have officially adopted any of these proposals. Over the ensuing years, the growth of this city region has been among the most spectacular in Asia, which jumped from under 5 million in 1970 to nearly 30 million inhabitants in 2010, representing annual increases of over half a million people per year (Kurniawati 2009).

Now officially called Jabodetabek-Punjur[5], the greater Jakarta region has generated environmental sustainability problems that also continue to increase in scale and impacts (Arai 2001, Firman 2004, Peresthu 2005, Tunas 2008).[6] The floods of 1996, 2002, 2007 and 2013 were the greatest and most destructive ever recorded in the city's long history (WHO 2007).[7] Political reform and the devolution of government to provincial and regency levels have potentially generated a new era for a federated approach toward governing the Jabodetabek MUR. As annual flooding becomes more widespread and mutually destructive beyond the Jakarta DKI[8], this might also increase incentives to begin to effectively rescale governance to make this mega-urban region more resilient in the face of increasing disaster risks.

Despite differences in institutional arrangements, all efforts to re-scale urban governance have in common the attempt to achieve high level of coordinated planning capacities at the city region scale that can overcome tendencies among local governments in the region to disregard opportunities and impacts that cross borders. However, the idea of moving upward toward city region scales of governance for disaster preparedness and resilience is still novel, and the role of disaster governance in reducing vulnerability and exposure to hazards is just beginning to be recognized.

Transborder Riparian Regions

Transborder riparian basins are among the most at risk of compound disasters. Asia's riparian systems are immense. They include at least 40 major transborder rivers and lakes (Figure 3), totaling more than 16 million square kilometers of land area in their basins. As Asia urbanizes, cities reach ever more deeply into these regions to harness water supplies, generate hydro-power, appropriate natural resources, and re-organize local economies to serve urban demand. Global climate change adds to their transformations as the Tibetan-Himalayan glaciers rapidly recede and are likely to disappear, and unusual weather events create extraordinary episodes of flooding and landslides that

[5] As the mega-urban region of Jakarta has expanded, so has the name for it, beginning in the 1970s with Jabotabek, then Jabodetabek, and now Jabodetabek-Punjur to signal its expansion toward Bandung.

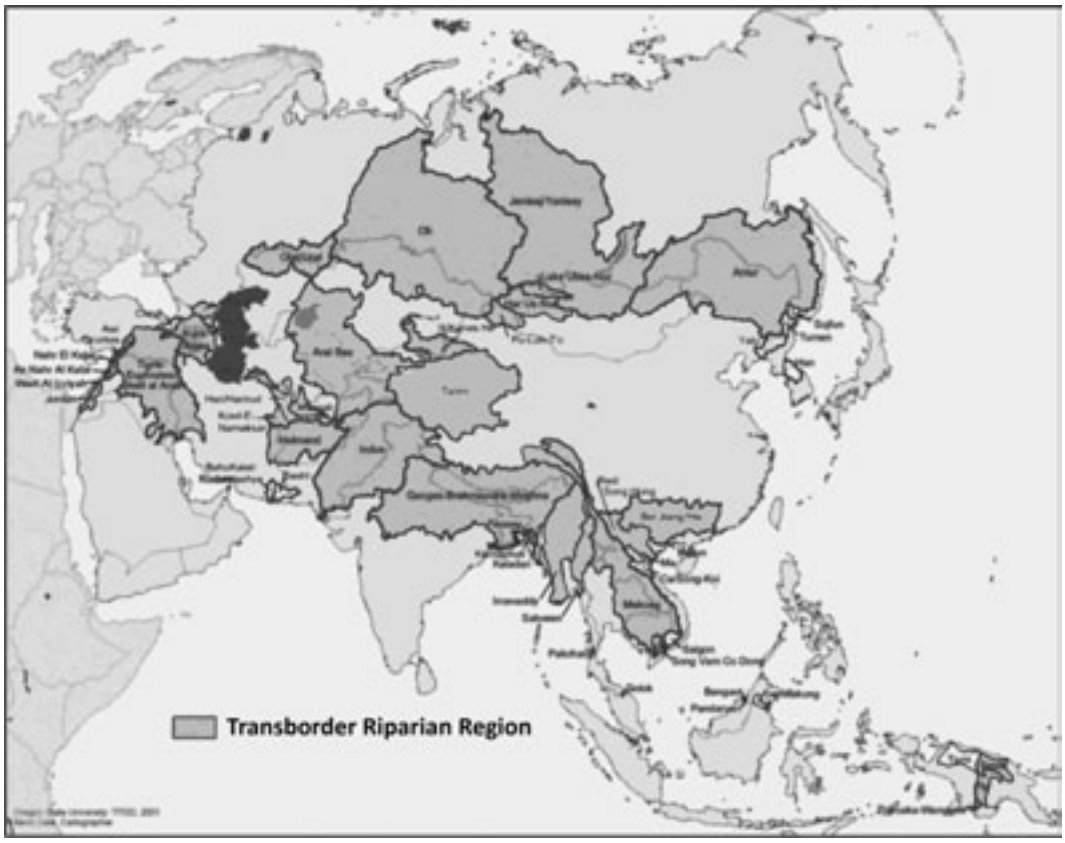
[6] The gap between low cost housing provision and demand continues to increase and is now reaching a deficit of 800,000 units (Widoyoko 2007).

[7] In the 2007 episode as much as 75 percent of the city was flooded, displacing a recorded 430,000 people, mostly poor, from their homes (BBC 2007, Steinberg 2007). Health impacts – diarrhea, skin and respiratory problems, dengue fever – breakdown of basic urban services and loss of livelihoods lingered long after the floodwaters resided (Yuniar 2009). Thousands of homes were totally destroyed, and business losses were estimated to total $1 billion (Rukmana 2011). The 2013 torrential rains flooded more than 100,000 homes, left 47 people dead, and shut down the entire city of 10 million people for several days (*Jakarta Globe* 2013). The estimated economic cost of the flood is more than $3 billion.

[8] Jakarta DKI (Daerah Khusus Ibukota) is the name given to Jakarta as a special city region with status equal to that of a province.

threaten life, livelihoods, social and cultural practices, and biodiversity throughout each region (UNEP 2006, 2007).

Figure 3. Transborder Riparian Regions of Asia



Source: UNEP (2007).

Among the more controversial urban intrusions into riparian regions is the construction of mega-dams. Research by the independent World Commission on Dams (2000) found that the damaging ecological impacts of the larger dam projects are substantial and, in some instances, irreversible (WCD 2000, ICEM 2007). When riparian regions cross national borders, nationalism and a lack of incentives for upstream countries to be concerned about downstream disasters has made riparian governance extremely difficult (Ashayagachat 2008, Chellaney 2007; Dinar et al. 2007, Gunn and McCartan 2008).[9] These observations lead to the need for cooperative transborder mechanisms to govern riparian regions that are able to cover four dimensions of governance. Among the key components of a much needed riparian governance are (Douglass 2011):

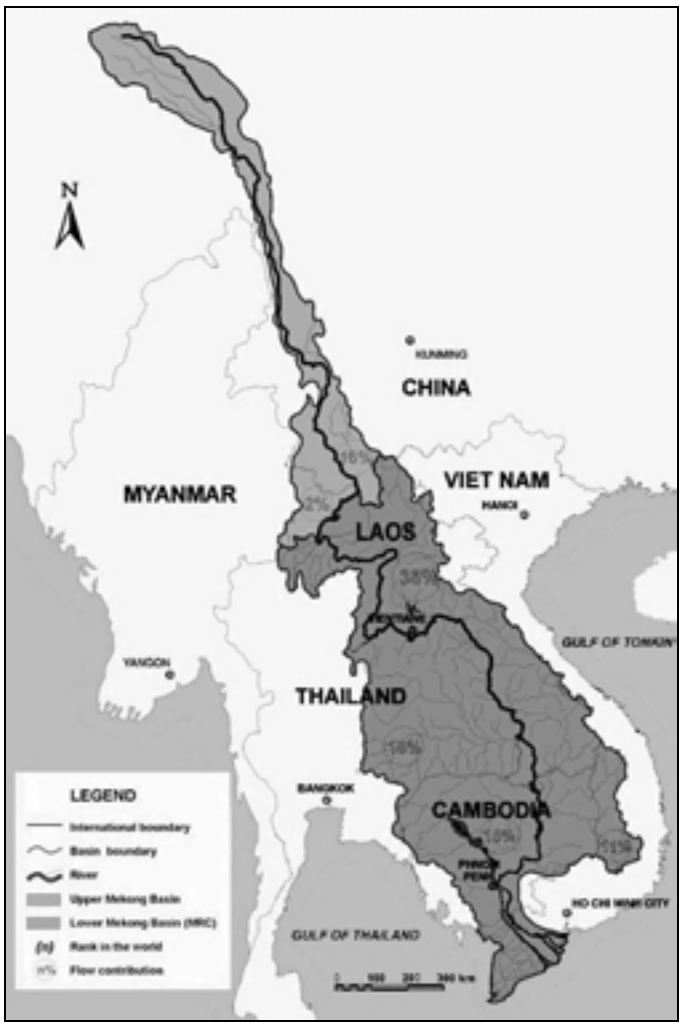
- **Information processing and sharing.** Governments of upstream countries can be unwilling to share information with downstream countries about impending water diversion, dam construction, and waste disposal. Multiple forms of data are needed from different sources to ensure open dialogue and greater trust among stakeholders (Nakayama 2007, Wyatt and Baird 2007).

9. Most large dams are significantly under-performing with reduced holding capacities from silting, and thus power generating ability (Bauer and Rudolph 2001, WCD 2000).

- **Transborder Agreements** to establish legitimacy for long-term transborder cooperation and conflict resolution. These can take many forms: treaties, compacts, memoranda of understanding, protocols, and others, including personal relations of trust among national leaders.
- **Civil society participation** to ensure that local social and economic interests are included in decisions that reshape regional ecologies and human lives that depend on them.
- **Supra-national governance authority** to establish a significantly autonomous and neutral source of information, agreement brokering, and venue for participatory transborder regional governance.

The Mekong River Basin provides one approach to transborder riparian governance that more recently includes concerns over environmental disasters. Running from the Tibetan Plateau through six countries, the Mekong is the 12th-longest river in the world (Figure 4). Approximately 60 million people live in the Lower Mekong Basin where the river supplies water for drinking, irrigation, hydropower, transportation and commerce for and connected with the region's fast expanding cities. It serves millions more in China and Myanmar (UNDP 2006).

Figure 4. The Mekong River Basin



Source: The Mekong River Commission (VNMC 2009)

Transformations of the basin have intensified in recent decades (ADB 2008, WWF 2008). The Mekong River Basin is at high risk of flood disasters. Almost 70 percent of the forest cover is gone. The 2011 floods set new records (International Rivers 2013). In the same year a study by Princeton University concluded that if the 27 new hydropower dams planned for the region were built, they "could have a catastrophic impact on the river's fishery and millions of people who depend on it" (Sullivan 2012:1).

The Mekong River Commission (MRC) was re-established in 1995 as a means to create a form of transborder governance capable of guiding development toward more sustainable ecology and livelihoods of people in the region (Jacobs 2002). Funded by UNDP, the MRC includes provisions for cooperative natural resource planning, environmental and social cost management, databases and information systems, and organizational management and cooperation. China and Myanmar are dialogue partners of the MRC to further its reach for transborder cooperation. The 2001 Work Programme represented an important shift toward creating region-wide approaches to planning rather than continue to focus on individual projects. It also included the idea of the MRC as a "learning organization" that was to engage civil society organizations in finding "bottom-up" solutions to river basin planning issues, particularly with regard to livelihoods.

The MRC is also attempting to turn toward a transborder regional development approach through "Integrated Water Resource Management" (IWRM). Defined by the Global Water Partnership as "coordination of development and management of water, land and other resources for maximizing of economic results and social welfare with no compromise on environment" (GWP 2003), the central principals of the IWRM are participation and integration of the resources, institutions and stakeholders for sustainable water resources. Transborder collaboration across the riparian region is included in the approach (Biswas 2008).

As a donor driven organization that has been criticized for putting urban-centered interests over those of the environmental and riparian populations, the MRC faces continuing challenges in getting governments to buy into the IWRM formulation as a new approach toward riparian governance with environmental disaster elements (Varis et al. 2008a, 2008b; Hirsch and Jensen 2006). In response, the MRC has stepped up research and dissemination of technical reports on major trends and issues in the region, and has begun requiring large-scale projects to do environmental impact statements before, during and after construction (MRC 2009). Given the often contentious political contexts of transborder riparian planning, and the unlikelihood of supra-national regulatory institutions to appear in the near future, the most promising areas for collaboration remain in the realm of transparency in information analysis and sharing, open forum for discussions and, particularly among powerful international funders, continued openings for 'bottom up' planning from within the regions at very local levels.

CONCLUSIONS: THE URBAN MATRIX OF DISASTER GOVERNANCE

> *Natural disasters occur in a political space*
>
> (Cohen and Werker 2008:795)

> *Public involvement is critical in all aspects of disaster risk planning from central to local governments and to community levels…It is important to decentralize policies and customize them according to local needs and priorities*
>
> (ADB 2013)

Asia's rapid urban transition and its effects on environmental disasters call for new approaches to disaster governance, not just for cities but also for the regions incorporated into their spheres of influence. The sheer size of still expanding urban agglomerations that now include millions of people in a single contiguous space presents novel conditions for approaching the many questions about how to confront the portent of increasing disasters. The gravitation of urban populations to coastal and river basin areas with high disaster risk magnifies the need to reflexively respond to scales and impacts of disasters for which societies have little previous experience. Urbanization in Asia also adds new types of vulnerabilities in need of concerted attention, which in addition to children, elders and disabled people, would include the millions of people living precariously in high disaster prone slums.

In the emerging urban matrix of social, political and economic relations, disasters can quickly compound into other disasters that cascade through spatial systems, with events in one location impacting conditions in another in almost instantaneously unexpected ways. As cities organize distant natural resource regions and other rural sites to supply energy and resources to them, disasters can incubate unnoticed or unreported in jurisdictions with weak authority to oversee projects such as nuclear power plants or mega-dams.

Disasters emanating from such areas can boomerang back to the metropolitan regions that put them in place. They can also leap frog from city region to city region on a global scale, with the impact of an earthquake or tsunami shutting down production in one city region or country creating a production crisis in another.

While physical recovery of a disaster site might be possible in a relatively short period of time, finding resilience to both its social consequences and its compound effects can be expected to take much longer, and in some cases might not occur at all. Preparing for possible disasters thus extends beyond a single event, and for this reason governance should be given attention to underscore the need for a social learning process that includes many perspectives and voices in political processes of decision-making. As summarized by Jabareen (2013:227):

> *City and community resilience is a phenomenon that is complex, non-deterministic, dynamic in structure, and uncertain in nature. It is a phenomenon that is affected by a multiplicity of economic, social, spatial, and physical factors. Its planning involves a wide range of stakeholders including civil society, local and national governments, the private sector, and various professional communities, and it therefore affects a variety of urban communities and city residents*.

Though not automatic, participatory governance can provide an arena for pursuing social and environmental justice in responding to environmental disasters. This entails governance institutions and mechanisms organized at the critical scale of critical "problem sheds" (Allen 1998), three of which are the neighborhood, city region and transborder riparian region. The case of transborder riparian regions presents formidable challenges in improving transborder governance capacities. The social and economic life of most of continental Asia depends on the ability to prevent and recover from what seems certain to be increasing environmental disasters in these regions. Asia's urban transition figures highly in the matrix of riparian region governance as cities reach ever more deeply into these regions to build dams for hydro-electricity and water for urban, industrial, as well as commercial agricultural uses.

Decentralization, democratization and participatory planning are fundamental in creating arrangements that are able to work horizontally and vertically over space to link the smaller scales of daily life-spaces with city and regional level planning processes. Success at one scale can magnify

problems at another, however, and mechanisms are needed to overcome the tendency of boundaries to separate or generate competitive relations rather than integrate through collaborative agreements among them. In terms of disaster governance, an important consideration is whether decentralization of government powers within nation-states would allow and encourage city regions most affected by transborder disasters to proactively engage in disaster governance across borders with other affected city regions. This is a question which has yet to have significant experiential evidence to assess.

The five types of effects of Asia's urban transition on environmental disasters at three geographical scales discussed above are illustrative of the multiplicity of ways in which our understanding of environmental disasters needs to be recalibrated in research and policy. Instead of understanding disasters as separate events, we need to understand them as ruptures that reflexively compound through chains of interdependencies that begin well before a disaster and ripple long after in unexpected ways. To cover these temporally and spatially wider complexities, we need perspectives from many disciplines and knowledge from multiple sources, most especially from people who live in localities experiencing a natural disaster. By helping to triangulate competing reconstructions of events, a scanning of many sources of knowledge is important not only for building consistent evidence-based records and coherent explanations of disasters and their impacts. Through such a process research can also better contribute to the production of knowledge as a social learning process that can bring the knowledge and skills of academics and disaster specialists into conversation with the richly contextual knowledge of people in disaster localities. In this way, too, it can make needed contributions to inclusive processes of disaster governance.

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