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The Urban Risk Dilemma: Urbanisation, Modernisation and Disaster Risks in Ho Chi Minh City

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1 ABSTRACT

The future challenges for urban planning and urban governance are often far more observable within the context and complexity of urban agglomerations in countries of the Global South like Vietnam. Here urban development is dynamically changing both urban form and function. More attention therefore should be placed on documenting, mapping and comparing the spatial distribution of urban structures and population over time. This however would require conceptual and methodological clarity to go beyond simplistic assumptions and to arrive at spatial planning recommendations, which effectively direct urban growth and redevelopment priorities and patterns. Rapid urbanisation is a manifestation of the ongoing modernisation process in Asia accompanied by rapid economic and social development. The environmental dilemma, as the major risk component of urbanisation, stresses the negative side-effects of urban-environmental processes. Urbanisation and environmental change is seen to shape the basic prerequisites for urban resilience to climate related hazards. In one sense, the local urban environmental risks themselves can be seen to reflect the challenges of such changes through global climate change and its impacts on population.

2 URBAN GROWTH MONITORING - CASE STUDY HO CHI MINH CITY, VIETNAM

Coastal Asia is facing an urban century in which not only the growth of population in their cities will ultimately determine their resilience and sustainability, but also their patterns of development. The empirical interrelationship between rapid urbanisation processes in coastal Asia and the associated increases of risk to weather and climate-related disaster hazards cannot be fully explained solely in terms of changes in population. Much more important however, is the consideration of the spatial distribution of people and economic assets in risk-prone areas, primarily as a result of rapid urbanisation. Here the sensitivity of both the exposed population and assets—can be used as an indicator for the ability to cope with and reduce risk. There can be little doubt, that a dominant factor contributing to increased vulnerability is urbanisation itself. How this dynamic pattern of urban development assists or hinders risk adapted planning and management is the critical issue that will be highlighted in our indicator-based assessment.

The southern Vietnamese city of Ho Chi Minh City (HCMC) is a rapidly emerging megacity and represents one of the most dynamic examples of urban development over the last few decades. The city is precariously located on the banks of the Saigon River, 60 kilometres from the South China Sea and northeast of the Mekong Delta, in an estuarine area of Dong Nai River system. In a short space of time, the city has grown into Vietnam's largest and most populous settlement, becoming an important port city for Southeast Asia and beyond and contributing a dominant share to the national economy. The official population of the city as of 2009 was 7.2 million, spread over a total administrative area of 2095 square kilometres (STORCH& DOWNES 2011a).

Originally founded on relatively higher grounds, the city has densified through the infilling of open spaces or the redevelopment of existing buildings. However of greater concern is the rapid expansion into lower-lying and former wetland surroundings, primarily at the expense of urban greenscape and valuable multifunctional natural areas. The city is currently incised by a dense network of rivers and canals of around 8.000 kilometres in length, which account for 16 percent of the total area. These waterways are affected by a semi-diurnal tide. In coincident with annual rainfall peaks a significant percentage of the city's neighbourhoods regularly experience floods, due to a combination of tides, heavy monsoon rains and storm surge floods. The dimensions of this flooding are however constantly changing due to the ongoing rapid urbanisation (STORCH& DOWNES 2011b).

2.1 Urban development trends and problems in HCMC

The official population forecast estimates that HCMC will become a megacity and reach a population of 10 million by 2020. According to the official urban development strategy, HCMC will be developed in the future based on a multi-centre pattern along the northeast, south/southeast, north/northwest, southwest directions. As a result, HCMC's planning administration has recently established so-called new urban areas as focal points for new satellite development, which will integrate fringe areas in the currently more rural outer city districts. The city's current radial development structure is still to some extent impractical, resulting in insufficient land available for public services and for open space.

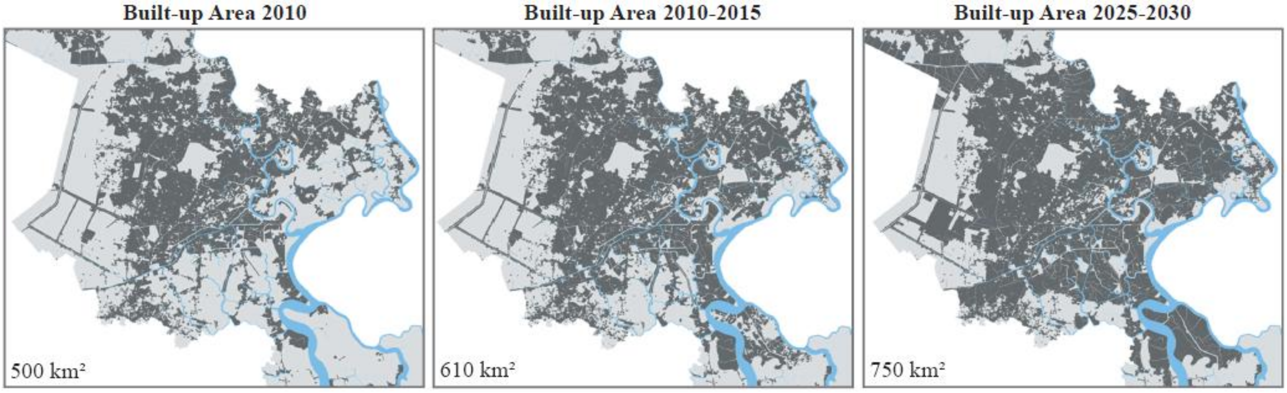

Fig. 1: HCMC's official urban development scenario up to 2025/30

Figure 1 illustrates the future urban growth process of HCMC based on the official land-use plans for the next planning period. The implementation of the land-use plans for the years 2010 up to 2025 will increase the total built-up area to 750 square kilometres (an increase of 50 percent). In order to accurately define the precise spatial extent of the current built-up area, the digitalised version of the official land-use map 2010 at a scale 1:25,000 provided the common spatial geometry based on which a 'current land-use' map for the year 2010 was compiled. Current land-use was determined from the visual interpretation of high resolution panchromatic satellite imagery; the classification was based on our urban structure type classification for the entire HCMC urban area (STORCH& DOWNES 2011b). A limitation of simple urban growth scenarios is that the simplified mapping of built-up areas over time fails to show real land-use densities, ignoring the structural changes and alterations of the current and future urban settlement typologies over time.

2.2 Urban structural indicators to analyse development patterns

Urbanisation is an extreme case of land-use change. For HCMC, rapid and dense urban expansion and inner-city redevelopment has primary direct impacts at the local scale in changing the visible urban structures and form and indirect secondary affects in for example alteration of the urban climate and increasing the need for indoor cooling or modifying the urban water-cycle. The following questions will be explored for climate-related impacts in the urban environment of HCMC (STORCH 2007):

- Where and how does urban development change the land-use pattern of the metropolitan area of HCMC, and to what extent does this affect climate change related impacts on the urban environment?
- Which urban structure typologies can be distinguished (DOWNES ET AL.2011), and what is the relation between their characteristics and the assessed level of resilience against climate-related impacts?
- How adequate are the existing land-use planning and urban-environmental management approaches to the relevant governance structures; to what extent do they contribute to an urban development that takes climate-related urban-structural indicators into account?
- Which hotspot areas can be identified for predominant climate-related impacts in HCMC, like inner-urban flooding caused by high-degrees of imperviousness, and affects to urban climate caused by high-dense building structures?

An important first step in the estimation of hotspot areas is to describe the observable indicators related to both urban form and structure (STORCH ET AL. 2011). The most dominant feature of the urbanisation process in HCMC is the rapid growth of the city itself and the surrounding urban agglomerations. Urban population growth due to birth surplus and in-migration has caused high land demands. In HCMC, urban growth and land consumption indicators are just about to be recognised in planning decisions, while a more regulating use of core urban indicators is still limited. Until recently the available information is often inadequate or spatially not explicit enough for assisting urban policies like indicator-based planning regulations.

In general, the ratio between built-up and non-built land provides a good overall first impression of the spatial character of the city. Built-up areas typically include residential areas, industrial, and commercial areas. However, in emerging Asian megacities like HCMC, the monitoring of the building footprint alone is not sufficient. Therefore, in order to analyse urban land-use, urban density and spatial development trends over time typically a stepwise indicator approach is used. Here, an initial indicator framework is composed of core sets of indicators measuring different aspects of urban land-use and building density. The first step in assessing the existing urban structure and land-use efficiency is to evaluate changes of the urban form and housing structure and their relation to building densities and land utilisation efficiencies (GILL ET AL. 2008). The indicator framework leads from basic land-use indicators to building density measurements and finally to a combined analysis of population densities and land-use intensities. The most important efficiency indicator pattern is the ratio between built-up and non-built areas.

2.3 Urban Indicators describing the built-up structure of HCMC in 2005

The total area of HCMC is about 2095 square kilometres, divided into 24 administrative districts, hosting in the year 2004 an official population of 6.2 million. 5.2 million of which lived in the 17 urban districts occupying an area of 494 square kilometres and displaying an average population density of around 11,000 inhabitants per square kilometre. The inner-city urban areas are concentrating on an area of 140 square kilometres more than half of the population resulting in an average density of 26.000 inhabitants per square kilometre, with peak values in inner-city informal settlements with up to 80.000 inhabitants per sq km (GSO HCMC 2006).

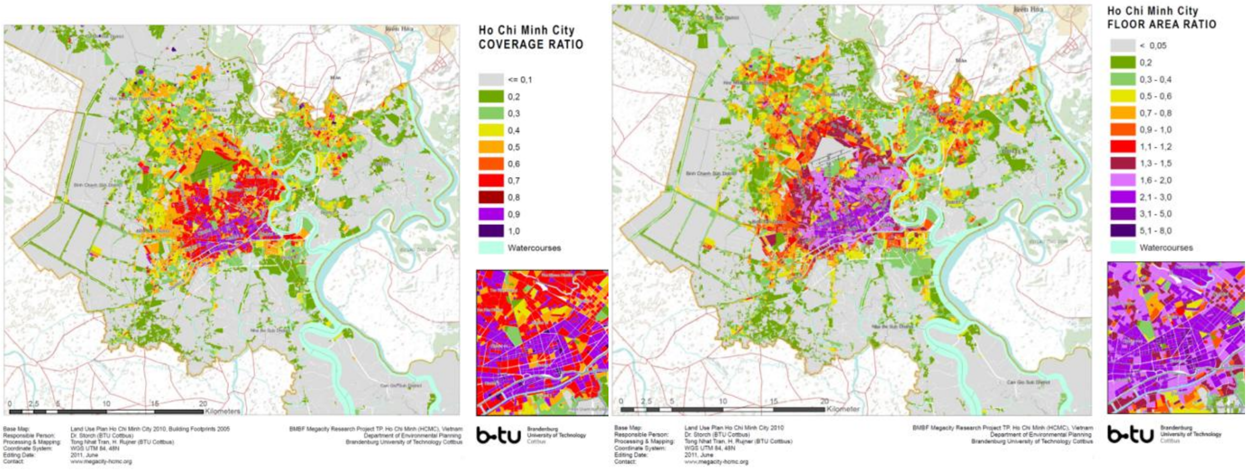

Fig. 2: Coverage ratio and floor area ratio in HCMC's urban core for the year 2005

The extremely high-dense inner city development, with built-up (coverage) ratios of more than 0.6 (i.e. 60% ground coverage) and floor area ratios equal or greater than 1.5 (Figure 2), is predominately realised by the infamous shophouse typology. This typology consists of a flat-roofed row house with a plot size of approximately 4 x 20 metres. The shophouse typologies are the dominant structure in HCMC, accounting for 95% of the seen residential urban structure types (Table 1). Furthermore, with typical building heights of between two and five floors (Table 2), very high density levels are achieved, while the remaining open space is often only represented by the public street areas.

Residential category	No. of sub-division into urban structure types	No. of blocks	Surface Area (km²)	Percentage utilisation category	Percentage of total HCMC surface area
Residential (total):	25	6.717	446	100	21
Shophouse-based	12	6.346	425	95	20
Villa based	04	107	8	2	<1
Apartments	05	103	5	1	<1
CBD	02	160	7	2	<1

Table 1: Classification of HCMC's urban structure types for the year 2010, defining residential land-use

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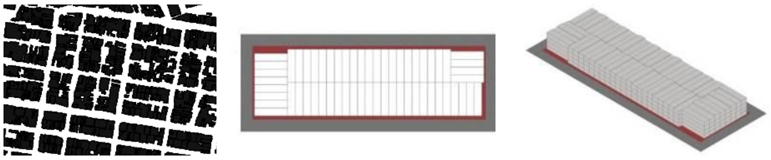
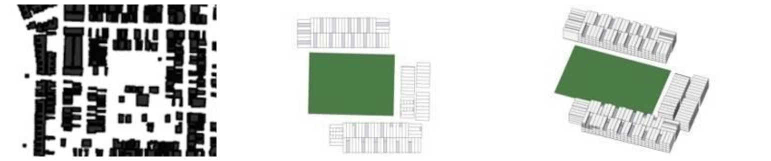
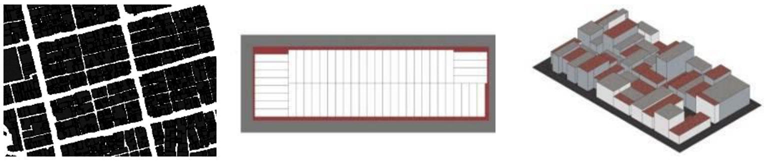
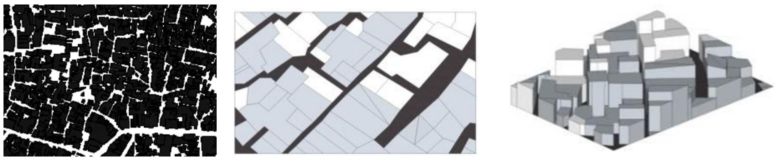
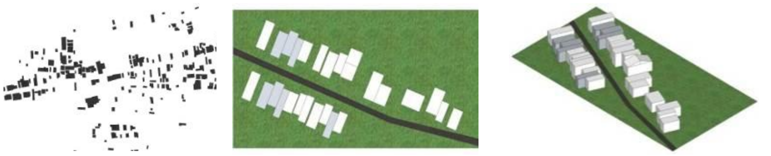
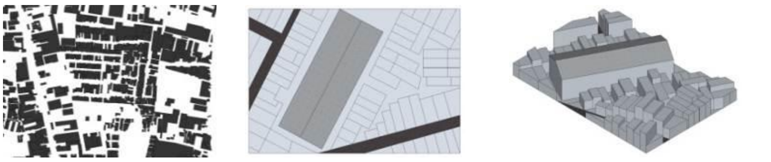
Code /Urban Structure Type Name	Building Footprint	Plan View	3D View	Built-up Ratio (%)	Floor-Area Ratio (%)	Avg. no. of floors
111 / Shophouse Reg. New				45	123	2.7
112 / Shophouse Reg. New Community				26	88	3.4
113 / Shophouse Reg. Alleyways				57	153	2.7
114 / Shophouse Reg. w/ Yards				28	64	2.2
121 / Shophouse Irreg. High-dense				58	154	2.7
122 / Shophouse Irreg. w/ Yards				38	88	2.3
123 / Shophouse Irreg. Scatt. (Peri-urban)				14	30	2.2
124 / Shophouse Irreg. Clust./Line. (Peri-urban)				15	29	2.0
125 / Shophouse Irreg. w/ lar. Fields (Peri-urban)				5	9	1.9
131 / Shophouse w/ Indust.				38	81	2.1

Table 2: Density related indicators of HCMC's shophouse-based urban structure types

2.4 Urban indicators describing the change of built-up structures of HCMC over time (2005-2010)

Our core indicator set (STORCH ET AL. 2007), measures the issues linked to the extent and growth of built-up areas and the efficiency of the land utilisation (floorspace), in relation to the common spatial unit of the official land-use block. The following urban growth and (re)development oriented aspects are measured by comparison of the core-indicators themselves over time. This describes more specifically the growth rate at which built-up areas and floorspace have expanded and evolved over the time period of between 2005 to 2010.

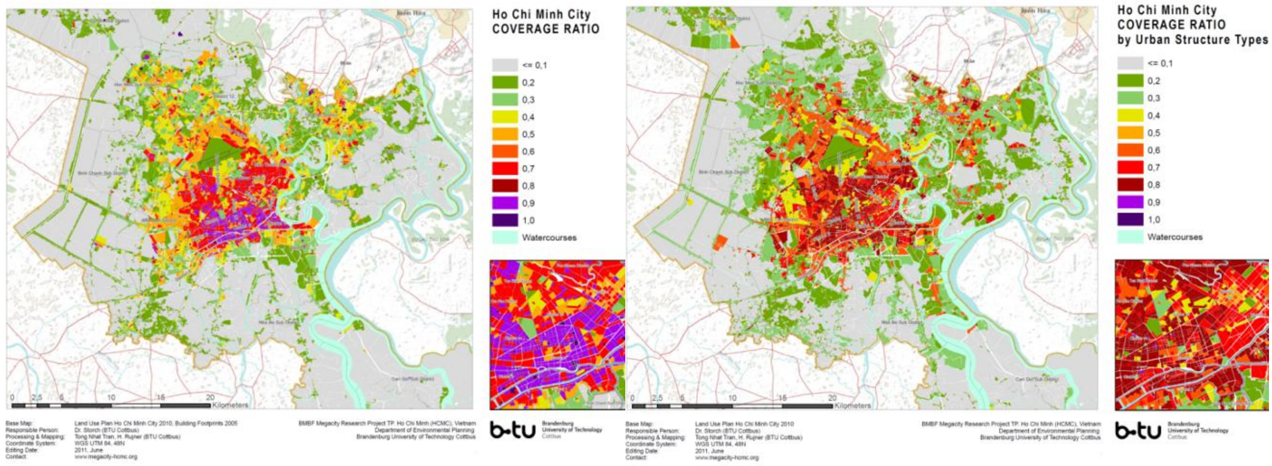


Fig. 3: Comparison of the indicator "coverage ratio" between the years 2005 and 2010 (Note: the map for the year 2005 (left), is based on building footprint data, while the map for year 2010 (right), is based on urban structure type mapping)

Figure 3, illustrates the urban development for the period 2005 to 2010 for built-up areas based on the indicator ground coverage ratio. Seen are the ongoing sprawl developments taking place along the main transportation routes on agricultural land, counteracting the official development according to the satellite urban model. Recent and current residential areas are dispersing towards eastern (District 2, 9 & Thu Duc), southern (District 7, Nha Be) and western directions (District Tan Phu, Binh Tan, Binh Chanh).

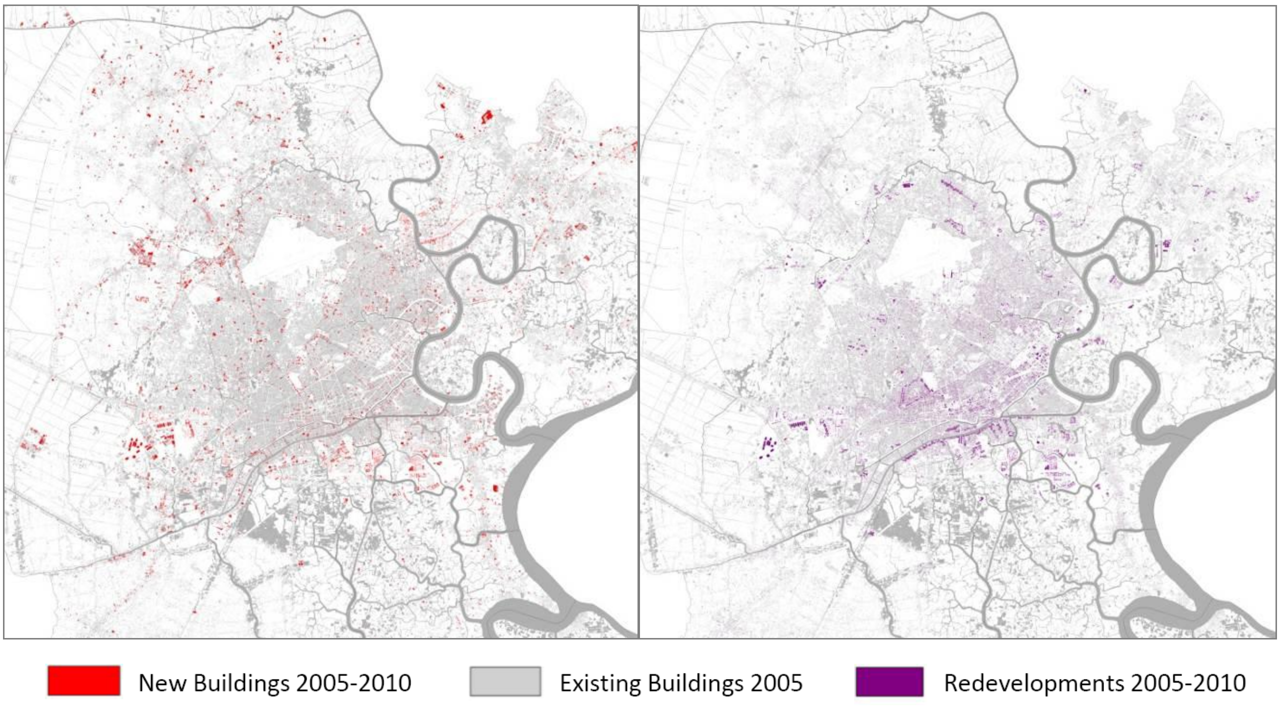


Fig. 4: New developments (left) and redevelopment Activities (right) between the years 2005 and 2010 (The Analyse is based on the detailed mapping of building typologies, shown in Table 3, at a scale 1:5000 in 2005 and 2010)

Interesting to note is that even within the existing urban core (District 6, Binh Thanh) (re)development activities are high. Caution should be exercised however as an overdevelopment in the existing urban core will result in an overload to the limited basic urban services and infrastructure. For a sustainable development scenario, it is important to understand and not lose track of the future urbanisation challenges and the requirements for the provision of basic urban services and technical urban infrastructure preparation. Besides sprawling new urban developments, the ongoing continuous compacting and densification, horizontally as well as vertically, of the existing settlement structures is a visible trend in HCMCs recent development pattern.

Figure 4 illustrates that new developments and redevelopment activities—mapped on the level of building types (Table 3) —between 2005 and 2010 that lie within the current urban core. Visible are the concentrated new developments seen focused in new urban areas in the outer districts. However also visible and rather surprising, is the great number of construction activities on single construction sites at the building level in the inner city core. This activity is seen to counteract the official development strategy.

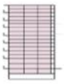
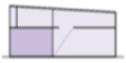
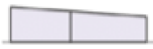
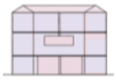
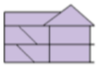
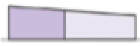
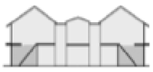
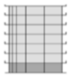
Building Type		Coverage (ha)	Floorspac (ha)	Height (flrs)	Coverage (ha)	Floorspace (ha)	Height (flrs)	Coverage (%)	Floorspac (%)	Height (%)
		2005			2010			Change 2005- 2010		
Apartment		113	569	5,0	166	890	5,3	48	57	6
High-rise		19	120	6,4	28	223	7,9	51	86	23
Detached		2149	2824	1,3	2872	5893	2,1	34	109	56
Semi detached		317	334	1,1	458	724	1,6	45	117	50
Temporarily-built and others		37	41	1,1	17	21	1,2	-54	-50	8
Terraced		3496	7001	2,0	7154	18001	2,5	105	157	26
Villas		893	1504	1,7	897	1777	2,0	0	18	18
Wood-framed, thatch- roofed		54	56	1,0	52	53	1,0	-5	-6	-1
Markets		8	29	3,5	17	66	3,8	108	126	9
Hotels		39	160	4,1	45	226	5,0	16	41	22
Office building		113	593	5,3	131	777	5,9	16	31	13

Table 3: Urban structural changes in HCMC from 2005-2010—Core indicators for dominant building types.

Table 3, additionally underlines with the comparison of urban structural indicators (ground coverage and floorspace) the ongoing densification trend between 2005 and 2010. Except for the more informal building types, all building types have significantly increased in both built-up (coverage) and in floorspace density. Particularly the dominant shophouse-related building types show a doubling of their total ground coverage and—due to an increase in their average heights – the floorspace for this type can be seen to have increased by more than 150% in only 5 short years.

3 CONCLUSION

Planning for risk and uncertainty for future urban growth will not just be a challenge for high-flood prone areas; it will be a broader challenge impacting on the very nature and location of future urban developments, particularly when planning for climate change. There is a strong correlation between urban vulnerability and physical exposure. Here land-use planning that takes into account disaster risks can be seen as the single most important adaptation measure for minimising future disaster losses. The spatial planning frameworks and subsequent urban planning decisions, as currently applied, do not attach sufficient importance to both the physical exposure and the actual rate of urban growth. Urban growth does not increase exposure of population to risks per-se. In general, urban governments are responsible for regulating either building or development in a way that reduces risks. For high-dense Asian megacities, the complexity of risk and vulnerability requires high resolution spatial information systems, in order to identify hazard patterns, vulnerability and risk at a scale that can provide information for urban land-use and development planning. Urbanisation does not necessarily have to lead to an increasing hazard portfolio and can, if managed properly, contribute to reduce risk. Yet, there are a number of key characteristics of the urbanisation process that do directly contribute to the configuration of risk. Spatial and physical exposure alone does not explain nor directly lead to increased urban risk. If urban growth in risk-prone locations is redirected by adapted land-use zoning and guided by adequate building standards, resulting risk patterns can be effectively managed and reduced. It is the very 'spatial dimension', the form and structure of urban settlements that concerns urban and regional planning.

4 ACKNOWLEDGMENTS

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