Chapter 15
Development Plan as a Tool to Improve the Disaster Resilience of Urban Areas

Ranjith Perera and Dzul Khaimi bin Khailani

Abstract This chapter argues for the mainstreaming of disaster resilience attributes in local development plans as an overarching adaptive measure with regards to urban areas facing climate related disasters. The chapter is based on empirical research involving a group of professional urban planners and managers who are responsible for formulating development plans for local urban areas in a developing country. Using the key-informant technique, the research investigated the ideas of a set of professional planners and managers regarding the suitable urban planning strategies to improve the resilience of local areas against a common hazard (e.g., flooding) that has a tendency to intensify due to climate change. In the next step, the common attributes of more frequently suggested strategies were identified using the principal component analysis technique. In the last step, the extent to which the local development planning system has responded so far to the vulnerability reduction and resilience improvement needs of the civil society. The findings indicate that local planners are sensitive to the flood risks faced by people. They have incorporated policies and strategies in the local development plan to minimize exposure of the people and property to flood hazard and improve the adaptive capacity of the urban settlements. However, the sector-based organization of the plan prepared by the federal level planners was found to be a hindrance to improving mainstream disaster resilience attributes in development planning. Therefore, the paper calls for strengthening the participatory planning and development capacity of the local authorities to enable more resolute mainstreaming of disaster resilience in local development plans.

Keywords Climate change · Disaster resilience · Local development plan · Mainstreaming

R. Perera (✉)
Department of Civil & Architectural Engineering, Sultan Qaboos University, Muscat, Oman
e-mail: ranjith.perera@gmail.com

D.K. bin Khailani
Federal Department of Town & Country Planning, Kuala Lumpur, Malaysia

W. Yan and W. Galloway (eds.), *Rethinking Resilience, Adaptation and Transformation in a Time of Change*,
DOI 10.1007/978-3-319-50171-0_15

Introduction

In much of the world the development plan is the main tool used to guide and control physical development in local urban areas. They are also referred to as structure plans, local plans and master plans, depending on the context, but the basic function is the same.

Development plans primarily focus on land-use control and infrastructure development as strategies to stimulate socio-economic development and environmental management. They are conventionally implemented by enforcing regulatory and incentive measures. With the increase in large-scale problems caused by climate change, it has been found that development plans in general, and land-use planning and building regulations in particular, are not effective enough to ensure the sustainability of the achievements of development so far. For example, it has come to the point that hazard risk reduction in urban areas cannot be addressed through land-use zoning and building regulations alone. This is particularly true in developing countries, where it is common knowledge that land-use zoning and building regulations are abused and disregarded. Therefore, urban planners and managers have to devise more comprehensive and effective measures to adapt local areas in order to face more frequent and intense hazards induced by climate change. Local development plans need to change from their current use as general guidance and development controls, and take on the role of strategic plans that will ensure the sustainable and resilient development of urban areas.

According to Klein et al. (2003), local and city governments should be aware of current and future climate risks and take appropriate initiatives to enhance the resilience of urban systems and communities. The 13th Conference of the Parties to the United Nations Framework Convention on Climate Change, held in Bali in December 2007 affirmed the increased willingness of city governments to take actions to address climate impacts. Furthermore, Smith (1996) alleges that local government authorities may take several precautionary steps to modify urban land use and development by-laws to respond to increasing climate risks. For example, land use, buildings, and infrastructure change or depreciate over time, requiring their managers to incorporate risk reduction measures to make them less vulnerable. One adaptive action that governments can implement is non-structural mitigation, achieved through the use of development planning control; land use controls can affect anthropogenic activities vulnerable to climate hazards (UNISDR 2002) and it is useful to reconsider which controls are put in place as a result. Smith (2001) also points out that one of the key benefits of development planning control is the reduction of risk and increased resilience.

Development plans are the main tools used by local authorities in guiding sustainable development within their jurisdictions. Among them, the ‘local plan’, is the primary instrument used to guide physical development at the local-authority level (Bruton 2007a, b). However, inadequate actions have been taken to analyze the extent to which local plans are effective in disaster mitigation (Deyle et al. 2008). Carter (1991) observes that disasters cannot be prevented but the effects can

be mitigated. According to this view, hazard impacts may not happen or can be reduced if land use planning is integrated with disaster risk reduction activities.

Saavedra and Budd (2009) emphasize the importance of understanding the inherent resilience of local areas and enhancing this resilience through strategic interventions involving stakeholders. Inherent resilience is the natural capacity of people, communities and habitats to cope with and adapt to major perturbations. Local people and community leaders usually possess an understanding of inherent resilience. Thus, Godschalk (2003), Wamsler (2005), Campanella (2006) and Ernstson et al. (2010) have pointed out the importance of a participatory approach in urban planning and the utilization of indigenous knowledge in order to identify strategies to reduce the vulnerability of urban areas. Contemporary urban planning practices are becoming more participatory, involving stakeholders in decision-making. However, little empirical evidence exists on the extent to which urban planning practices and products (i.e. plans) have incorporated inherent resilience or have improved resilience through strategic interventions derived from a participatory urban-planning process. Few studies have attempted to understand the extent to which the stakeholders' needs to reduce vulnerability are embedded in urban development plans and strategic proposals. Therefore, the central research question addressed by this chapter is: to what extent have local development plans incorporated the attributes of resilience, in consultation with local stakeholders, to adapt to the changing disaster scenario? In other words, the chapter questions whether development plans have become effective tools to improve the disaster resilience of urban areas. This chapter attempts to answer these questions with respect to an urban area selected for the empirical part of the research.

The Process of Planning for Resilient Cities

Planning for resilient cities requires urban planners to go through a participatory process in plan making, plan adoption, plan implementation and governance. Using Malaysia as the context, this section examines the realm of urban planning in general and the local planning process in particular.

Plan Making

It can be argued that in general, urban plans are built on the policies and strategies pertaining to socio-economic development sectors such as housing, infrastructure, transportation, and health (Phong and Shaw 2007). However, other than referring to general safety and hygienic conditions, there is no explicit set of strategies to ensure public safety and security against natural hazards, even though the improvement of quality of life is the overall goal of most urban plans. The lack of reference to safety and security against natural hazards is a crucial gap in the context of climate

change, raising a major sustainability issue. In the context of Malaysia, this omission is due to the sector-based format used to propose policies and strategies in the development plans. The state "structure plan" is organized according to the needs of the development sectors of the state, and as a result the same approach is used to organize district local plans, which are designed to implement the policies and strategies of the structure plan. As a result, cross-cutting issues, such as security and safety in local areas and the reduction of vulnerability to multiple hazards, have not been explicitly included among the strategies in the local district plans of Malaysia.

A local plan serves as a tool to communicate land-use and resource-use promotion, prevention, and conservation in a local area. In this regard, the local plan can be used to identify areas vulnerable to climate related hazards and can prevent or control development in those palces. Conversely, characteristics that provide resilience can be conserved (e.g., mangrove forests) and areas with inherent resilience, such as firm ground above the high flood level, can be allocated and promoted for human settlements. Sustaining and improving resilience should be a major strategy requiring special consideration in local plans.

Several scholars argue that barriers need to be overcome when formulating disaster resilience strategies in urban development policies and plans. As a starting point, Pelling (2006), Berke et al. (2006), and Singh (2008), argue that the formulation of disaster resilience strategies is an integral part of the process when preparing district local plans in which people participate, decide and plan the area based on their own needs and resources, and considering the general safety, security and quality of life issues. Ainul (2008) asserts that residents have their own safety objectives regarding how they want the plan to direct development of their living environment. For example, in the rebuilt city of Kobe in Japan, some settlements were able to adapt after the earthquake disaster in 1995 because of the communities' desire to live in structures that complied with building codes and that were served by the necessary infrastructure and service systems. In Smit and Wandel's (2006) words, people are sensitive to their vulnerability, take measures to minimize their exposure to hazard and strengthen their adaptive capacity to live with inevitable hazards. In view of that, public participation is required at all stages of the planning process to achieve improved understanding and identification of critical issues, and their resolution through socially acceptable, environmentally sustainable, technically viable and economically feasible strategies.

Plan Adoption

Once a plan is prepared, it needs to be adopted by the relevant authorities before it can be implemented. If the policy direction and legal backing are in place, the plans can themselves drive the adoption of disaster resilience in the planning process. The current need is not simply to be prepared for a particular disaster but to prepare for multiple disasters induced by climate change. The most appropriate levels of

intervention to improve preparedness for climate change-induced disasters are found at the large scale of national planning and the small scale of local planning (i.e., "think globally and act locally"). The impacts of disasters are felt most strongly at the local level and therefore national policies are most suitably implemented at the local level (UNISDR 2005b). In order to do that it is first necessary to understand how a district local plan can influence the resilience of a local area. A district local plan also provides the basis for local governance under a decentralized administrative system and is therefore the most appropriate level of intervention to introduce adaptation strategies for climate change-induced disasters.

Plan Implementation and Governance

Many local development plans are not action oriented or time specific (Berke et al. 2006). Their implementation relies mainly on private developers who carry out development projects at their own pace, location and schedule, resulting in leapfrogging developments and causing environmental problems. In this regard the implementation of local plans requires better coordination between local authorities, development players and local communities. If private developers implement projects at their own pace they might affect the coordinated implementation of the plan (prepared on the basis of meeting the needs of all stakeholders). Saavedra and Budd (2009) argue that some natural hazards are very location-specific and their deepest impact may not be within administrative boundaries. This condition weakens the effectiveness of plans prepared for administrative areas and based on the needs of the stakeholders in that area. In countries like Malaysia, urban areas often exceed the jurisdictional boundaries of local authorities. Urban fringe areas are especially under great pressure for development (FDTCP 2006). These areas may come under rural local authorities that are not organized well enough to initiate a participatory planning process. In this context, district level analysis and intervention could be more effective even though preparation of the district plan in that case might be based on the findings and recommendations of the State Structure Plan. In a similar way plan making and implementation with regards to disaster planning might be undertaken more effectively at the district level when considering the spatial impacts of multiple disasters that do not conform to the boundaries of a local area.

A local plan fulfills certain important functions. An important activity is to ensure that local issues are included at the local planning level, thus providing a broader basis for development control and coordination. There are also arguments in favor of improving disaster resilience in the process of local plan. In those cases, residents are able to decide and plan their own environment, based on their knowledge of the local capacities and resources. Noor (2004) points out that every local plan has its own objectives, which reflect the way the population wishes to develop.

Recent studies note the importance of urban governance in promoting the planning of resilient cities. UN-HABITAT (2002), Ignesias and Arambepola (2007) and Tanner et al. (2009) write that good urban governance plays an important role in the success of planning and management of cities that are working towards resilience. From these same sources we also take the argument that good urban governance implies equity, efficiency, transparency, accountability, civic engagement and citizenship, as well as security and sustainability (UN-HABITAT 2002).

Still, consideration of the socio-physical resilience of people and settlements is not adequately incorporated in many development plans, and thus lack the qualities needed to ensure some degree of resilience. In the absence of a systematic approach, new settlements continue to expand towards disaster prone areas, or even increase the vulnerability of areas due to rapid land use changes that do not recognize existing capacity for resilience.

Within the paradigm of participatory development planning, it is important for urban planners to consider the need for vulnerability reduction and improved resilience strategies among the stakeholders of a civil society. When disaster preparedness is absent in the urban planning process and likewise absent in its practice, the need for adaptation to climate-change related hazards tends to be overlooked. Therefore, this chapter focuses its attention on the prospects of vulnerability reduction in general, and resilience improvement in particular, through the use of development planning.

A local plan is the result of a prescribed procedural process (see Fig. 15.1). It begins with the preparation of the terms of reference by the Local Planning Authority (LPA), followed by review of sectoral reports (Noor 1999). As stated in Sect. 12A of Act 172, the LPA should publicize the preparation of a local plan in the area for which it is being planned. This public information should contain the objectives and the purposes of the plan, as well as the main developmental issues that the LPA proposes to include. This is to ensure that the public will be aware of the forthcoming plan and gives it an opportunity to participate in the planning process. Similarly, after the draft plan is finalized, it must be made available for public scrutiny. Any objections and comments by the public will be considered by the LPA at a public hearing conducted by a special committee appointed by the SPC, and the plan will then be revised accordingly. The SALP 2020 went through the procedure shown in Fig. 15.1. It is used as the main document to guide physical, social, economic and environmental development in the Shah Alam City's jurisdiction until 2020.

Shah Alam City's planning policy evolved from a garden city concept in the early 1980s to a sustainable urban development concept for the plan that is to be carried out between 2003 and 2020. Climate change mitigation and adaptation are claimed to be central to the new plan with the inclusion of the 'resilient city' as a planning goal. However, climate change as a factor that influences sustainable urban development was not widely discussed among planning professionals and

The Shah Alam Case Study in Malaysia

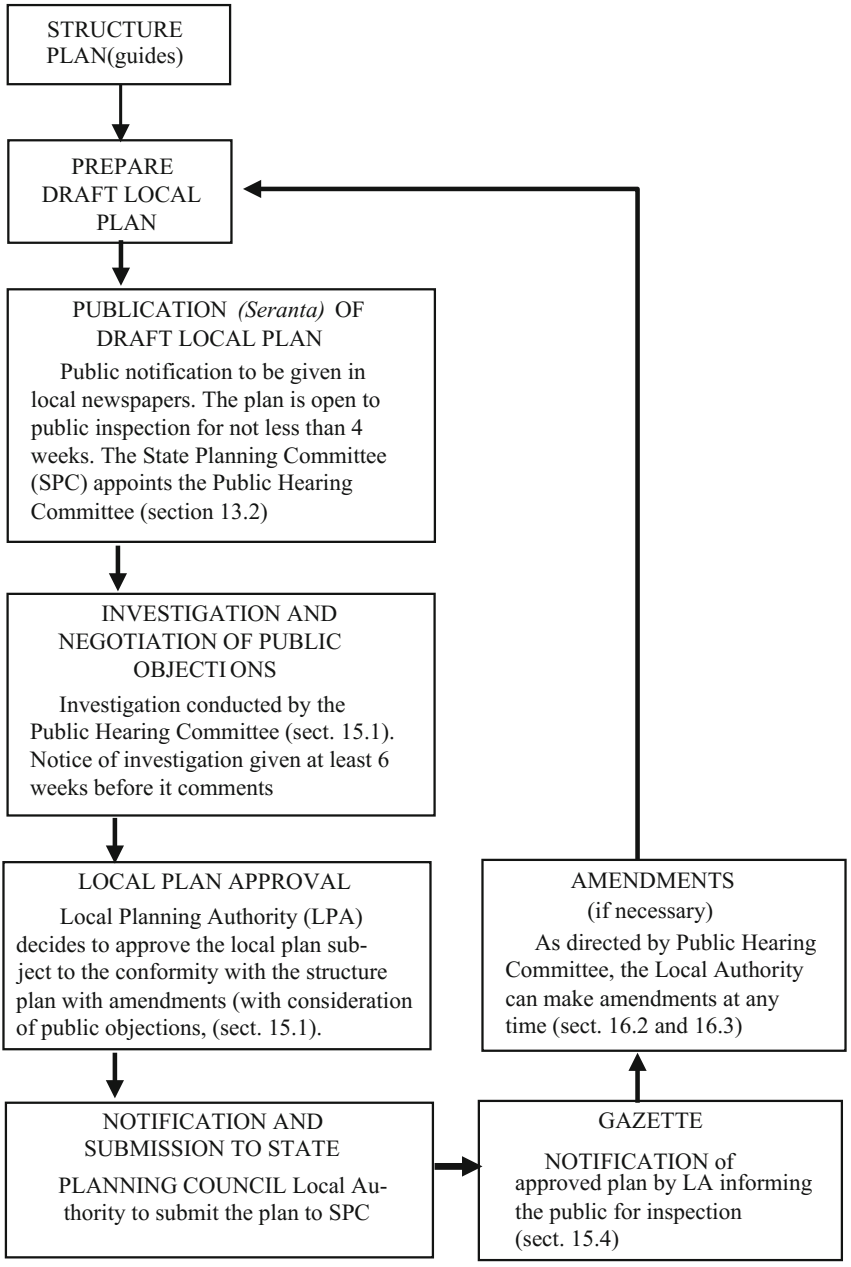

Fig. 15.1 Local plan preparation procedure according to town and country planning Act 1976 (Act 172)

scholars in Malaysia until the early 2000s. Whether the local development plan has met vulnerability reduction and resilience improvement needs is assessed in the next section.

The Perception of Key Informants' on Strategizing for Resilience Improvement

The key informants interviewed for this study include senior/executive level policy makers, urban planners and managers who were involved in the development planning of Shah Alam City. They are attached to the federal and state level planning authorities as well as the local authority of Shah Alam City. Without referring to the SALP 2020 or any planning or management measures that have already been taken to improve the resilience of Shah Alam City, these key informants were asked about their general perceptions on making Shah Alam into a resilient city. They were particularly asked about strategies to improve resilience against climate change related hazards, in order to make Shah Alam City more resilient. Any reference to climate change mitigation strategies was excluded as the focus of this study is on adaptation to climate change. Table 15.1 lists the 42 strategies (out of a total of 47) that were shared by more than a third of the key informants. It is noted here that each respondent pointed out a number of strategies to improve the resilience of Shah Alam City in response to an open-ended question. These strategies are listed in Table 15.1 in descending order of recurrence. It should also be noted that similar ideas were identified as a single strategy and re-phrased to encapsulate the concept being described by the various actors.

The list remains too large to incorporate into a local development plan. Therefore, the list was further analyzed using the Principal Component Analysis (PCA) technique to identify clusters of common ideas. The clusters indicate the most important and most frequently shared set of strategies needed to make Shah Alam a resilient city. Strategies with a 'Measure of Sampling Adequacy (MSA)' less than 0.50 were removed from further analysis.

Eight groups of strategies having *Eigen values of* >1 were identified using varimax rotation with Kaiser normalization to maximize intra-component variance as suggested by Tabachnick and Fidel (1996). The percentage of variance garnered by each group of strategies was the basis for ranking the groups. In other words, group 1 is considered as the most important group of strategies among the eight groups obtained by the PCA. These groups of strategies were given separate names (statistically called new variables) based on the common attributes of the strategies in each group. These new variables are indicated in Table 15.2.

Table 15.1 Strategies identified to improve disaster resilience of Shah Alam city by the professional urban planners and managers (N = 115)

Serial No.	Strategies to improve resilience (*strategies identified for analysis under PCA are shown in italics*)	Frequency of citation	% of cited respondents
ST1	*Ensure rule of law for development control*	98	85.2
ST2	*Involve stakeholders in risk mapping*	97	84.4
ST3	*Improve the capacity and readiness of local government officers*	95	82.6
ST4	*Regulate development of land in the urbanized areas*	93	80.9
ST5	*Encourage stakeholder participation in adaptation planning*	93	80.9
ST6	*Localize land-use zoning and building regulation by-laws*	88	76.5
ST7	*Sustain value of property and assets*	87	75.6
ST8	Reduce the percentage of impervious surfaces	85	73.9
ST9	*Protect ecologically sensitive areas*	85	73.9
ST10	*Establish environmental stewardship within communities*	83	72.2
ST11	*Improve solid waste collection and disposal*	82	71.3
ST12	*Allocate land for public spaces and uses*	80	69.6
ST13	*Enhance inter agency collaboration for disaster preparedness*	80	69.6
ST14	*Improve the quality of public transport services*	79	68.7
ST15	*Reduce soil erosion rate*	78	67.8
ST16	*Protect lifelines and critical infrastructure*	78	67.8
ST17	*Integrate city-wide emergency and rescue services*	77	66.9
ST18	*Disseminate zoning* and *building regulations among the public*	77	66.9
ST19	*Improve community awareness on hazard intensity and frequency*	76	66.1
ST20	*Protect water retention areas such as wetlands and ponds*	75	65.2
ST21	*Ensure residential and commercial activities to be in safer zones*	74	64.3
ST22	Improve public warning and evacuation systems in communities	74	64.3
ST23	Increase the percentage of public transport users	74	64.3
ST24	*Improve sanitation system*	72	62.6
ST25	Protect greenery and soil cover	72	62.6
ST26	*Improve public understanding on climate change and risks*	71	61.7
ST27	*Improve the access to safety zones*	70	60.9
ST28	Allocate budget and subsidy for community actions	70	60.9
ST29	*Enhance and sustain social capital*	69	60.0
ST30	*Improve transportation network*	68	59.1
ST31	*Inculcate saving and insurance habits among people*	67	58.3
ST32	Ensure satisfaction on the quality of life in every citizen	65	56.5
ST33	Disseminate the emergency response plan on a regular basis	65	56.5
ST34	*Support community-based environmental management actions*	65	56.5
ST35	*Restrict single occupancy vehicles in times of emergency*	63	54.8
ST36	*Propagate the city's development vision regularly*	62	53.9
ST37	Ensure no obstructions on natural drainage channels	58	50.4
ST38	Disseminate guidelines on risk reduction and mitigation	50	43.5
ST39	Control the percentage of residential floor area in the city centre	48	41.8
ST40	Control population growth rate of the city	45	39.1
ST41	Improve health and wellness of people	44	38.3
ST42	Diversify the types of employment in the city	40	34.8

Table 15.2 Eight strategy groups identified from the result of PCA

Group of strategies (Principal components)	Common attribute	Percentage of variance explained
Group 1	Community resilience	8.459
Group 2	Infrastructure resilience	7.616
Group 3	Ecological resilience	7.060
Group 4	Environmental quality resilience	6.953
Group 5	Land-use resilience	6.893
Group 6	Emergency readiness and responsiveness	5.752
Group 7	Stakeholder participation	5.534
Group 8	Socio-economic resilience	5.459

Implementation Efficacy of the Resilience Improvement Strategies in the Shah Alam Local Development Plan

Before assessing SALP 2020 for its implementation efficacy, it should be reiterated that the plan is not specifically a climate change adaptation plan. Nonetheless it is argued that local development plans should ideally be comprehensive in nature and not limited to guiding the socio-economic and physical development of the plan area. In this sense it is also argued that disaster preparedness in general, and resilience improvement in particular, should be part and parcel of a local development plan. Therefore, the purpose of this assessment is to verify the extent to which the specific attributes of resilience as identified by the PCA are integrated in the local plan. Any shortcomings are indicators of room for improvement and formal mainstreaming of resilience as an attribute in future plans.

The assessment used a 5-point Likert Scale (1.0 = extensively implemented, to 0.0 = not implement at all). The Weighted Mean Score (WMS) was used as a tool to arrive at an overall assessment of the extent of implementation of each short-listed strategy. WMS for each strategy was computed using the formula $\sum W_i/n$. After determination of the individual weighted mean score (index) for each strategy, an "index mean" for the set of strategies (and thereby for the attribute) was prepared using the formula $\sum W_i f_i / \sum f_i$ (where W_i = the individual's weighted score for each strategy, f_i = frequency of that particular score). Tables 15.3, 15.4, 15.5, 15.6, 15.7, 15.8 and 15.9 provide a summary of the implementation efficacy of the short listed strategies in the local development plan of Shah Alam City (SALP 2020). The summary provides an Index Mean Score for each specific attribute of resilience to indicate the integration of that attribute in the local development plan. Any Index Mean Score of more than 0.75 was considered as an indication that an attribute was adequately integrated into the local development plan.

The first principal component is 'Community Resilience'. Table 15.3 indicates that strategies to achieve community resilience have been more or less adequately

Table 15.3 Implementation efficacy of resilience improvement strategies for community resilience as suggested by the key informants in SALP 2020

Principal component	Resilience improvement strategies	Responses of the professional planners and managers (N = 97)					Weighted Mean Score (WMS)
		Extensively implemented (1)	Adequately implemented (0.75)	Moderately implemented (0.5)	Inadequately implemented (0.25)	Not implemented at all (0)	
Community resilience	ST21. Ensure residential and commercial activities to be in safer zones	63 (65.08%)	23 (23.7%)	4 (4.1%)	5 (5.2%)	2 (2.1%)	0.86
	ST12. Allocate land for public spaces and uses	50 (51.6%)	33 (34.0%)	7 (7.2%)	8 (8.3%)	9 (9.3%)	0.83
	ST19. Improve community awareness on hazard intensity and frequency	57 (58.8%)	22 (22.7%)	7 (7.2%)	6 (8.2%)	5 (5.1%)	0.81
	ST10. Establish environmental stewardship within communities	32 (33.0%)	51 (52.6%)	2 (2.1%)	7 (7.2%)	5 (5.2%)	0.75
	ST26. Improve public understanding on climate change and risks	35 (46.4%)	22 (36.1%)	18 (8.3%)	15 (5.2%)	7 (4.1%)	0.66
	ST29. Enhance and sustain social capital	12 (12.4%)	23 (23.7%)	15 (15.5%)	37 (38.1%)	10 (10.3%)	0.47
Index Mean Score for the attribute							0.73

Table 15.4 Implementation efficacy of resilience improvement strategies for infrastructure resilience as suggested by the key informants in SALP 2020

Principal component	Resilience improvement strategies	Responses of the professional planners and managers (N = 97)					Weighted Mean Score (WMS)
		Extensively Implemented (1)	Adequately implemented (0.75)	Moderately implemented (0.5)	Inadequately implemented (0.25)	Not implemented at all (0)	
Infrastructure resilience	ST36. Propagate the city's development vision regularly	46 (47.4%)	23 (19.6%)	6 (6.2%)	19 (19.6%)	7 (7.2%)	0.73
	ST30. Improve transportation network	34 (35.1%)	23 (23.8%)	10 (10.3%)	22 (22.7%)	8 (8.3%)	0.64
	ST16. Protect lifelines and critical infrastructure	34 (35.1%)	19 (19.6%)	9 (9.3%)	26 (26.8%)	9 (9.3%)	0.62
	ST15. Improve the quality of public transport services	22 (22.7%)	31 (32%)	18 (18.6%)	17 (17.5%)	9 (9.3%)	0.60
	ST35. Restrict the single occupancy vehicles during times of emergency	15 (15.5%)	34 (35.1%)	8 (8.3%)	29 (29.9%)	11 (11.3%)	0.54
	ST13. Enhance inter agency collaboration for disaster preparedness	9 (9.3%)	20 (20.6%)	18 (18.6%)	28 (28.9%)	22 (22.7%)	0.41
Index Mean Score for the attribute							0.59

Table 15.5 Implementation efficacy of resilience improvement strategies for ecological resilience as suggested by the key informants in SALP 2020

Principal component	Resilience improvement strategies	Responses of the professional planners and managers (N = 97)					Weighted Mean Score (WMS)
		Extensively Implemented (1)	Adequately implemented (0.75)	Moderately implemented (0.5)	Inadequately implemented (0.25)	Not implemented at all (0)	
Ecological resilience	ST20. Protect water retention areas such as wetlands and ponds	28 (28.9%)	35 (36.1%)	15 (15.5%)	10 (10.3%)	9 (9.3%)	0.66
	ST9. Protect ecologically sensitive areas	25 (25.8%)	36 (37.1%)	12 (12.4%)	1 (15.5%)	9 (9.3%)	0.64
	ST15. Reduce soil erosion rate	22 (22.7%)	31 (31.9%)	16 (16.5%)	18 (18.6%)	10 (10.3%)	0.60
	ST18. Disseminate zoning and building regulations among the public	16 (16.5%)	24 (24.7%)	27 (27.8%)	17 (17.5%)	13 (13.4%)	0.53
Index Mean Score for the attribute							0.61

Table 15.6 Implementation efficacy of resilience improvement strategies for environmental quality resilience as suggested by the key informants in SALP 2020

Principal component	Resilience improvement strategies	Responses of the professional planners and managers (N = 97)					Weighted Mean Score (WMS)
		Extensively implemented (1)	Adequately implemented (0.75)	Moderately implemented (0.5)	Inadequately implemented (0.25)	Not implemented at all (0)	
Environmental quality resilience	ST4. Regulate development of land in urbanizing areas	48 (49.5%)	31 (32.0%)	11 (11.34%)	5 (5.16%)	2 (2.10%)	0.80
	ST11. Improve solid waste collection and disposal	43 (44.3%)	28 (28.9%)	13 (13.4%)	6 (6.2%)	7 (7.2%)	0.74
	ST24. Improve sanitation system	35 (36.1%)	23 (23.7%)	26 (26.8%)	10 (10.3%)	3 (3.1%)	0.70
	ST34. Support community-based environmental management actions	11 (10.7%)	26 (26.8%)	33 (34.0%)	14 (15.4%)	13 (13.4%)	0.52
Index Mean Score for the attribute							0.70

Table 15.7 Implementation efficacy of resilience improvement strategies for land use resilience as suggested by the key informants in SALP 2020

Principal component	Resilience improvement strategies	Responses of the professional planners and managers (N = 97)					Weighted Mean Score (WMS)
		Extensively implemented (1)	Adequately implemented (0.75)	Moderately implemented (0.5)	Inadequately implemented (0.25)	Not implemented at all (0)	
Land use resilience	ST27. Improve the access to safety zones	42 (43.3%)	26 (26.8%)	22 (22.7%)	5 (5.2%)	2 (2.1%)	0.76
	ST1. Ensure rule of law in development control	33 (34.0%)	16 (16.5%)	29 (29.9%)	13 (13.4%)	6 (6.2%)	0.65
	ST2. Involve stakeholders in risk mapping	9 (9.3%)	20 (20.6%)	18 (18.6%)	28 (28.9%)	22 (22.7%)	0.41
	ST6. Localize land-use zoning and building regulation by-laws	–	3 (3.1%)	20 (20.6%)	39 (40.2%)	35 (36.1%)	0.23
Index Mean Score for the attribute							0.51

Table 15.8 Implementation efficacy of resilience improvement strategies for emergency readiness and responsiveness as suggested by the key informants in SALP 2020

Principal component	Resilience improvement strategies	Responses of the professional planners and managers (N = 97)					Weighted Mean Score (WMS)
		Extensively implemented (1)	Adequately implemented (0.75)	Moderately implemented (0.5)	Inadequately implemented (0.25)	Not Implemented at all (0)	
Emergency readiness and responsiveness	ST3. Improve the capacity and readiness of local government officers	38 (39.2%)	24 (24.7%)	19 (19.6%)	11 (11.3%)	5 (5.2%)	0.70
	ST17. Integrate city-wide emergency and rescue services	3 (3.1%)	5 (5.2%)	37 (38.1)	29 (29.9)	23 (23.7%)	0.34
Index Mean Score for the attribute							0.45

Table 15.9 Implementation efficacy of resilience improvement strategies for emergency readiness and responsiveness as suggested by the key informants in SALP 2020

Principal component	Resilience improvement strategies	Responses of the professional planners and managers (N = 97)					Weighted Mean Score (WMS)
		Extensively implemented (1)	Adequately implemented (0.75)	Moderately implemented (0.5)	Inadequately implemented (0.25)	Not at all implemented (0)	
Stakeholder participation	ST5. Stakeholder participation in climate change adaptation planning	7 (7.2%)	22 (22.7%)	28 (28.9%)	25 (25.8%)	15 (15.5%)	0.45
	Index Mean Score for the attribute						0.45
Socio-economic resilience	ST7. Sustain value of property and assets	19 (19.6%)	37 (38.1%)	24 (24.7%)	10 (10.3%)	7 (7.2%)	0.63
	ST31. Inculcate saving and insurance habits among people	–	16 (16.5%)	30 (30.9%)	28 (28.9%)	23 (23.7%)	0.35
	Index Mean Score for the attribute						0.50

implemented under the SALP 2020. This condition is indicated by the Index Mean Score of 0.73 (≈0.75). It is also an indication of the Shah Alam City Council's highest priority, making the communities resilient against climate change induced flooding. It is noted that only two strategies to improve community resilience have not been adequately implemented under the SALP 2020. They are; ST26—"Improve public understanding on climate change and risks" (WMS = 0.66); and ST29—"Enhance and sustain social capital" (WMS = 0.47). These two findings indicate that the Shah Alam City Council should take action to improve the understanding of climate change and its risks among for members of the city population. Social capital is a relatively new term for urban planners and managers although the existence of it is evident in traditional *gotong royong* (mutual help) activities. With urbanization and modernization, these traditional practices gradually disappeared from civil society, and so the city council faces the challenge of rebuilding social capital in its communities. Successful actions will help to increase community resilience against climate change related hazards as well as other unforeseen.

'Infrastructure Resilience' is the second principal component. Although improvement of resilience with regards to infrastructure, especially in the case of the city's major lifelines, is the second highest priority for urban planners and managers, achievement of that target in implementing SALP 2020 is only moderately successful, as shown by an Index Mean Score of 0.59 (see the last part of Table 15.4). Apparently this deficiency is largely due to inadequate collaboration between agencies that manage infrastructure networks.

The relevant strategy, ST13- Enhance inter agency collaboration for disaster preparedness, has garnered only a WMS of 0.41, indicating less than moderate success in implementation of that strategy under SALP 2020. Therefore, the city council has to play a stronger role coordinating different agencies functioning in the city in order to improve the resilience of transport and other critical infrastructure.

The third highest priority for urban planners and managers is the improvement of the ecological resilience of the city. Implementation of strategies targeting ecological resilience garnered an Index Mean Score of 0.60 indicating slightly more than moderate level of implementation. The analytical results presented in Table 15.5 indicate that further dissemination of zoning and building regulations among the public (i.e., ST18) may lead to higher level of ecological resilience in the city.

According to the fourth principal component, the SALP 2020 has more or less adequately implemented strategies to improve the resilience of environmental quality in the city, as indicated by an Index Mean Score of 0.70. The analytical data presented in Table 15.6 indicates that the city council has given only moderate support for community-based environmental management actions (WMS for ST34 = 0.52). It is a fact that local government authorities in many cities collaborate with community organizations to improve the environmental quality in residential areas and thereby the whole city. Apparently the Shah Alam City Council has not done enough to support the community-based environmental management actions. On the other hand, Table 15.6 does not indicate that support from the city

council to improve the environmental quality of the communities is a particular need of the people. Even so, more support and collaborative activities with community organizations can further improve the environmental quality in the city.

According to the fifth principal component, the land-use resilience of Shah Alam City is only moderate, as indicated by an Index Mean Score of 0.51 (see Table 15.7). Apparently the urban planners and managers have been inadequately successful in involving stakeholders in the mapping of climate change risk areas in the city. This is indicated by a WMS of 0.41 for the relevant strategy (ST2). On the other hand, as this strategy is ranked number 2 and cited by nearly 85% of the key informants—it is clearly significant from their point of view (see Table 15.1). Therefore, Shah Alam City Council needs to make a concerted effort to collaborate with local stakeholders in order to uncover the areas of climate change risk in the city, and use that information for climate change adaptation planning. Moreover, it is worth noting that it is difficult for urban planners and managers to increase land-use resilience without localizing land-use zoning and building regulations.

There is a common set of land-use and building regulations applicable throughout Malaysia under the Town and Country Planning Act of 1976 (Act 172) and the Street, Drainage and Building Act of 1974 (Act 133). The land-use and building regulations in SALP 2020 are based on these Acts, while local authorities such as Shah Alam City Council are allowed only to enforce by-laws under the Local Government Act of 1976 (Act 171). This provision is inadequate with regards to counteracting climate change related risks (Khir 2008). Therefore, the majority of the urban policy makers, planners and managers (76.5% of the key informants) share the view that 'localized land-use zoning and building regulation by-laws' are a critical need (see ST6 in Table 15.1). However, such by-laws are difficult to enforce without amending the Local Government Act (Act 171) in a way that will empower local authorities to enact 'localized land-use zoning and building regulations'. Until this change takes place, improving land-use resilience will remain a challenge for the Shah Alam City Council.

The sixth principal component is 'Emergency Readiness and Responsiveness'. Table 15.8 indicates that 'emergency readiness and responsiveness' as a specific attribute of resilience has fared only moderately well (Index Mean Score = 0.52) in the implementation of SALP 2020. The main reason for this level of implementation is due to inadequate integration of the city-wide emergency and rescue services (WMS = 0.34 for ST17, see in Table 15.8). As discussed earlier, integration of city-wide emergency and rescue services which often compete with, and duplicate each other, is a difficult task. Therefore, Shah Alam City Council will find it difficult to improve the overall status of 'emergency readiness and responsiveness' without taking strenuous actions to integrate city-wide emergency and rescue services.

'Stakeholder Participation' is the seventh principal component. Stakeholder participation in climate change adaptation planning was found to be inadequately implemented under SALP 2020. This deficiency is indicated by a WMS of 0.45 for ST5 (see Table 15.9). The urban policy makers, planners and managers rank stakeholder participation very highly as indicated by more than 80% of the key

respondents pointing it out as a key strategy to improve the resilience of Shah Alam City from climate change related hazards (see Table 15.1). However, collaboration between urban planners and managers and local stakeholders appears to be difficult. It may be that there is a need for training in order to build skills and techniques necessary to improve stakeholder participation.

'Socio-economic Resilience' is the eighth and last principal component. Surprisingly, socio-economic resilience features last in the list of specific attributes of resilience. It also fares moderately in terms of implementation under SALP 2020, as indicated by an Index Mean Score of just 0.50 (see Table 15.9). The main reason for this moderate level is due to the difficulty of inculcating saving and insurance habits among people. The relevant strategy (ST31) has a WMS of only 0.35 indicating inadequate implementation under SALP 2020.

Discussion

Although Shah Alam City has a modern society, when it comes to saving money, habits remain very traditional. It is not uncommon to find that many people place their savings in precious metals like gold, for instance. Similarly, taking an insurance policy against disasters is an uncommon practice although many suffer from floods annually. Instead, many try to cope with emergencies by themselves or with the support of their relatives and friends, and it is difficult to inculcate new habits of saving and insurance. As a result, the socio-economic resilience of people in Shah Alam will remain low from the perspective of urban planners and managers. However, the findings of the social survey suggested the exact opposite is true, as the majority of respondents have regular incomes from salaried jobs. In this regard the evidence of needs related to improving resilience do not likewise indicate that socio-economic resilience is poor. On the other hand, community resilience featured at the top of the specific attributes of resilience (see Table 15.2). Therefore, it can be inferred that socio-economic resilience is more critical at the collective level than at the individual level.

Moreover, the results of PCA and the subsequent discussion on the strategies pointed out by key informants revealed that SALP 2020 has also inadvertently integrated all 8 specific attributes of resilience.

Regarding the specific attributes of resilience, it was revealed that 'community resilience' and 'environmental quality resilience' are integrated in SALP 2020, and more or less achieved through the implementation of their relevant strategies. Similarly, 'Infrastructure resilience', 'Ecological resilience', 'Land-use resilience', 'Emergency readiness and responsive-ness', and 'Socio-Economic resilience', are also integrated in SALP 2020, but only moderately achieved through the implementation of their strategies. Only the strategy on 'Stakeholder participation' was inadequately implemented. Which is to say, the status of 'Stakeholder participation' as a specific attribute of resilience in SALP 2020 is questionable.

It can be preliminarily concluded that both general and specific attributes of resilience are already integrated into the local development plan of Shah Alam City although there is room for improvement. It is reiterated here that the integration of general and specific attributes of resilience in the local development plan is a finding of this research based on the interpretation of the contents of SALP 2020 and the strategies proposed to make Shah Alam a resilient city. Based on these findings, the research argues the case for formal mainstreaming of disaster resilience attributes in the local development plan.

Closing Remarks

This chapter examined how adaptation of disaster resilience attributes in the local development plan can satisfy the goal of creating a resilient city. In order to investigate this possibility, the urban policy makers, planners and managers who shape the destiny of Shah Alam city were asked a reverse question; what are the planning interventions needed to make Shah Alam a resilient city? The answers to this question by key informants were analyzed in order to identify common themes among them and then reconsidered those themes as the specific attributes of resilience. The analyses lead to the distillation of 8 specific attributes of resilience. Adaptation of those specific attributes in the local development plan will be necessary to achieve the planning goal of a resilient city, according to the views and opinions expressed by the planners and managers who might wish to see such an ambition carried out. Since the opinions of the key informants were more or less general and not so specific to Shah Alam City and its development plan, the specific attributes of resilience identified above can be considered as applicable for any city in Malaysia that face the threat of climate change induced disasters.

It is reiterated here that adaptation is a higher status of integration which requires the subject to adapt in order to be specifically included in the plan making, plan adoption and plan implementation process. As the Hyogo Framework for Action 2005–2015 recommends, adaptation to climate change related hazards require resolute actions by planning agencies and local authorities (UNISDR 2005a). If the disaster resilience attributes were resolutely adapted in SALP 2020, and relevant strategies were specifically targeted to improve sensitivity to hazards, exposure minimization, and adaptive capacity improvement, the plan would have been more effective in fulfilling peoples' needs. In other words, the findings support the initial proposition of the study that adaptation of disaster resilient attributes in the local development plan can make it more effective in achieving the planning goal of a resilient city. Answer to the research question give directions on how to adapt disaster resilience attributes in the local development plan from the perspective of urban policy makers, planners and managers. This kind of adaptation has the potential to make the development plan an effective tool to improve the disaster resilience of urban areas.

References

Ainul, J. M. (2008). Role of land use planning in improving public health. *Planning Malaysia Journal, Kuala Lumpur*.

Berke, R. P., et al. (Eds.). (2006). *Urban land use planning*. Chicago: University of Illinois Press.

Bruton, M. J. (2007a). *Malaysia: The planning of a nation*. Kuala Lumpur: PERSADA.

Bruton, M. J. (2007b). The evolution of town planning in malaysia from amat salleh's point of view. In *Proceedings of the World Town Planning Day Seminar 2007, Kuala Lumpur, Federal Department of Town & Country Planning* (pp. 35–53).

Campanella, T. J. (2006). Urban resilience and the recovery of New Orleans. *Journal of the American Planning Association, 72*(2), 141–146.

Carter, N. W. (1991). *Disaster management—a disaster manager's handbook*. Manila: Asian Development Bank.

Deyle, R. E., Chapin, T. S., & Baker, E. J. (2008). The proof of the planning is in the platting: An evaluation of florida's hurricane exposure mitigation planning mandate. *Journal of the American Planning Association, 74*(3), 349–370.

Ernstson, H., Leeuw, S. E. V. D., Redman, L. C., Meffert, J. D., Davis, G., Alfsen, C., et al. (2010). Urban transitions: On urban resilience and human-dominated ecosystems. *Ambio, 39*, 531–545.

FDTCP (2006). *National urbanization policy*. Kuala Lumpur: Federal Department of Town and Country Planning, Peninsular Malaysia, Ministry of Housing and Local Government.

Godschalk, D. R. (2003). Urban hazard mitigation: creating resilient cities. *Natural Hazards Review*, 136–143.

Ignesias, G., & Arambepola, N.M.S.I. (2007). Emerging risks and approaches for reducing vulnerabilities of the urban built environment. *Asia Disaster Management News*, *13*(2).

Khir, M. F. M. (2008). *Planning towards sustainability*. Keynote Address in: World Habitat and Town Planning Day 2008, 5–7 November, 2008, Putrajaya, Malaysia.

Klein, R. J. T., Nicholls, R. J., & Thomalla, F. (2003). Resilience to natural hazards: how useful is this concept? *Environmental Hazards, 3*, 35–45.

Noor, M. W. M. M. (1999). The existing town and country planning system—application and relevance to planning and zoning to protected areas. In DWNP (Ed.), World earth day: The development on zoning system for protected areas in peninsula Malaysia. Towards sustainable management of biological resources, 21–23 April, 1999, Kuala Lumpur, Malaysia.

Noor, M. W. M. M. (2004). Planning systems and procedures in planning approval. In World Town Planning Day Conference, Kuala Lumpur, Malaysia.

Pelling, M. (2006). Measuring vulnerability to urban natural disaster risk reduction: Benchmarks for sustainability. *Open House International, Special Edition on Managing Urban Disasters, 31*(1), 125–132.

Phong, T., & Shaw, R. (2007). Towards an integrated approach of disaster and environment management: A case study of Thua Thien Hue Province, Central Vietnam. *Environmental Hazards, 7*, 271–282.

Saavedra, C., & Budd, W. W. (2009). Climate change and environmental planning: Working to build community resilience and adaptive capacity in Washington State, USA. *Habitat International, 33*, 246–252.

Singh, K. S. G. (2008). Global warming-adaptation policies. In Seminar Proceeding on National Planning for Sustainable and Harmonious Cities, Kuala Lumpur: Selangor State Department of Town and Country Planning.

Smit, B., & Wandel, J. (2006). Adaptation, adaptive capacity and vulnerability. *Global Environmental Change, 16*, 282–292.

Smith, N. (1996). *The new urban frontier: Gentrification and the revanchist city*. New York: Routledge.

Smith, K. (2001). *Environmental hazard—assessing risk and reducing disaster*. New York: Routledge.

Tabachnick, B. G., & Fidell, L. S. (1996). *Using multivariate statistics*. New York: Harper Collins College.

Tanner, T., Mitchell, T., Polack, E., & Guenther, T. (2009). Urban governance for adaptation: Assessing climate change resilience in ten Asian cities. In IDS Working Paper 315. Institute of Development Studies at the University of Sussex, Brighton, 1–47.

UNISDR (2002). *Living with risk: A global review of disaster reduction initiatives*. Preliminary Version Prepared as an Inter-agency Effort Co-ordinated by the ISDR Secretariat, Geneva: United Nations.

UNISDR (2005a). *Hyogo framework for action 2005–2015: Building the resilience of nations and communities to disasters*. www.unisdr.org/2005/wcdr/intergover/official-doc/L-docs/Hyogo-framework-for-action-english.pdf.

UNISDR (2005b). *Disaster risk and sustainable development: Understanding the links between development, environment and natural hazards leading to disasters, background paper for the world summit on sustainable development (WSSD)*. Geneva: International Strategy for Disaster Reduction, United Nations.

UN-HABITAT. (2002). *Global campaign on urban governance, concept paper*. Nairobi: United Nations.

Wamsler, C. (2005). Managing urban risk: Perceptions of housing and planning as a tool for reducing disaster risk. *Global Built Environment Review, 4*(2), 11–28.