

Climate Change Adaptation and Disaster Risk Reduction in Urban Development Plans for Resilient Cities

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Abstract. As a result of climate change, cities today are increasingly exposed to various climate-related risks. This has resulted in a significant change in the way we deal with cities. In recent years, efforts toward achieving resilient cities have been strengthened with various initiatives and actions. Internationally, among the key initiatives are the launching of Sustainable Development Goals, New Urban Agenda, and Sendai Framework for Disaster Risk Reduction, the Paris Agreement to achieve climate and disaster resilient within cities. Development plans are known to be essential documents to present strategies to guide future development, thus have the potential to ensure the improvement of the city's resilience. Hence, this paper aimed at assessing the current state of the adoption of climate change adaptation and disaster risk reduction strategies in the various level of development planning. Based on the content analysis method, the paper discusses the different types of adaptation and mitigation interventions at national, state and local level plans aimed at reducing the impact of climate change and disaster risk in cities. Malaysian's federal policy documents (Eleventh Malaysia Plan, National Physical Plan III and National Urbanisation Policy II), state structure plans (Kuala Lumpur Structure Plan 2020 and Pahang State Structure Plan 2035) and local development plans (Kuala Lumpur City Plan 2030 and Cameron Highlands Draft Local Plan 2030) were referred to for this purpose. Overall, findings of the study indicated that at the national level, aspects of CCA and DRR are limited to the environment and infrastructure sector. However, locally, much higher integration of CCA and DRR strategies are evident in the Cameron Highlands Draft Local Plan 2030. Thus, it is realised that Malaysia is progressing positively towards mainstreaming CCA and DRR strategy in the different level of development plans crossing all sectors with various types of interventions. However, more effort is needed to focus on the collaborative action in the implementation of the strategies and actions stipulated in the development plans.

Keywords : resilient cities, climate change adaptation, disaster risk reduction, development plans

1. Introduction

As a result of climate change, cities today are increasingly exposed to various climate-related risks. South Asian region, including Malaysia are known as hotspots for climate-related disasters [1]. This situation has resulted in a significant change in the way we deal with cities towards strengthening



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resilience [2,3]. In recent years, efforts toward achieving resilient cities have been supported by various initiatives and actions [4,5]. Globally, among the key initiatives are the launching of Sustainable Development Goals, New Urban Agenda, Sendai Framework for Disaster Risk Reduction, the Paris Agreement to achieve climate and disaster-resilient within cities. The integration of climate change adaptation and disaster risk reduction in development planning is acknowledged as an important process to achieve resilient cities, specifically in high-risk areas [4]. Nowadays, in disaster risk management and planning for resilience. Novak et al. (2017) explained that the consideration of the intricacy and dynamic nature of the ecological systems impacted by climate change is crucial [6]. However, the method of integration is still uncertain due to the limitation and capacity of the current practice. Therefore, this paper aimed at assessing the current state of the adoption of climate change adaptation and disaster risk reduction strategies in the various level of development planning in Malaysia.

2. CCA and DRR Integration in Urban Development Plans

Urban development plans refer to guiding documents that steer the planning and development of a designated area to guide future development, thus have the potential to ensure the improvement of the city's resilience [7]. Generally, such document is established by the planning authority at various level; state, local and or district, depending on the level of the development plan. These development plans are the basis to guide local authorities to assess development proposals as well as strengthen the government capacity [7]. Thus, the integration of related DRR and CCA strategies into these development plans are appropriate to ensure future development are more resilience to climate change and disasters [8]. In Malaysia, the urban development planning is guided by the three tiers planning system consist of the federal, state and local government, which was adopted from the British planning system since the colonial era (refer Figure 1). Each local government are responsible to plan and ensure all areas within the boundary are developed according to the statutory planning policy documents.

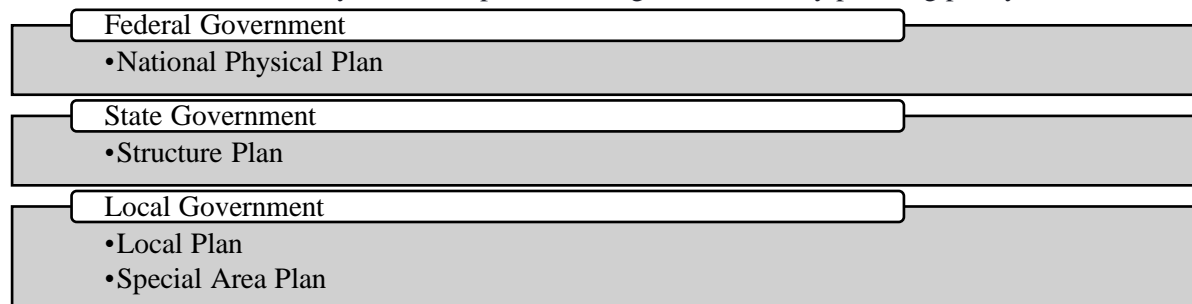


Figure 1. The Hierarchy of Development Plans in Malaysia

Previous studies have highlighted the possible ways to integrate elements of climate change adaptation (CCA) and disaster risk reduction (DRR) in the various level of urban development plans. According to UNDP, National Development Plans are the right channel to mainstream DRR and CCA into the development process as it involves the formulation of policies, regulations, budget, and programmes. Establishment of specific projects that focuses on ways to prevent and manage disaster risk is also made possible.

Climate change adaptation (CCA) refers to the act of reducing the adverse impact of climate change while taking the opportunities looking into innovative solutions [4]. Such approach requires a revision to the conventional policies and strategies as a result of the dynamic forces of climate change [9]. On the other hand, the understanding of disaster risk involves the consideration of the elements at risk in order to comprehend how a particular event or disaster would unfold and impact its surrounding. In achieving disaster resilient cities, these elements need to be considered in the multi-level phase of city planning. According to UNISDR (2012), risks refer to “*a function of the hazard (e.g. cyclones earthquake, flood, or fire), the exposure of people and assets to hazards, and the conditions of vulnerability of the exposed population or assets*” (refer Figure 2) [10]. Figure 2 below illustrates the

relationship between climate change adaptation and disaster risk reduction, as highlighted by the IPCC [11]. DRR and CCA are evidence-based policies that are complementary. However, some authors highlighted that the difference between them are CCA are more of general policy, whereas DRR is more action-oriented policy [4].

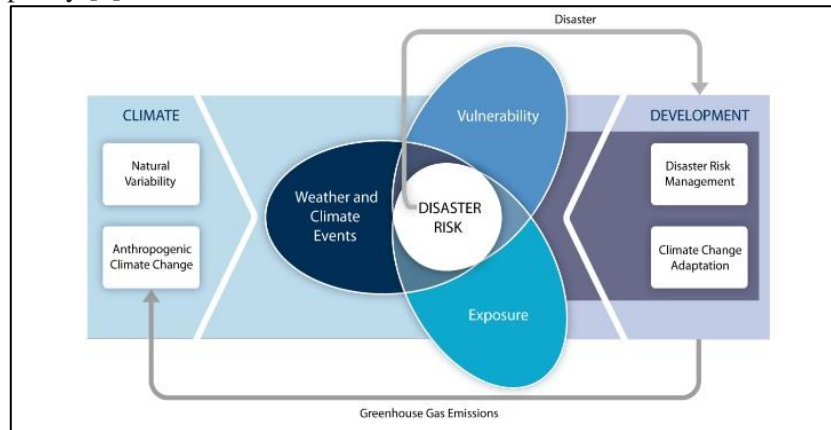


Figure 2. The relationship between climate change adaptation (CCA) and disaster risk reduction (DRR) management (Source: IPCC, 2012)

3. Methodology

Based content analysis method, the paper discusses the different types of adaptation and mitigation policies and strategies to be implemented at national, state and local level plans aimed at reducing the impact of climate change and disaster risk in cities. Malaysian's federal policy documents (Eleventh Malaysia Plan, National Physical Plan III and National Urbanisation Policy II), state structure plans (Kuala Lumpur Structure Plan 2020 and Pahang State Structure Plan 2035) and local development plans (Kuala Lumpur City Plan 2020 and Cameron Highlands Draft Local Plan 2030) were referred to for this purpose.

4. Findings and Discussion

Malaysia is governed by two national policies, which are the 5-year Malaysia Plan and National Physical Plan. Eleventh Malaysia Plan (2016-2020) (11MP) is about to reach its final leg and the government is currently reviewing prior to establish the Twelfth Malaysia Plan (2021-2025). In the 11MP, Thrust 4 focussed on the aim to pursue green growth and resilience with Focus Area D specifically addresses the need to strengthen resilience against climate change and natural disasters [12]. National Physical Plan is a platform to specify national's long-term strategic spatial planning policies needed to guide the general direction and broad pattern of the land use, biodiversity conservation and physical development in Peninsular Malaysia (Federal Department of Town and Country Planning, 2010). The National Physical Plan 3 (2015-2020) (NPP3), Malaysia aimed at providing the best spatial planning policies to ensure continued sustainable development as well as addressing the issues of climate change that may pose a risk to the natural environment and human settlement. Through four main thrusts of green growth, resiliency, liveability, and sustainability, NPP3 act as a reference for the development of strategic policies at the state and local level [13]. Furthermore, the use of National Physical Plan 3 must be referred together with the 5-year Malaysia Plan, Eleventh Malaysia Plan. The NPP3 highlighted five main natural disasters that need to give priority; flooding, landslides, earthquake and tsunami and sea level rise. On the other hand, National Urbanisation Policy II (NUP II) (2016) is a policy document that aimed at coordinating the planning and development of urban areas within Peninsular Malaysia and Federal Territory of Labuan [14]. Vision of NUP II is to ensure urban areas within Malaysia to achieve Sustainable Cities for the wellbeing of the people by 2025. With reference to Table 1, measures of CCA are evident in all three documents, while DRR was much more focussed in the National Physical Plan

III and the Eleventh Malaysia Plan. This is because NUP II focuses more on green growth and aspects of low carbon and the general aspects of the quality of urban life.

Table 1. Related Policies, strategies and actions at Federal/National Level

	Climate Change Adaptation	Disaster Risk Reduction
Eleventh Malaysia Plan (2016 – 2020).	<ul style="list-style-type: none"> ▪ Focus on building resilient infrastructure ▪ Strengthen natural buffers – focusing on enhance terrestrial and marine biodiversity through conservation measures ▪ Strengthen the management of rivers and coastal areas (continuation of conservation efforts) ▪ Increase resilience in the agriculture sector – improve food security ▪ Support research and development especially in agriculture-climate modelling ▪ Increase awareness on the health impact of climate change (climate related diseases). 	<ul style="list-style-type: none"> ▪ Strengthen disaster risk management – the policy, regulatory and institutional framework of DRM under ▪ Incorporate DRM into development planning, evaluation and implementation ▪ To establish national crisis and disaster management centre ▪ Improve disaster detection and response capacity ▪ Long term planning on flood mitigation including flood forecast and warning system.
National Physical Plan III	<ul style="list-style-type: none"> • To ensure effective management of natural resources • The integration of green city and low carbon concept in transportation management system, urban infrastructure development and waste management. 	<ul style="list-style-type: none"> • Ensure effective spatial sustainability through land use planning with consideration of climate change and disaster risks. • Effectively manage high risk areas. <ul style="list-style-type: none"> ○ Mapping of disaster risk areas and establish integrated flood mitigation management (urban and rural)
National Urbanisation Policy II	<ul style="list-style-type: none"> • Integration of green growth elements in planning documents to address issues related to climate change • Encourage more efficient and Sustainable Use of Energy as well as Sustainable Water Management • preservation and maintenance on trees in urban areas to reduce urban heat island • Improve the awareness of all level of personnel involved in 	<ul style="list-style-type: none"> • Ensure all development plans provided are taken into account to address climate change issues and apply green development to cities sustainable for future generations •

the urban planning and
development to achieve low
carbon and green cities.

For the assessment at the state level, two states of Pahang and Kuala Lumpur were selected, and its State Structure Plan was carefully reviewed. Kuala Lumpur is an unplanned city that covers an area of 243.65 sq.km. As the capital state of Malaysia, Federal Territory of Kuala Lumpur is highly dense and the busiest city in Malaysia. This resulted in flooding, traffic congestion, and urban heat island are the common issues faced by the city. The state of Pahang covers an area of 35,965 sq.km (3,596,585 hectares), which is approximately 27% of the total area of Peninsular Malaysia (13.33 million hectares) **15**. In 2015, the total number of the population was at 1.6 million. Regionally, the state of Pahang is bordered with six states, namely, Terengganu, Kelantan, Selangor, Perak, Negeri Sembilan, and Johor.

The structure plan (SP) is the state document that interprets national and regional policies; establishing aims policies and general proposals; providing the framework for local plans; indicating special area plans. SP is also the main reference to guide land use planning and development control as well as indicating main planning issues and decisions to the general public and State Planning Committee (SPC). Kuala Lumpur Structure Plan 2020 was gazetted in 2008 with the vision to transform Kuala Lumpur into a leading World-Class City [15]. Whereas, the state of Pahang through the Pahang Town and Country Planning Department (PlanMalaysia@Pahang) is currently in the process of revising its Structure Plan (2002-2020) which was gazetted on 22nd November 2007. A lot of consideration has been made to ensure more holistic planning on all sectors. However, until the release of the new revised version, all developments are required to follow the State Structure Plan 2002-2020 [16]. In both states, CCA and DRR policies have been generally incorporated (refer Table 2). However, it is limited to the preservation of environmentally sensitive areas and flood mitigation. Pahang State Structure Plan provides further detail on the action-oriented strategies that can be categorised as DRR measures. Nonetheless, the strategies outlined are still considered as conventional approaches, thus require further considerations on innovative structural and non-structural measures as the impact of climate change escalates. The process of formulating the strategies and actions need to be supported with scientific evidence and technical data to ensure the proposed policies addresses the fundamental issues.

Table 2. Policies, strategies and actions at State Level

	Climate Change Adaptation	Disaster Risk Reduction
Kuala Lumpur Structure Plan 2020 (KLSP)	<ul style="list-style-type: none"> • Priority is given to environmentally sensitive areas by providing guidelines (development control and management). • Coordinate with all relevant agencies and stakeholders to implement the policies and guidelines of environmentally sensitive areas. 	<ul style="list-style-type: none"> • Focus on flood mitigation along flood prone areas. • To control development along river reserves – not allowing and permanent structure. • Priority given to rehabilitation programme of Sungai Klang and Sungai Gombak.
Pahang State Structure Plan 2030	<ul style="list-style-type: none"> • Focuses on the preservation and conservation of natural resources, habitats and environmental sensitive areas. • Preserve critical habitat and environmental sensitive areas as 	<ul style="list-style-type: none"> • Establish Integrated Environmental Sensitive Area Plan that correspond to the concept and criteria outlined in the National Physical Plan.

- well as improve its surrounding environment.
- All permanent forest reserve and gazetted water catchment areas should be managed sustainably.
- Preserve local heritage, ecological support system
- Efficient land use development to reduce environmental problems such as landslides, flash floods and local ecosystem destruction;
- Provision of flood control system and structures in each development to reduce flood risk (with reference to Urban Stormwater Management Manual for Malaysia - MASMA).

The local plan consists of a written statement and illustrations setting out the detailed planning and manner of carrying out the proposals set out in the structure plan for a particular local planning authority area. Though the draft KLCP was finalised in 2012, it was only gazetted in 2018 due to issues between different stakeholders. The assessment of CCA and DRR in the document revealed that KLCP still lacks strategies that directly address CCA and DRR [17]. Unlike Cameron Highland Draft Local Plan 2030 (CHDLP), the incorporation of CCA and DRR policies is more evident. Cameron Highlands is known to be exposed to multiple disasters such as erosion, landslides, and flooding. As reported in the CHDLP, at least 33 slope catastrophic incidents were reported around Cameron Highlands District during the period 1961 to 2007 with an estimated loss of about RM1. 35 million per incident for recovery works [18]. The document also highlighted that there were 515 landslides at risk of landslides, both active and inactive. As a result, the local district office has taken serious measures to ensure it is well addressed in the Cameron Highlands Local Plan. A clear flow chart of procedure in dealing with DRR management is also provided in Chapter 4 of the CHDLP [17].

Table 3. Policies, strategies and actions at Local Level

	Climate Change Adaptation	Disaster Risk Reduction
Kuala Lumpur City Plan 2020 (KLCP)	<ul style="list-style-type: none"> • Protecting environmentally sensitive area • Promote green infrastructure throughout the city • Encourage low carbon city initiatives • Address climate change by promoting more holistic and integrated growth. 	<ul style="list-style-type: none"> • Mitigate flood and manage storm water (ensure effective implementation of Kuala Lumpur Drainage Masterplan)
Cameron Highland Draft Local Plan 2030 (CHDLP)	<ul style="list-style-type: none"> • Enhances resilience and adaptation to climate change, disaster risk management as well as biodiversity protection and conservation. 	<ul style="list-style-type: none"> • Control the development and management of land use to maintain environmental quality, while avoiding and

- Control and maintain Environmental Sensitive Areas with integrated and sustainable planning.
 - Focuses on the implementation of Low Impact Development Concept throughout the area
- minimizing the impact of disasters.
 - Establish a comprehensive and effective disaster risk management strategy for disaster preparedness and response and disaster recovery.

5. Conclusion

Mainstreaming CCA and DRR strategy in the different level of development plans crossing all sectors with various types of intervention have been the current agenda worldwide. Overall, the findings of the study indicated that the integration of CCA and DRR is an agenda that has been well accepted in the planning and development of cities in Malaysia. However, it is noted that at the national level, aspects of CCA and DRR are limited to the environment and infrastructure sector. However, locally, much higher integration of CCA and DRR strategies are evident in the Cameron Highlands Draft Local Plan 2030 as compared to the Kuala Lumpur City Plan 2020. This is due to the geographical characteristic of the area, highland and prone to landslide, which is also highlighted in the National Physical Plan 3. Also, Kuala Lumpur's development plans, both SP and LP need to be revised to ensure it reflects the current global policies such as the Sustainable Development Goals, New Urban Agenda, SFDRR that focuses a lot on to address climate change issues and disaster risks which are more evident in these past few years. Additionally, more effort is needed to focus on the collaborative action in the revision of the development plans as well as the implementation of the strategies and actions stipulated. Establishment of a dedicated centre on climate resilience and disaster risk management within the state and local government is viable and vital as a mechanism to ensure a good platform for partnership for collaborative practices and effectiveness of the implementation.

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