



RESILIENT LAND USE PLANNING FOR RESILIENT CITIES IN VIETNAM - ISSUES AND OPINIONS FOR IMPLEMENTATION

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Abstract: Resilient land-use planning (RLUP) is a key factor to land use decisions and zoning extensions. A better land-use management and integrated urban planning strategy, involving all levels of governance and local communities are essential to improve the current and future resilience and overall adaptive capacity of vulnerable urban regions in emerging Asia, especially for urban areas in Vietnam. This paper describes the essential elements of resilient land-use planning for climate change and hazard mitigation. The prospects and challenges to implement RLUP into the practical context of cities in Vietnam are analyzed and evaluated. This paper also highlights the approach of RLUP as well as the process of mainstreaming RLUP to urban planning so that it will be more resilient to natural hazards throughout some practical examples already implemented in Vietnam.

Keywords: Resilient land-use planning, disaster risk, climate change, Vietnam.

Received: October 5th, 2017; revised: October 31st, 2017; accepted: November 2nd, 2017



1. Introduction

Vietnam is one of the countries that has the highest growth rates in urbanization and urban population in East Asia, represented as the sixth-largest urban population in East Asia with 23 million people. During the period of 2000-2010, its urban population grew by 7.5 million people and this annual urban population rise of 4.1% was one of the highest rates in the region [1]. After 30 years of the Reform, urbanization has been strongly linked to the industrialization and modernization of the country, at the same time obtained significant achievements including: the development of the national urban system in both quantity and quality. The urbanization rate increased from 19,6% with 629 urban centers in 2009 to approximately 36,6% with 802 urban centers in 2016 [1]. Urban land acreage increased from 630 square kilometers to 41,700 square kilometers, equal to 12.6% of the country's natural area. Urban areas make a substantial contribution to the total GDP, bringing in major values from the industrial production, export and import activities, science and technology sectors resulting the spillover effects for the socio-economic development nationwide. In 2015, the GDP of Vietnam was \$ 193.6 billion. GDP growth rate for the period 2001-2015 was 6.7%. The urban areas contributed 70% of the budget income and 50% of the GDP. The dynamic ecological - economic development in the last three decades has created an important need for an efficient land-use planning to manage the development of urban, rural and coastal areas in Vietnam. An efficient land-use planning is a key component for the new urban development strategy in Vietnam [2].

In the process of urban development, climate change has also been a growing risk for Vietnam's cities recently. Vietnam is one of the top four countries, which has been severely impacted by extreme climate phenomena over the past two decades. Every year, storms, floods, landslides, flash floods, droughts and other natural disasters caused severe impacts to many cities in Vietnam. "...In terms of frequency of natural disasters, Vietnam is among the world's top 10 countries most devastated by natural disasters" as Mr. John Hendra, UN resident coordinator in Vietnam mentioned at the Launch of Global Compact network in Vietnam. Recently, the Vietnamese government has become more aware of the country's vulnerability to climate change impacts. The Government promulgated the National Target Program to Respond to Climate change in 2008. The climate change and sea level rising scenarios for Vietnam have been formulated and proclaimed since 2009. The Government also approved of the National Climate Change Strategy in 2011

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and provided a National Action Plan for Climate Change Adaptation for 2012-2020. However, local authorities across the country, as well as the central government, are slowly coming to realize that land-use planning is an important tool for reducing losses in natural disasters. They have emphasized programs that slow down the development and optimize the use of land exposed to hazards with little attention to the long-term sustainability of that development.

This paper reviews the key features of resilient land-use planning (RLUP) for hazard and disaster risk mitigation. The prospects and challenges to implement RLUP into practical context of cities in Vietnam are also analyzed. The paper highlights the approach of mainstreaming RLUP into the process of urban planning in Vietnam to be more resilient to natural hazards. Throughout two case studies of Danang and Can Tho city's master plans, this paper insists the potential to implement RLUP in Vietnam cities' context for better responses to disaster risks and climate change.



2. Resilient land use planning in adapting to climate change risks

Urban resilience is the ability of urban areas to withstand acute shocks or chronic stress caused by crises or natural disasters, and to adapt and recover quickly without compromising their medium and longer-term plans and prospects. Central to urban resilience is disaster management that is all activities relating to preventing and preparing for disasters as well as those relating to response and recovery after a disaster has taken place [3].

Resilience to climate change must become a mainstream consideration when preparing land use plans, reviewing urban planning proposals, or making decisions about future urban infrastructures and services. Better preparing urban areas for potential impacts associated with climate change will bring valuable opportunities for cities to benefit from optimized urban planning strategies that improve climate resilience and bring important overall environmental, social and economic benefits for the local neighborhoods [4].

A resilient land use planning (RLUP) is to link climate change issues in to urban planning (spatial development, land usage, socio-technical development...). RLUP is the means for gathering and analyzing information about the suitability for development of land exposed to natural hazards, so that the limitations of hazard-prone areas are understood by citizens, potential investors, and government officials. RLUP combines technical analysis and community participation to make wise choices among alternative strategies for managing changes in land use [5].



3. Issues and challenges to implement RLUP to Vietnam's cities

3.1 Legal and institutional aspects

In the effort to solve the issues related to land use planning, urban development and disaster risk management, the Government has promulgated a number of legal and policy frameworks as well as documents to address challenges and provide actions as well as guidelines for implementation: The Legal Framework for Urban Resilience and Urban Development includes the following documents as Land Law revised in 2013; Law on Environmental Protection revised in 2014; Law on Natural Disaster Risk Prevention and Reduction issued from 2013; Law on Urban Planning in 2009; The Policy Framework for Urban Resilience includes the National Socio-economic Development Plan for 2016-2020; National Climate Change Strategy in 2011; The National Green Growth Strategy, 2012; The National Sustainable Development Strategy 2011-2020, 2012; Urban Development Plan of Vietnam for Climate Change Adaptation for 2013-2020; National Action Plan for Climate Change Adaptation for 2012-2020 in 2012; The National Orientation Plan for Urban System Development in Vietnam to 2025 with Vision towards 2050 in 2009.

The key issues that arise in this aspect are:

- Inadequate integration in preparing prescriptive sector master plans (e.g. land use plans and spatial plans, land-use plans and socio-economic development plans).

In the urban planning process, the sector master plans are prepared independently. The socio-economic plans was formulated separately to land use and spatial plans. It is resulted in the lack of coordination in land-use (and spatial) development.

- Climate change adaption and green growth strategies (i.e. SUDS) have not been addressed in details in Provincial Socio-Economic Development Plan (SED) and/or Provincial Action Plans.

So far, the climate change adaptation and green growth strategies have been integrated in many national policy frameworks. It has become priorities for research and investment projects at ministry levels. However, they have not been addressed well in provincial SEDP. Green house reduction is the only thing they mention as a solution for climate change adaption, for instance. There is a lack of explicit requirements for climate and disaster in land use plans and socio-economic plans at provincial level [6].

3.2 Resilient land use planning in urban development process

In Vietnam, there are two types of planning that were made for an area: Land-use planning and spatial/construction planning at local level. However, there are problems between two types of planning:

- *The overlapping and inconsistency of the two types of plans leading to limitation of the roles of each plan in the economic and social development of an area.*

Table 1. The differences between land use planning and spatial construction planning [6]

No.	Difference factors	Land use planning	Spatial construction planning
1	Institutional frameworks	Land Law, Government's Decrees, Circular instructions of the Ministry of Natural Resource and Environment (MONRE)	Construction Law, Government's Decrees, Circular instructions of the Ministry of Construction (MOC)
2	Time frame	10 years, 5 year plan	Regional plan: short term: 5, 10 years; Long term: 20 years or more. Master plan: short term: 5, 10 years; Long term: 20 years.
3	Spatial level of planning	Based on administrative levels: Country, province, district, commune/ward, based on administrative boundary	Not based on administrative boundary and administrative levels.
4	Focus	Land resource	Allocation of urban population, infrastructure
5	Objectives	Appropriate, economic, logical, effective land usage	Sustainable urban spatial development (residential areas, industrial zones, infrastructure)
6	Planning approach	Allocation of different types of land for suitable purposes (socio-economic development, national security, infrastructure) regarding the climate change	Formulate urban system, residential centers, industrial clusters Define network, location, scale of technical infrastructure hub

The relation between land-use planning and spatial/construction planning was not consistent in terms of time and space.

Particularly, there are many differences in terms of content and adjustment procedure in planning approach. The land use indexes at the same period of two kinds of planning are still not similar or conflicted. The relation between construction and land use planning is not appropriate through different procedures of two types of planning. These problems show that the cooperation between Natural Resources and Environment Department and Construction Department at provincial level is not closely integrated. As a result, the effectiveness of both plans is low in terms of planning the land use in the study area.

- *Resilient land use planning has not been integrated closely in provincial urban plans (e.g. master plan, zoning plan and detailed plan).*

In 2009, the Vietnamese Government approved and launched the Adjustment of Oriented Master Plan for the National Urban System Development to 2025 and the vision to 2050 (Decision No. 445/QĐ-TTg dated 7th April 2009) with a set of urban development indexes such as in 2025, the number of urban centers will increase to one thousand with about fifty percent of country's population will live in urban areas. In 2012, the National Urban Development Program (followed by Decision No.1659/QĐ-TTg dated 7/11/2012) was launched, emphasizing the urban system development and urban quality. These Government policies also mention the aim of urban sustainable development. However, that urban development policies have not mentioned yet the need of integrating resilient land use planning in urban spatial plans at all levels as regional, provincial and district levels. It can be seen from the facts that many new urban development areas or new residential areas have been planned and constructed in low-lying areas which will be the main driver



of both current and future increasing exposure to flooding. There are many residential areas or industrial zones that have been developed on vulnerable areas under the impact of climate change. Therefore, the lack of careful research on land use planning for vulnerable and disaster risk areas is one of the most crucial issues in many urban spatial plans of Vietnam.

- Lack of tools, techniques and guidance to implement RLUP to Vietnam's urban development planning

According to Dr. Nguyen Huu Cuong from the University of Natural Resource and Environment, RLUP with socio-technical, legislation and environmental solutions plays a very important role in implementing effective land use strategies to adapt and mitigate the negative impacts of climate change. For the climate change-impacted or disaster-vulnerable land, the land use should be limited and be strictly controlled. However, there is no guidance or detail instruction for each step of the resilient land-use process in Vietnam to respond, adapt and reduce the negative impacts of climate change and natural hazards. The tools that should be used to collect climate change related data, to assess land resource potential or to assess environmental impacts are not provided in each step of the RLUP process.



4. Opinions to implement RLUP into Vietnamese context

Based on current assessment of the urban development context, analysis of issues and challenges to implement RLUP in Vietnam's cities as well as national policy frameworks, the research proposed for four key objectives to establish the RLUP for Vietnamese cities as: i) To be in line with the National Urban Development Strategies, contributing to key strategies and framework for Urban Planning and Climate change; ii) To reduce the gaps between urban planning and current situation, closer to reality: more responsive to changes, more decentralized, more effective, more priority- focused and more reliable to investors; iii) To address climate change and climate resilience to urban planning process; iv) To prepare guidelines helping the local government, development agencies, professionals in land-use planning practices.

By reviewing some experiences in land-use planning for resilient and sustainable development cities in Asian countries which demonstrated similar conditions to that of Vietnam [7,8,9,10], this paper proposes six key steps of RLUP process as below:

4.1 Step 1. Data collection, inventory and analysis

This step aims to bring about the characterization of the city involves gathering, collecting, and processing information necessary to provide a clear picture of the development situation of the city. A sectoral profile and thematic maps are used as a major reference to the analysis of the current situation.

What to mainstream in the land-use planning process/plan: It is very important to collect Flooding Hazard, Vulnerability and Risk Assessment (FHVRA) information on the existing hazard, flooding vulnerability and risk situation from National Center for Hydro - Meteorological Forecasting (NCHMF). The Strengths, Weaknesses, Opportunities and Challenges (SWOC) should be assessed in carrying out the resilient land use planning strategies and implementing projects. The Disaster Risk Management (DRM) legal frameworks related to Land Use Management (LUM), Construction Codes and Standards (CCS), should be a mainstream in the policies and strategies for city development [9].

How to mainstream: There are five major works at this step to mainstream the RLUP as: 1) Utilize FHVRA information and Risk Atlas to provide maps of possible or known hotspots for useful parameters; 2) Utilize FHVRA findings to prepare city profiles and situational analysis of development sectors (e.g., settlements, infrastructure and natural environment) 3) Include earthquake, land-sliding and flooding hazard maps in environment profile [9,10]; 4) Identify spatial development trends for urban areas in a region; 5) Document impacts of FHVRA findings to population, sectors and to spatial development of urban areas of the Region and Corporation areas; 6) Organize workshops for consultation meetings and validate information with stakeholders.

Example 1: In the assessment of current conditions and resilient challenges of Danang a number of issues are listed to identify the major vulnerabilities, challenges and opportunities for development, impacts, risks and resilience challenges are analyzed [2].

- Issue 1: climate change implications for urban and socio-economic development
- Issue 2: population growth, particular immigrant labors, increases local social issues
- Issue 3: climate change and urban development impacting infrastructure and the environment

For each issue, all impact factors and potential consequences are defined as below (Table 2).

Example 2: In the process of carrying out the master plan for Cantho city inundation hazard maps by climate change in Mekong River Delta were made for reviewing and identifying spatial development trends for urban areas in the region.

4.2 Step 2: Setting the resilient city's vision

This step aims to create Resilient Land Use Planning (RLUP) vision statement includes resilience of city to disasters for sustainable development.

What to mainstream in the land-use planning process/plan: There is a main factor as: An RLUP vision statement has elements for reducing threats to the following: population, productive assets, built and natural environment. Each element is given a set of descriptors (i.e. words and phrases that signify the quality of the future and resilience desired).

How to mainstream: It is very necessary to draft a vision/mission statement that is supportive of disaster resilience building; to hold consultation workshop(s) to agree on Vision/Mission among stakeholders; to engage the city development corporations, planning departments of ministries, community representatives, stakeholders and working committees in the planning activities and decision-making processes.

Example 4: Formulate vision of Danang resilient city

Despite being recognized as one of the fastest growing cities in Vietnam and one of the most attractive tourism destinations in Southeast Asia, Danang is vulnerable to catastrophes such as typhoons, floods, heat waves, droughts and saline intrusion and to long-term effects such as typhoon and flood damaged housing, water shortages, unemployment, poor health care, and business continuity challenges. These challenges are predicted to increase with development, climate change, and population growth. In November 2015, Danang launched a Preliminary Resilience Assessment (PRA) and Da Nang's Resilience Strategy. The Resilience

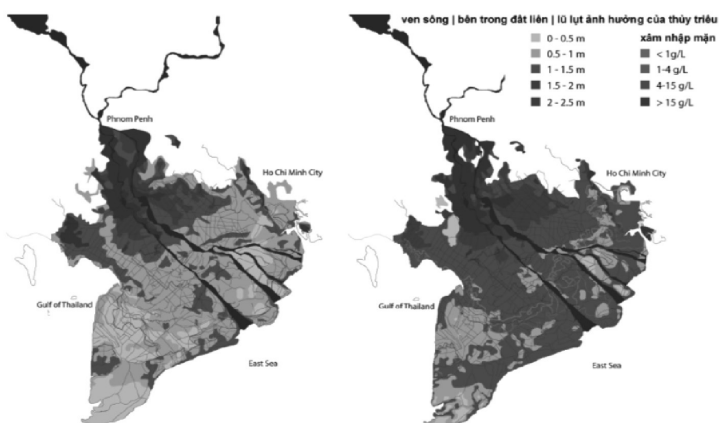


Figure 1. Predicted flooding, saline intrusion & displacement in Mekong River Delta by Climate Change ([6,7])

Table 2. Analysis of impact factors and potential results causes from climate change [2]

Shocks and Stresses	Associated Risks and Impacts
<i>Rising Intensity of Typhoons</i>	- Houses of the poor are seriously damaged, hard to recover after typhoons. - Tourism, services and industrial production are disrupted. - Traffic network is interrupted, increasing risk for tourists and residents.
<i>Flooding menaces</i>	- Housing and construction along rivers and in low-lying areas are damaged. - Flooding affects residents' lives including loss of life as well as financial and social impacts. - Property values within the city are reduced. - Constructions and infrastructure systems along rivers and in low-lying areas are destroyed
<i>Heat Waves</i>	- There is an increase in demand for energy. - Production activities (including tourism) are affected. - Infectious diseases increase among the community.
<i>Droughts</i>	- Prices for water access, treatment and supply increase. - Conflicts arise among water users (irrigation, hydro-power generation, household use and agriculture). - Water quality decreases as flow volumes drop, Saline intrusion increases due to reduced flow volume. - Agricultural productivity drops, leading to livelihood decline in rural areas.



Strategy focuses on dealing with the major challenges of four focus areas of Da Nang's urban resilience planning. Under the view of urban resilience, the Resilience Strategy points out priority actions and initiatives that are needed to deal with future challenges. The city set up a city future with a vision to 2030 as: *Danang, a peaceful, dynamic, well prepared and well connected city in the changing world* [2,4].

4.3 Step 3. Formulation of goals, objectives and strategies

The aim of this step is to provide goals and objectives to address the development problems, issues and concerns to achieve sustainable development of a city or new development areas. This step also formulates the strategies for the approach to achieving the desired goals and objectives (both long-term and short-term).

What to mainstream in the land-use planning process/plan: There are three factors at this step that should be mainstreamed in the LUPP such as: 1) Goals and objectives that establish resilience desired for a city; 2) Harmonized components of various master plans showing river development plans, road development plans, and other higher level and city plans and projects for the urban areas; 3) well formulated strategies, programs, and projects to respond to DRR and climate change adaptation.

How to mainstream: To organize workshops for setting sectoral development and land use goals, objectives and targets; To hold consultation workshops among stakeholders to identify, evaluate and agree on applicable and workable land-use management methods that support risk reduction, emergency management and in general-adaptation; To document outputs and findings.

Example 5: In the project of resilient strategy for Danang city funded by Dang People Committee [3], and Rockefeller Foundation, 2014, there are three strategies with objectives are formulated based on detailed analysis of city's existing conditions and future potentials to direct for the city sustainable development, in which, the 1st and 3rd strategies emphasize the aspect of resilience and sustainability of the city as described below:

STRATEGY 1: A peaceful city-A city that removes fear and anxiety from places where residents live, work and recreate.

- Short-term objective: the city will promote basic services for residents' safety against disasters.
- Long-term objective: the city and communities will have adequate capacity to become more resilient and recover against shocks and stresses.

STRATEGY 3: A well prepared city - A city with infrastructure systems, which can recover and be well prepared for challenges in development process.

- Short-term objective: Ecological and environmental solutions will be integrated into urban plan, development and management.
- Long-term objective: Danang city embeds multi-benefit solutions into creating a healthy ecological environment, and to improve community health, towards sustainable development [2,3].

4.4 Step 4. Generation and evaluation of alternative strategies

The aims of this step are: 1) to generate alternative spatial strategies as a major activity in crafting a land use plan. The spatial strategy is the form or pattern of physical development of the city that will contribute to the realization of the long-term vision and 2) to evaluate the alternative spatial strategies based on the advantages and disadvantages of each strategy to meet identified development goals, objectives and targets.

What to mainstream in the land-use planning process/plan: There are some major factors that should be mainstreamed in the LUPP as: Urban structures that establish a sustainable balance between the built and natural environment with considerations of seismic hazards, risks and their possible management; New development is directed into areas that are relatively free from hazards; Type, size and intensity of development are designed with the carrying capacity (e.g. soil, access to utility services), protection and safety (e.g. building codes, assigned open areas); Land use management methods are used for risk reduction strategies such as avoidance of unsafe areas, mitigation works, and adjustments in zoning character and these are incorporated into preferred spatial strategies; Strategies to improve enforcement of construction codes and standards are identified with other development controls by the city.

How to mainstream: It is highly recommended to use flooding risk maps (e.g. derived from Vietnam Risk Atlas) as overlays to identify exposed features (e.g. buildings, utilities, transport) or “hotspots” and screen inappropriate areas in the different use zones and to develop hazard zones. Open spaces and routes for evacuations for emergency management purposes should be identified. The best practices on DRM for possible adaptation or innovation are gathered and documented. Consultation workshops to agree on applicable and acceptable land use management strategies, preferred actions among stakeholders are held on-site.

4.5 Step 5. Detailing of preferred resilient land use plan (RLUP)

This step aims to provide the preferred spatial strategy/strategies served as a take-off point for preparing a detailed area plan (land-use zoning plan).

What to mainstream in the land-use planning process/plan: Land-use management strategies, construction codes and standards, development permitting process that support disaster risk management should be formulated. Spatial strategies and corresponding urban arrangements are supported with zoning ordinances, sectoral development investment programs, projects and activities that reduce seismic risk. Capacity building of institutions and communities for implementing DRR measures are also very needed.

How to Mainstream: There are four main works that have to do to mainstream above factors into LUPP: To identify and map the available and potential land supply for developments within and outside the city; To prioritize risk-sensitive redevelopment (e.g. increase open space, design using carrying capacities, reducing fragmentation and incompatible use, improve environmental quality and living conditions); To identify policies that reduce sprawls and incompatible uses; To invite legal experts, ministries, government departments and agencies, utility companies and academies to assess and offer solutions to existing conflicts in land use and zoning.

Example 5: Resilient land use planning to respond to climate change of Cantho city ([6,7])

Situated in the heart of Vietnam’s Mekong Delta, Cantho (population 1.2 million in 2015) has developed over the last three centuries with the unique spatial structure of overlapping systems of water and road infrastructures, and settlements are dispersed within the productive landscape of low-land paddy fields and high-land orchards atop dikes. Today, Cantho is faced with the challenge to guide massive urbanization.

In the proposed critical contextual approach made by a Belgian team (OSA-WIT-LATITUDE) and the Can Tho Department of Construction, an extensive analysis of Cantho’s historical evolution, recent conditions and future challenges provided the base for design ideas. These ideas were elaborated through conceptual visions, (urban) design guidelines and strategic projects. This case study highlights a selection of the work in order to clarify the methodology. In the proposed revision to the master plan, climate change is explicitly addressed through the elaboration of resilient land use planning based on landscape urbanism strategies. By re-uniting engineered and natural processes, the proposal strengthens existing logics to create an infrastructured landscape, which in turn would become the base for a new regional and urban form.

4.6 Step 6. Formulating policies and implementation tools (ex. zoning, monitoring and evaluation)



Figure 2. Resilient land use plan of Cantho city based on landscape urbanism strategies ([6,7])

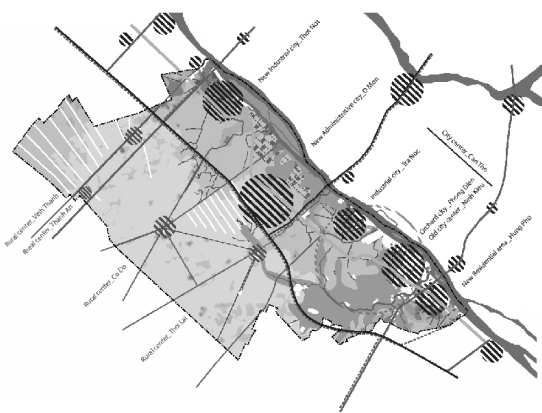


Figure 3. Planning for urban centers - O Mon town is located in high land and connects with highway (high land), not the Hau river to mitigate flooding ([6,7])

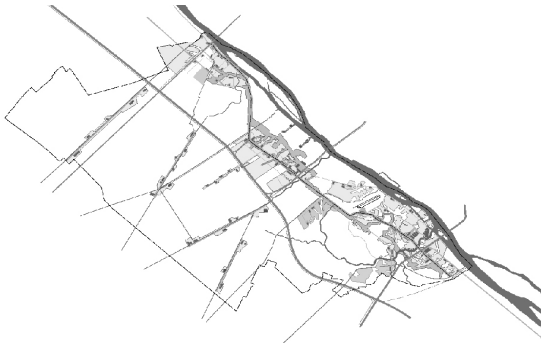


Figure 4. Planning for construction land: different ground codes for different land use functions ([6,7])

The aims of this step are: To review existing relevant national laws, to identify needed land use policies, and to draft the initial zoning policies and ordinances; To enact possible regulatory measures by the legislative council or by the provision of certain incentives to attract private investments or partnerships (new local legislation) to provide “teeth” to the sectoral and spatial policies, strategies and PPAs; To identifying zones (e.g. residential, commercial, industrial) requiring safety or risk reduction considerations that are identified in the land use plan.

What to mainstream in the land-use planning process/plan: The two key factors are considered to mainstream in the LUPP such as: National laws and local ordinances that support resilient land use planning and best management practices, advice and inputs by qualified professionals contribute to policy, strategy, implementation such as in development permits or exemptions issued.

How to mainstream: There are six major things to be done as: To detail the zoning ordinances that support risk-sensitive zoning; To clearly define zoning regulations: areas for development; the restricted areas and the no-development areas (or zones) for development permitting; To identify strategic locations of community facilities and discontinue facilities in areas that increase risk to life and damage; To consider land use arrangements, building and population densities, building occupancies, and landscapes that promote safe densities and arrangements; To review and improve the permitting process and adoption of risk sensitive construction codes and standards; To invite legal experts, government agencies mandated to plan and implement the different projects; utility companies and academe to assess and offer solutions on existing conflicts.

5. Conclusion

Urbanization, environmental degradation, climate change, development-related processes, planning shape and configure hazards are major issues that should be addressed nowadays. The complexity of systems and uncertainty related to the impact of development and climate change affect the way we understand

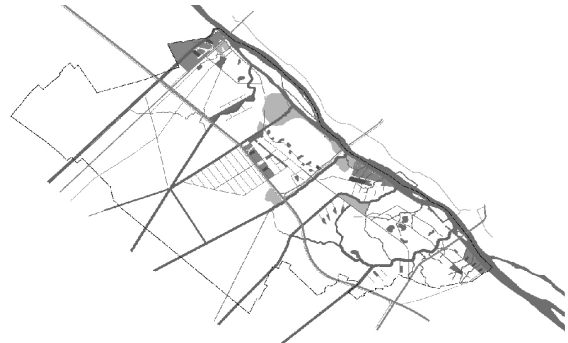


Figure 5. Planning for water network: quantity (flood, retention, drainage and irrigation) and quality (purification) ([6,7])

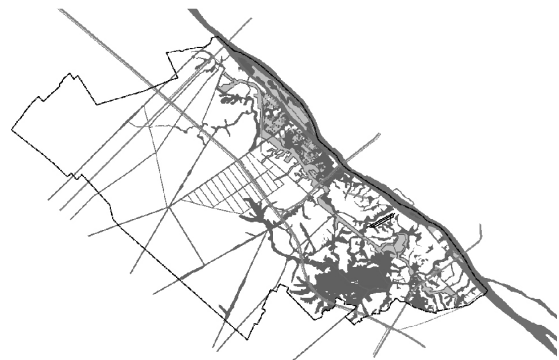


Figure 6. Planning for Green network: the Hau river park, Cantho linear park, civic spine tree planting ([6,7])

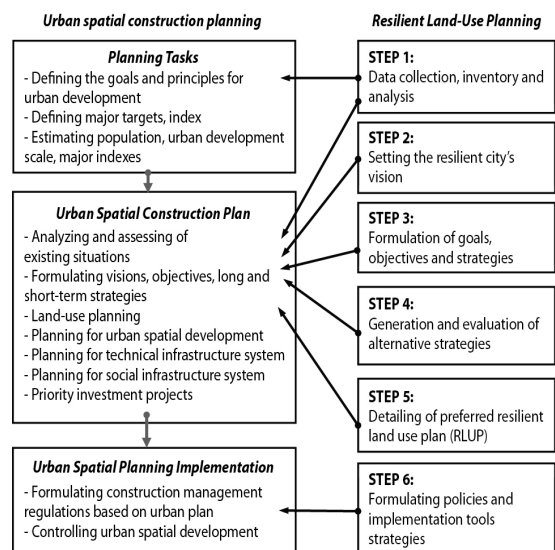


Figure 7. Mainstreaming RLUP into urban spatial construction planning process

and manage risks when we build and develop our cities. Urban planners must understand and incorporate natural ecosystem services into urban infrastructure and resilient land use projects [1]. Besides, the recognition of residual risks implies that cities have to continue improving the quality of risk communication, early warning systems, emergency contingency, evacuation and recovery planning.

RLUP identifies the safest areas to prioritize immediate investments in urban development and infrastructure projects. Land use plans influence the location, type, design, quality and timing of development. Mainstreaming RLUP in infrastructure projects reduces episodic and everyday risk in rapidly growing urban centers prevalent in hazard-prone areas.

The six steps of resilient land use planning proposed in this paper provide an important process and guidance for experts and urban planners to mainstream RLUP to urban master and detailed plans. This six steps include: 1.Data Collection, Inventory and Analysis; 2.Setting the resilient city's vision; 3. Formulation of goals, objectives and strategies; 4.Generation and evaluation of alternative strategies; 5.Detailing of preferred resilient land use plan (RLUP); 6.Formulating policies and implementation tools has been implemented in some projects in Vietnam to demonstrate the possibilities to apply the process widely in urban planning in Vietnam.

Moreover, social resilience also plays a very important role for the resilience of the city [5]. A resilient community is able to respond to changes or stress in a positive way, and to maintain its core functions as a community despite those stresses. Policy-makers should strive to create an enabling environment for communities to be able to participate in the activities and make decisions. This increases collective resilience and facilitates public authorities in their dual role of creating and disseminating risk information.

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