# การจัดการและการวางผังเมืองเพื่อให้เมืองมีความสามารถกลับคืนสู่สภาพเดิมหลังภัยพิบัติ

## Urban Planning and Management for City Resilience to Disasters

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### บทคัดย่อ

การศึกษานี้มีวัตถุประสงค์เพื่อสร้างระบบเมืองชายฝั่งให้มีความพร้อมในการรับมือกับความเสี่ยงจากคลื่นยักษ์สึนามิ จังหวัดภูเก็ตในประเทศไทย ถูกเลือกให้เป็นกรณีศึกษาที่จะใช้ประกอบในการอธิบายแนวคิดพื้นฐานของกระบวนการสร้างความพร้อมของเมืองเพื่อรับมือกับความเสี่ยงต่างๆ ทั้งนี้การศึกษามุ่งเน้นถึงการอธิบายผลกระทบจากคลื่นยักษ์สึนามิในปี 2547 ที่มีต่อชุมชน รวมถึงบทบาทของสถาบันในระดับชาติจนถึงระดับท้องถิ่นในการฟื้นฟูจังหวัดภูเก็ต หลังเหตุการณ์คลื่นยักษ์สึนามิ การศึกษาชี้ให้เห็นถึงความพร้อมของจังหวัดภูเก็ตในการรับมือกับความเสี่ยงโดยใช้การเปรียบเทียบสมรรถนะจากคุณลักษณะเฉพาะของชุมชนในอุดมคติและประยุกต์คุณลักษณะเหล่านั้นในบริบทท้องถิ่น จากกระบวนการศึกษาดังกล่าวได้อธิบายว่านโยบายการประโยชน์ใช้ที่ดิน กิจกรรมทางเศรษฐกิจของเมือง และศักยภาพในการปรับตัวของสถาบันเป็นองค์ประกอบที่มีความสำคัญต่อการสร้างความพร้อมของเมืองเพื่อรับมือกับความเสี่ยงดังกล่าว การกำหนดกลยุทธ์ในการควบคุมความหนาแน่นของเมือง และข้อกำหนดการใช้ประโยชน์ที่ดินที่คำนึงถึงปัญหาสิ่งแวดล้อม สามารถยกระดับความมีเสถียรภาพของระบบชุมชนเมือง และสิ่งเหล่านี้สามารถป้องกันผลกระทบจากคลื่นยักษ์สึนามิได้

### Abstract

The purpose of this study is to build city resilience of the coastal urban system to tsunami. To explain the basis concept of city resilience, Phuket Province in Thailand was selected as a case study. The study aims to explore how 2004 tsunami affected communities and how a wide range of institutions at national to local scales took actions to recover Phuket after 2004 tsunami event. The study expresses resilience of Phuket by adopting benchmarks from characteristics of ideal community resilience and adapting those benchmarks to the local context. As the results, the study found that land use policies, economic activities, and institutional adaptive capacities were crucial elements contributing to the city resilience. Urban diversity strategy formation and land use ordinances with a concern on environmental problems could enhance stability of urban system and those could buffer effects of tsunami.

Keywords: Coastal urban systems, Resilience, Adaptive capacity

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## 1. Statement of problems

All cities around the world have been developing and transforming themselves over time because of social-economic dynamics. Those transformations would be either positive or negative, depending on how urban planning and management deals with the changes and consequent perturbations. Negative impacts of transformations are results of the vulnerability of these cities.

The vulnerability and risk of cities are both outcomes and pressures shaping the progression of relationships between urbanization and urban planning. In addition, those relationships become more complicated when the risk is caused by not only urban activities, but also environmental changes; namely natural disaster. There is nowhere else that cities tend to be more vulnerable than cities in coast areas, which is interestingly regarded as the most productive yet highly threatened systems in the world (Agardy, et al., 2005). Those areas are combined with inland settlements and lowland settlements. The resource enrichment in the coastal area provides a variety of inputs for catalyzing urban development and urban economy more qualitatively and quantitatively. Therefore, the largest share of area in urban settlement tends to be on or near the coast, which leads to an increase in tsunami vulnerability of urban settlements and urban system.

The study aims to apply a resilience approach to the urban planning filed, which integrate disaster risks into urban environmental planning. Recognizing the increasing vulnerability of coastal urban system to natural disaster leads to the provision of modern disaster risk management, but some disaster prevention measures might not be cost-effective for some countries. Therefore, this study focuses on building resilience at the software scale of urban planning and development. To answer a question “Is the Coastal Urban System Resilient to Tsunami?” the main objectives are constructed: to identify indicators contributing to city resilience, to explore how much Phuket is resilient to tsunami, and to illustrate the environmental concern in the days following the tsunami.

## 2. Urban systems

Residents in every city always depend on the urban services provided by the articulations of urban inputs and outputs, which are all the results of the urban systems. Those urban systems are an integration of a trinity comprising of (a) the natural environment, (b) the built environment, and (c) the socio-economic environment. Hence, the urban systems have been regarded as a central metaphor for urban management in terms of metabolism over density, which makes an urban system is not just a set in terms of geographical parts, but that it is also a set of interconnected parts. The interconnection of various parts makes urban systems analogous to a ‘set’ in mathematics, where a change in one system can affect changes in the others.

Based on the system approach, the structure of urban systems can be studied through a formalized method determining the role and rule of components within overall interactive operation of

the trinity environmental service (Exline, Peters and Larkin; 1982 cited in Marcotullion and Boyle, 2003). The systems approach to urban planning changes the way of dealing with urban environmental problems from design to urban management aspects, which urban planning tries to keep each part of the entire urban system functioning under any risky perturbation. Noticeably, coastal zones are the downstream recipients of negative impacts of land use, while a number of coastal settlements are unprotected or marginally protected (Agardy, et al., 2005). With the devastating impact of tsunami, the coastal cities tend to face a deeper and prolonged crisis rather than inland cities do. As a result, the existence of urban systems has been questionable.

## 3. Resilience approach for urban adaptation to natural disaster risks

Resilience, in the viewpoint of Holling (1973), is "a measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationship between populations or state variables". Namely, the resilience approach identifies the resources and adaptive capacity that a community can utilize to overcome the problems that may result from changes. Resilience is closely related to the concept of vulnerability, and those two may co-exist. Vulnerability is a state of susceptibility to be damaged both from exposure to stresses associated with environmental and social change, and from the inability to adapt to unforeseen circumstances (Neil, 2006), while resilience refers to a process of adaptability to resist and recover from changed environment. However, when the urban system is not resilient, the status of this system does not automatically become vulnerable; its state is in a continuum between resilience and vulnerability in which a sliding state gradually changes into vulnerable. Noticeably, a city will be regarded as a resilient city when three elements occur: (1) the ability to absorb or avoid impacts of hazard events, (2) the ability to adapt to changing conditions and to function without changing to other states defined by a disaster threshold and (3) the ability to recover from hazard events quickly. Planning measures and interventions arising from a resilience approach can then focus on the critical gaps and weaknesses of the urban system.

While a traditional spatial analysis would have overlooked the urban metabolism within complex urban systems, a resilience concept provides a platform for a more holistic approach in which cities are considered as interconnected systems. City resilience can be measured in terms of performance of urban systems in response to changed circumstances (Silva, et al., 2012). Hence, a resilience approach is regarded as the basis for analysis and action that can be used in decision-making processes. With a documentary research method, the study adopts four key characteristics of the resilient city - which are served as a theoretical reference in order to reveal the Phuket's resilience to natural disasters (Table 1). To avoid the bias and prejudices against the truth, the literature review

supporting research's findings was based on different viewpoints from various authors and institutions across the world, whereas the gathered information was traced back their reliability and the truth using statistic data. Nevertheless, the study concerned that a gap between the reality and reported statements might exist unavoidably. This study, therefore, served as a foundation of enhancing better understanding and identifying crucial elements within the city that need to be improved.

**Table 1: Candidate benchmarks for assessing city resilience**

| Dimensions | Benchmarks |
|---|---|
| 1) Land use policies and their enforcement | - Land use policies relating to Disaster Risk Reduction (DRR) are established, monitored and enforced (1), (3)<br>- Developers and communities incorporate risk reduction into the location and design of structures (1)<br>- Legal and regulatory systems protect land ownership and tenancy rights (3)<br>- Defined structures, roles and mandates for government and nongovernment actors in coastal zone management (3) |
| 2) Evacuation infrastructure | - Community warning and evacuation infrastructure is in place and maintained (1). |
| 3) Economy | - Stability and diversity in economic activities and employment (1) (3) |
| 4) Institutional adaptive capacities | - Defined structures, roles and mandates of stakeholders in disaster preparation and response (3)<br>- Disaster recovery plan addresses economic, environmental, and social concerns of the community (1), (3)<br>- Self-help and Social embeddedness supporting vulnerable groups (2), (3) |

Note: The study realizes that the availability of evacuation infrastructure is one of characteristics of resilient cities without illustrating in the study, because there was no evacuation infrastructure in place at that time.

Sources: Adopted from (1) USAID : the United States Agency for International Development, 2007; (2) Cutter, et al., 2008; and (3) Twigg, 2009.

## 4. Results

The following results of this study illustrated how Phuket government authorities, local residents, and business groups collectively tried to recover their city from the catastrophe damages.

### 4.1 Land use policy and its enforcement

One year after 2004 tsunami, the local authority of Phuket announced a 2005 master plan, which intentionally took advantages of the Tsunami's destruction to guide and enforce the restoration process rather than merely following regular reconstruction procedures; however, the efforts to improve the tourism facilities by the traditional zoning was not enough to capture the tourism urbanization of Phuket. Hence, the obsolete plan is replaced with a 2011 master plan in order to provide better zoning regulations. As a result, the more sophisticated perspective concerning on impacts of urban development and its vulnerability to environmental risk was translated into a plan.

Inland areas along the coastline (Green) were indicated as recreation area for coastal environment preservation, whereas the littoral zone (Alternate colors: blue and white) was given significantly meaningful for ecotourism and fishery activities. In addition, 13 types of land-use activities in the previous plan were divided elaborately into 16 categories in the current plan. An increase in another special land-use activity – which is different from designated land use in the

master plan – would be allowed to add up to 5-15% of the total designated area, instead of to 30-50 % of each land lot – in the previous plan. Nevertheless, the current master still overlooks a common ground approach to integrated coastal zone management (ICZM) firstly initiated in Thailand in the 1980s, which would raise possibility to enhance city resilience. As a result, the mechanisms to bring about rapid urban sprawl and urban development under controls as well as an effective enforcement monitoring system have highly been remained doubtful.

**4.2 The coastal zone management and land tenure problems**

Showing less concern on ICZM, land tenure and rights became the most important causes of social problems after tsunami. Of the 63 affected communities in Phuket, 12 communities with unsecure land tenure (accounting for 19.05 % of total affected communities) faced difficulties during the reconstruction and rehabitation process. Those communities were mostly fishing communities in which they had resided on prime beachfront land for decades, but they typically have no legal title deeds nor lease contracts, and therefore it could be considered as illegal squatters (Paphavasit, Chotiyaputta, & Siriboon, 2006; United Nations Country, 2005). Numerous literature sources criticized that tsunami offered developers an opportunity to take these area under control through seizing such land, readjusting land lots and evicting the tradition occupants (Handmer and Choong, 2006; Mitchell, 2010; Rice & Haynes, 2005). None of a rehabitation or relocation plan was significantly produced by local authorities, but by nonprofit and nongovernment organizations (NGOs and NPOs). Meaningful planning techniques such relocation plans and land readjustments as well as a holistic approach to ICZM were scarcely recognized neither a previous nor a current master plan. It would reflect back a breakdown in corporate governance influencing on city resilience.

**4.3 Economic stability and diversity**

Phuket characterizes as same as tourism islands. The old town serving for local residents is in the east coastline, in face to face with the main land, whereas the west coastline that faces to the Andaman Sea is populous by tourism industry, where hotels and restaurants were located. This economic segment shared the largest proportion of Gross Provincial Product (GPP) accounting for 38.5% to 46.9%, between 2004 and 2007. Similarly, the employment in tourism segment accounted for 28.5%, which was regarded as a major job-creation compared with other segments. Located in the west coastline, the tourism industries were completely collapsed in the tsunami event, and the overwhelming shortage of financial liquidity of this major segment made other economic activities collapsed because of high dependence on tourism industry as the commercial vehicle chain. Of 250-264 million USD estimated as physical destruction, 72 % of the losses belonged to individual businesses (World Tourism Organization, 2005). An ability to recover the economy and sustain its flourishing monetary flows depended on both formal and informal businesses, while the subsequent tourist arrivals dramatically fell by 67.2% in the first half of 2005 (Henderson, J., 2007). As a result,

tons of businesses face with down-sizing and shutting-down situations. Therefore, “The Association of Small Businesses Affected by the Tsunami” organied by about 300 enterpreneurs was established in order to improve their ability to articulate needs and provide mutual support. It is clear that having less diversified economic activity and a main economic segment depending on tourism industry were the root cause of overwhelming financial liquidity resulting in the instability of urban economy.

**4.4 Institutional and community adaptive capacities**

Even though Thailand has been a member of the Pacific Tsunami Warning System before the tsunami event, Phuket Province had no warning systems and evacuation infrastructure in place. Disaster management at that time had focused mainly on the emergency response and post-disaster recovery, overlooking the potentials of mitigation and preparedness (Thanawood, Yongchalermchai & Densrisereekul, 2006). Hence, Thai national government was active in promoting the Nation Disaster Warning Center established in 2005 to administer risk communications across the country, which led to the establishment of several disaster risk reduction programs (DRR) aiming to strengthen efforts to reduce vulnerability to future tsunami events. Besides of the domestic policies, Phuket Action Plan was produced by United Nations World Tourism Organization (UNWTO). With the main goal to speed recovery in the affected destinations, the action plan prioritized five action areas, which were marketing and communication, community relief, professional training, sustainable redevelopment and risk management (Rice & Haynes, 2005).

The impacts of 2004 tsunami put pressure on government’s actions to recover affected cities from the catastrophe. With adaptive capacities of national government and local authorities and support from NGOs and international cooperation, many kinds of disaster reliefs and disaster recovery plans, were provided to the affected areas, particularly through vulnerable groups. To recover livelihood of people in affected areas, the government offered immediate cash handouts, temporary shelters, food rations, and 175 Bath per day (4.5 USD) for wage loss compensation, which would continue for another couple of months following disaster. However, the monetary relief provided by the government was criticized that it might benefit to local communities for increasing resilience of financial liquidity and accelerating recovery time, but the vulnerability of local communities did not drop down. Increased financial resilience of local communities through obtaining exogenous support could not be sustained and prolonged. Besides, the urban infrastructure and services that are constructed for mainly supporting residents rather than tourists limited possible opportunity to accommodate all affected people: this compromised adaptive capacity. Even through a number of produced re-development plans addressing on disaster risk deduction were produced, the government’s role changed from a reactive risk manager to a proactive planner, an essential part of creating an implementation plan with thoroughly documenting the actions at every step was ignored, making plans difficult to create possibly practicable.

## 5. Conclusion

The study proposes a preliminary set of characteristics that can be used to describe the city resilience. The evidence presented in this study illustrates how urban planning policies, economic development, and institutional adaptive capacities were the crucial determinants of the resilience building of Phuket tourism-dependent coastal city after the 2004 tsunami event. Previously, the economic benefits overrode other considerations and any impacts of economic-based development that a city might face. The 2004 tsunami event makes Thai planners pay more attention to environmental risk management and take a step forward to enhancing urban resilience to disaster and any potential climate change impact. The corporate government and local authorities are expected to improve their flexibility to adopt alternative strategies in response to perturbation. The government communication network and NPOs should be integrated into a holistic disaster-risk management network, whereas an initiative action to reduce city vulnerability and to improve the effectiveness of urban risk management must therefore address DRR, land tenure problems, and ICZM in a master plan and land use ordinances. The urban systems grounding on tourism industry can be sustained through the understanding of the relations among economic diversity, stability, and an effect of economic shocks. The study suggests that shifts to a more diversified sector-oriented economy can reduce the economic sensitivity and buffer an economic system from perturbations based on international tourism decline. A negative impact on economic activities generates a positive relation among SME enterprisers to cluster together and help each other in the business recovery process, which make them more resilient in terms of a speedy recovery. By this way, the resilience is not only spatially scaled, but it is also based on the institutional capacity to adapt to changing circumstances when disasters hit the city. The interventions aiming at increasing city resilience should not only focus on the physical elements and the formation of regulation, but also consider the social influence on common risk awareness and risk reduction behavior of institutions and individuals. A risk communication perspective can create environment that enhances the effectiveness of risk management strategies, while maintaining the highest attainable level of public participation in risk management, which is the ground for city resilience.

## References


Agardy, T. et al. 2005. Coastal System. *In* R. Hassan, R. Scholes and N. Ash (eds.). **Ecosystems and Human Well-being: Current State and Trends**. Island Press, Washington.

Cutter, S. L. et al. 2008. A place-based model for understanding community resilience to natural disasters. **Global Environmental Change**. 18: 598–606.

Exline, Peters and Larkin. 1982. **The City, Patterns and Processes in the Urban Ecology**. Westview Press. Boulder. Cited Marcotullion and Boyle. 2003. **Defining an ecosystem approach to urban**

**management and policy development**. United Nations University Institute of Advanced Studies (UNU/IAS). Available Source: http://www.ias.unu.edu/binaries/UNUIAS_UrbanReport1.pdf, March 20, 2012.

Handmer, J. and W. Choong. 2006. Disaster Resilience through Local Economic Activity in Phuket. **The Australian Journal of Emergency Management**. 21: 8-15.

Henderson, J. 2007. **Managing tourism crises.** Oxford, Butterworth-Heinemann.

Holling, C. S., 1973. Resilience and stability of ecological systems. **Annual Review of Ecology and Systematics**. 4: 1-23.

Mitchell, D. 2010. **Reducing Vulnerability to Natural Disasters in the Asia Pacific through Improved Land Administration and Management**. Available Source: http://www.fig.net/pub/monthly_articles/october_2010/october_2010_mitchell.html, April 17, 2012.

Neil, A. 2006. Vulnerability. **Global Environmental Change**. 16: 268-281.

Paphavasit, N., C. Chotiyaputta, and S. Siriboon. 2006. **Pre-and Post-Tsunami Coastal Planning and Land-use Policies and Issues in Thailand.** Available Source: http://www.fao.org/forestry/13145-0d2a4be335309affe5edb2179217efbab.pdf, April 17, 2012.

Rice, A. and K. Haynes. 2005. **Post-tsunami Reconstruction and Tourism: a Second Disaster?**. Stapleton House: London.

Silva, J. D., Kernaghan, S., & Luque, A. 2012. A systems approach to meeting the challenges of urban climate change. **International Journal of urban sustainable development**, 1-21.

Thanawood, C., C. Yongchalermchai, O. Densrisereekul. 2006. Effects of the december 2004 tsunami and disaster management in Southern Thailand. **Science of Tsunami Hazards**. 24: 206-215.

Twigg, J. 2009. **Characteristics of a Disaster-resilient Community: A Guidance Note.** Available Source:http://www.childreninachangingclimate.org/database/other/Publications/Twigg_CharacteristicsOfADisasterResilientCommunity_2007.pdf, April 18, 2012.

United Nations Country. 2005. **Tsunami Thailand — One Year Later: National Response and Contribution of International Partners**. Available Source: http://www.preventionweb.net/files/2203_VL323153.pdf, April 15, 2012.

USAID : the United States Agency for International Development. (2007). **How Resilient Is Your Coastal Community?: A Guide for Evaluating Coastal Community Resilience to Tsunamis and Other Hazards.** Bangkok. Available Source: http://www.meted.ucar.edu/communities/hazwarnsys/ccrg/CCR_All_lowres.pdf, March 2012.

World Tourism Organization. 2005. **Tsunami: One Year On - A Summary of the Implementation of the Phuket Action Plan.** Madrid, Spain: World Tourism Organization. Available Source: http://www.preventionweb.net/files/2202_VL323152.pdf, April 2012.