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An Approach to the Development of Resilient City from the City Governance

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Abstract: The climate change brought disaster impact to a city. Cities are complex and interdependent systems, extremely vulnerable to threats from both natural hazards and terrorism. A city resilience is the capacity of a city to function, so that citizens survive and thrive no matter what stresses or shocks they encounter. The cities need to be built for greater resilience and developed strategies for coping with the future shocks and stresses associated with climate change. This study explores that, from the concepts of city governance, the balanced scorecard correlates with city development in the process of city resilience development and constructs city resilience indicators to evaluate and the balanced scorecard raise the management performance. During the process of building the balanced scorecard, each problem can be faced and solved. To run the balanced scorecard is a continuous job and to become a resilient city coping with good city governance must adjust the balanced scorecard to meet its goals and vision to achieve sustainable development of the city.

Key words: Resilient city, balanced scorecard, resilience, city governance.

1. Introduction

Cities have been the centers of economic and social developments, as well as sources of many major environmental problems. Once they suffer from the natural disaster, the serious damage would be brought out. Humans need a new approach, a new way of thinking and a new way of looking at how the cities are designed, built and powered [1]. As a result of urbanization, increasingly large shares of the world population are living in cities. Cities are merging points of economic, political, social and cultural life, and as such face a higher risk of damages from climate hazards [2, 3]. The climate change brought disaster impact to a city. Cities are complex and interdependent systems, extremely vulnerable to threats from both natural hazards and terrorism. There should be not only the management and preventing and controlling, that must enhance the resilience of cities when give rise to the damage. In order to be workable and relevant for cities, the Rockefeller Foundation adopted the following definition of urban resilience [4]: *Resilience is the capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and grow no matter. what kinds of chronic stresses and acute shocks they experience.*

The resilient city constructs the flexible mechanisms and the various frameworks to make the life system functional, including the infrastructure, food, traffic, government and commerce. Resilience in terms of cities generally refers to the ability to absorb, adapt and respond to changes in an urban system. However, it is argued here that resilience shares much with other key contemporary urban goals such as sustainability and governance [5]. To increase their capacities for resilience, those cities will need to adopt urban planning and building design strategies [6] that allow them to increase their abilities to better respond and adapt to the economic, social and physical stresses they will face as they confront the challenges of increasing energy scarcity, climate change and

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population change [7].

City governance is the process by which governments (local, regional and national) and stakeholders collectively decide how to plan, finance and manage city areas [8]. However, the governance of city areas is to strive for the sustainable development of city economy, society and ecosystem. There are the important mechanisms of partnership [5, 9, 10], trust and share for the social economic ecosystem, and the communal cooperation way of combined public and private to create, produce, distribute, consume goods or service. Along with the rapid population concentration, the management of modern city becomes more complicated. Addressing them in a meaningful way requires governance system with systemic capacities to deal with complexity [11]. Simultaneously, in city areas, due to the conservation practices to mitigate and adapt to climate change, it is important that the climate change policy and the politics of climate change are fomulated [12, 13]. The combination of voluntary approaches to climate change policy and a growing interest in local action has supported a politics of climate change where multiple forms of governance, rather than a regulatory understanding of governing, play a fundamental role [14].

The BSC (Balanced Scorecard) was introduced by Drs. Kaplan, R. S. and Norton, D. P. [15] in a 1992 *Harvard Business Review* article. They started a working group to examine the challenge of reporting only on financial measures. The BSC is a performance measurement system as well as a strategic management tool introduced by Kaplan, R. S. and Norton, D. P. [15, 16]. The balanced scorecard is a business framework used for tracking and managing an organization's strategy, that is based on the balance between leading and lagging indicators, which can respectively be thought of as the drivers and outcomes of your company goals [17]. The balanced scorecard includes four key areas that are finance, customer, internal processes, knowledge and growth. The balanced scorecard method represents strategic planning and system management that are supposed to improve internal and external communication and monitor efficiency of an organization against strategic targets [18]. The balanced scorecard is a customer-based planning and process improvement system, with its primary focus on driving an organization's change process by identifying and evaluating pertinent performance measures [19, 20]. It is an integral part of the mission identification, strategy formulation and process execution, with an emphasis on translating strategy into a linked set of financial and non-financial measures [15]. The balanced scorecard method as a tool is applied widely. By focusing on specific qualitative and quantitative data around land use, transportation, energy and healthy community design, a resiliency scorecard helps communities assess their trajectory of smart growth and preparedness against the pressures of changing settlement patterns, particularly urban sprawl [21].

The cities need to be built for greater resilience and developed strategies for coping with the future shocks and stresses associated with climate change. This study explores that, from the concepts of city governance, the balanced scorecard correlates with city development in the process of city resilience development and constructs city resilience indicators to evaluate and the balanced scorecard raise the management performance. During the process of building the balanced scorecard, each problem can be faced and solved. To run the balanced scorecard is a continuous job and to become a resilient city coping with good city governance must adjust the balanced scorecard to meet its goals and vision to achieve sustainable development of the city.

2. Material and Methods

Before proceeding to complete the balanced scorecard, the hypothesized conceptual model has been formulated [22]. The hypothesized conceptual

model for the self-evaluation system is presented in Fig. 1. The major goal of the hypothesized conceptual model is to create a self-evaluation system that mainly uses the balanced scorecard theory as a framework and combines the UNISDR (United Nations International Strategy for Disaster Reduction) making cities resilient criteria [23, 24] for performance resilience and the characteristics of city governance for the resilient city.

Through the documentation analysis and Delphi technique, the balanced scorecard of resilient city was carefully designed. After reviewing the literature and conducting case study, the major component measures of the balanced scorecard of resilience governance are in Table 1. The measures among these four dimensions: finance, customer, internal processes, knowledge and growth, are randomly rearranged in order to test whether they are sufficient and efficient for evaluating the resilience governance performances of resilient city.

3. Indicators

Using indicators is a similar and popular way of assessing different features of a given city and a well-grounded methodology used worldwide [25]. The main aim of this paper is to collect indicators for evaluating mitigation and adaptive capacity of resilient city by using information-driven approach completed with scorecards to identify targets and sources of the variables. That can be interpreted as both strategic and decision making supporting tool. The features of the applied methodology based on the balanced scorecard can be seen through using indicators that provide useful information for decision-makers and planners about the climate-resilience of city. It is applied for the approach by customizing the following details:

- indicators grouped by resilience framework matched into the customers, internal processes, learning and growth and financial perspectives;
- including potential sources of the indicators;
- taking climate impacts into consideration as the main factor in selecting strategies.

That can be set out to the grouped indicators found in the City Resilience Framework which developed by ARUP (Arup Group Limited) with support from the Rockefeller Foundation, based on extensive research in cities. The City Resilience Framework is comprised

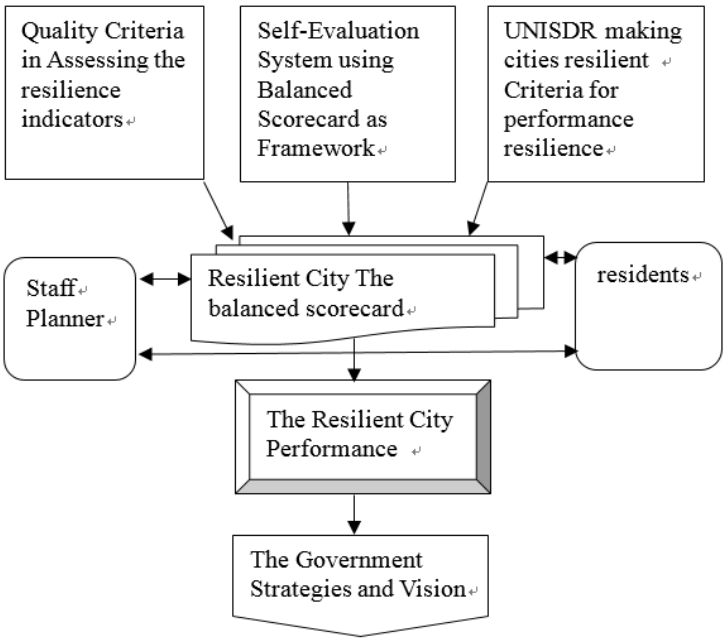

Fig. 1 The hypothesized conceptual model [22].

Table 1 Identified indicators regarding the balanced scorecard.

Dimension	Strategic theme	Strategic objectives	Strategic measure (key performance indicators)
Customer	Health & Wellbeing: The health & wellbeing of everyone living and working in the city.	·Minimized vulnerability of people ·Diversified living and employment ·Effectively life support and health security	·Medical system development rate ·Population density ·Employment rate ·Educational attainment ratio ·Disaster casualty rate
Finance	Economy & Society: The social & financial systems that enable urban populations to live peacefully, and act collectively.	·Sustainable economy ·Collective-identity and mutual support ·Comprehensive security and law and regulation	·GDP ·Casualty insurance system ·Ratio of total budget for disaster reduction and mitigation ·Policy and regulation for disaster reduction and mitigation ·Ratio of subsidy and budget disaster reduction and mitigation
Internal processes	Infrastructure & Environment: The way in which man-made & natural infrastructure provide critical services and protects urban citizens.	·Reducing exposure and vulnerability ·Adaptation and recovery capacity ·Reliable mobility and communication	·Disaster intensity ·Disaster frequency ·City scale and size ·Land use area ·Green cover rate ·Efficiency of Flood prevention and river hardness practice ·No. and mode of operating maintenance for infrastructure
Knowledge and growth	Leadership & Strategy: Effective leadership, empowered stakeholders, and integrated planning.	·Effective leadership and management ·Stakeholder empowered ·Integrative planning and development	·No. of meeting for disaster reduction and mitigation ·No. of environmental education training ·No. of training community empowerment ·Implementation rate of the proposal ·No. of case closed successfully for development and planning

of four categories, twelve indicators and seven qualities [26]. The four categories are considered basic elements available to a greater or lesser extent in all local systems. They cover the health and wellbeing of individuals (people); infrastructure & environment (place); economy and society (organization); and, leadership and strategy (knowledge). The twelve indicators have been found to be critical in cities dealing with shocks and stresses and describe the fundamental attributes of a resilient city. They are performance indicators and describe the outcome of actions to build resilience, not the actions themselves. Finally, the extent to which the seven qualities are available provides an indication of how well cities can respond to changing situations [26]. The original balanced scorecard method can be involved into this framework by defining balanced scorecard aspects as the parts of a given city subsystem in terms of being resilient regarding adverse effects of climate change. Indicators should be used for understanding processes from the present to the future, and for defining relevant actors and actions in terms of resiliency and adaptation goals.

4. Case Study and Method

4.1 Case Study

Taipei is the political, economic, educational, cultural center and the capital of Taiwan. It covers an area of 27,180 hectares and has a population of about 2,689,845 inhabitants until June, 2017 [27]. Taipei City is situated in the northern part of Taiwan Island, and the northeastern tip of the Taipei Basin. There are 12 administrative districts in the Taipei City, including Songshan, Xinyi, Daan, Zhongshan, Zhongzheng, Datong, Wanhua, Wenshan, Nangang, Neihu, Shilin and Beitou. Due to the varied topography, economic development and time of development, the population is unevenly distributed.

Daan, Songshan and Datong districts are the most populated. It borders New Taipei City on all sides [28].

Taipei has a monsoon-influenced humid subtropical climate. Taipei is characterized by a climate with warm to hot summers and cold winters. Daily mean temperatures of 30.0 °C were observed during the two warmest summer months of 2016. Scientific studies show the heat risks for Taipei on a small spatial scale. A potential heat risk map based on simulated air temperatures and the concentration of infant and elderly population. The analysis associates the inner city area with high risks. Other studies have presented heat mortality risk maps that reveal mortality patterns of great spatial variety with potential risk hubs also lying outside of the inner city ring.

The meteorological data for 2016 collected by the Taipei Weather Station and provided by the Central Weather Bureau are as follows: Annual accumulated rainfall: 2,431.7 mm; Annual average temperature: 24 °C; Annual average relative humidity: 74%; Number of rainy days: 188 [29].

By the end of 2016, the urban development plans had an area of 27,180 hectares, covering the entire administrative districts. Flat land suitable for city development accounted for 12,998 hectares or 47.8% of the city. Hills, slope land and low-lying land that were not suitable for city development accounted for the remaining 14,182 hectares or 52.2% of the city. Land for city development can be classified into various areas based on location, mode of use, socio economic structure and future trend of development. The largest was the land used for public facilities occupying 7,101 hectares or 26.1% of the city. The residential area occupied 3,791 hectares or 13.9% of the city. The commercial area had an area of 882 hectares or 3.2% while the industrial area covered 409 hectares or 1.5%. A large part of land for other use was the reserved area occupying an area of 6,905 hectares or 25.4% of the city. The waterside and other area occupied an area of 6,563 hectares or 24.1% of the city while agricultural and scenic area accounted for 715 hectares or 2.6% of the city [30].

4.2 Method

The main methods used in the research are documentation analysis and Delphi technique. This study was carried out the case study to gain the detailed and useful information. Through the Delphi survey which includes two rounds of experts, answering questions data were collected and were analyzed by content analysis. By nature, working on city resilience requires “complex thinking and complex methods” [31], and it also forces people to adopt a more holistic view [32]. This study explores that the policy and mechanism of city governance correlate with city development in the process of city resilience development and constructs city resilience indicators to evaluate and the balanced scorecard.

5. Results and Discussions

The study of how to establish a management system based on balanced scorecard is now the most popular topic amongst experts and researchers. An examination of the resilient city makes it clear that a highly impact by climate change of approaches stands to benefit from the creation of balanced scorecard. A scorecard that can reflect a history of best practices, and which can apply universally to cities and their varied and unique characteristics into one comprehensive vision, is crucial [33]. The approach to creating the climate impact resilience governance scorecard for the Taipei City would be guided by a comprehensive examination and presentation of city governance performance, followed by factors that can provide a holistic view of the resilient city’s trajectory of governance and development. The Strategic measures of the balanced scorecard of resilience governance are presented in Table 1.

In order to achieve mitigation and adaptation for climate change impact and to prevent from living under continuous threat and to become vulnerable to

risk [34, 35], the city vision is declared to make a resilient city that is resilient in response to this disaster. The four dimensions of the City Resilience Framework match to the four dimensions of the balanced scorecard that make the strategic themes. Those are health and wellbeing, economy and society, infrastructure and environment, and leadership and strategy. As for the implementation tips, the cities differ in size, culture and complexity, but key implementation points should be considered when using the balanced scorecard to develop strategic objectives [36]. Strategic themes are operationalized through the definition of strategic objectives [36]. To accomplish becoming a resilient city, the strategic objectives were set out of the human society [37], ecological city resilience [38], and economic recovery [39], disaster recovery and city security [35].

After the achievement of consensus of experts' opinions in two round processes and reviewing the City Resilience Framework by ARUP, the indicators of the resilient city performance were set out for Taipei City. In other word, the indicators were switched to the strategic measures that describe very specific things the city must do well to achieve its strategic objectives. The strategic measures were the key performance indicators. The strategic measures turned out to the operational level from the strategies. Moreover, the city governance performance derives from strategic measures.

Governance is the enabling environment that requires adequate legal frameworks, efficient political, managerial and administrative processes to enable the local government response to the needs of citizens [1, 40]. City governance is the software that enables the city hardware to function. Effective city governance is characterized as democratic and inclusive; long-term and integrated; multi-scale and multilevel; territorial; proficient and conscious of the digital age [41]. Due to facing the challenges and risks of climate change, the governance of resilient city includes two types: one is the prevention and mitigation of disasters before happening, in which assessment and preparation are inclusive; another type focuses on the capability of response and recovery for environment and the people negotiation mechanism after disasters happening. Related governance strategies for reaching it are affected by climate change and potential impacts, therefore, involving climate variables provided a mix of different strategies due to the different impacts of a given climate event.

After the indicators are being chosen, more extensive analysis should be done to formulate precise measures and targets for city governance. The large cities of today have recently been facing the major challenge of massive urban complexes, which create further need for proper governance [35]. Besides, the disasters from climate change cope with uncertainties, risk and hazards [42] and that is more resilient for the cities and communities and to be a shift in city governance [35].

6. Conclusions

Wilkinson, C.'s 'Strategies for Resilience' [43] helps to direct the development of these relationships of components towards the goals of managing and preparing for change and uncertainly through strategies, adaptive plans, redundancy, modularity and learning from crises. Building an enduring evaluation system will improve efficiency, enhance the resilient city performance and benefit in various ways. The city administrators could use the resilience framework of the balanced scorecard as guidelines for allocating resources value-added activities, deciding priorities in the decision-making process, gaining consensus and clarifying the vision of the city. Meanwhile, they could link outcomes to performance measures, updating for efficient governance systems, strengthening city performance and further enabling to achieve mitigation and adaptation for climate change impact [44, 45]. A city is complex environment and complicated context. Both physical and social processes can be considered as spatial and temporal

interactions across networks. A resilient city is defined by the overall abilities of its governance, physical, economic and social systems and entities exposed to hazards to learn [35, 46].

Deputy Mayor of Taipei City, Lin, C. [47] announced (2016): "A city needs to have adjustability and receptivity to grow as a resilient city. In order to achieve this, Taipei City has proposed the Taipei 2050 Vision Plan. Spatial redevelopmental strategies are proposed to aim at health and safety, justice society and open to public policies." [47]. The vision statement of Taipei City development is 'Livable and Sustainable City—construct safe, convenient, ecological landscapes". Therefore, integration of the balanced scorecard and the strategies and targets for becoming the resilient city that will enhance good governance, even city planning [48] and adaptive management [49] and promote the partnership. Taipei City takes the comprehensive exploitation of resilience governance as development opportunity; it bases on conducting for diversified physical and nonphysical management and sets up credit and builds the suitable policy and actions plan for adaptation and mitigation. That is ready in advance, to plan for uncertainties, resist, absorb, accommodate to and recover from the effects of a disaster in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions; it takes improving public service and being tried to give residents wellbeing and security as final pursuit.

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