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An exploratory study on land use planning of disaster prevention: A case study of Kaohsiung new town

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Abstract

Global Climate changes and greenhouse effect lead to an important issue on water management. However, previous studies focused on structural mitigation ways to solve the flood issue, leaving improvement on water management behind. This article attempts to deal with the issue of water management in non-structural mitigation way. As reviewing previous spatial planning method, this article seeks to sort out measures in water management. By choosing Kaohsiung new town as study area, the result indicates some measures can be intergraded into nowadays urban planning systems.

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Keywords: Flood mitigation, Non-structural measures, Kaohsiung New Town

1. Introduction

Global climate changes and greenhouse gas effect lead to extreme climate phenomenon; frequent floods and droughts now have become threats to social properties and individual lives. During 2009, countries such as Taiwan, India, Thailand, and Mexico suffered severe flood disasters, and revealing basin water management as urgent issue in Regional Plan. Under the impact of natural disasters, worldwide cities have conducted various natural disaster mitigation measures, and further indicated that traditional structural mitigation measures have limitation on risk of preventive efficiency [3]. As a result, countries and organizations have put emphasize on non-structural mitigation measures of spatial planning and risk management to redraft water management strategies recently. For instance, U.K claimed the

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strategy of “Making Space for Water”, World Meteorological Organization (WMO) promotes the concept of “Water Adaptation”, and “Living with Water” strategy in Netherland. Under this trend, many water management patterns major in spatial planning has been promoted. Such as Best Management Practices (BMPs), Low Impact Development (LID), and other planning measures, all of these include non-structural measures and low cost structural measures. Through the means of increasing infiltration, water purification and the flow retard, these measures are expected to moderate the natural impact from urban development.

Yet, on viewing the planning policy of flood mitigation measures in Taiwan, most of application tool paid attention to the structural mitigation tools. While some spatial planning and management law preliminary emphasized on the importance of non-structural mitigation strategy, many measures of this field leave a room to be executed properly. Due so, the research attempts to compare the application of water management between Taiwan and other countries, and further propose proper non-structural mitigation strategies to Kaoshiung New Town.

2. Literature review

2.1. *Measurement of disaster mitigation measures*

Disaster mitigation is defined as “the effort to reduce loss of lives and property by mitigating the impact of disasters.” [7], focusing on policy, planning and management, enhancing recovery ability and emergency dealing ability. Flood mitigation measures can be sorted to structural way and non-structural way initially. The former one is one behalf of engineering measures, lowers down the degree of disaster impact, such as dikes, dams, sediment control dams; the latter one is non-structural planning or education, changes the concept of build environment, and reduce the risk of disasters. For instance, land use planning, land use management, finance, insurance, monitoring or early warning system, and disaster preventive education are several ways of nonstructural way. The improvement of building seismic design is considered a non-structural way as well, including building construction material or changing different construction method [2]

Structural disaster mitigation measure was the core in previous world’s flood mitigation measure. However, it is not enough to lower down disaster risk [15] if only depending on structural disaster mitigation measure. The original mandatory engineering ways were unable to solve natural disasters. In common structural mitigation ways, the destruction of facility failure, human improper operating, or other destruction beyond expectation are not considered. Hence, the structural facilities might expose human lives and property to danger and further expand the disaster area. The experience in New Orleans by Hurricane Katrina during 2005, the disaster expanded due to facilities failure. Nonstructural mitigation ways should be first prior [12].

2.2. *Non-structural mitigation measures*

Land use management is the key part in non-structural disaster mitigation measures [2, 4, 15]. [2] adapted broad concept of land use to separate common tools of nonstructural disaster mitigation measures to seven categories as below: Moratorium Meaning, Levy, Comprehensive Plan, Capital Facilities Plan, Taxation and Tariff, Dissemination of information, Post-Disaster Recovery Planning. [15] generalized several usable spatial planning disaster mitigation measures, and advocated for the pre-disaster and post-disaster use. According to different types of disasters, he listed over 40 non-structural measures in ‘Emergency Response’, ‘Planning Tool’, ‘Detail Planning’, ‘Regulation and Design’, ‘Financial tool’ and ‘Management tool’. [12] proposed non-structural disaster mitigation includes ‘Resource control’ (which

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