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Amphibious Architecture and Design: A Catalyst of Opportunistic Adaptation? - Case Study Bangkok

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Abstract

This paper is part of a larger research into the conditions and challenges of mainstream or opportunistic adaptation of climate change adaptation in Bangkok in which adaptation measures are implemented in an integrative way with autonomous urban redevelopment projects. When compared to the application of stand-alone measures, mainstream adaptation will require a longer implementation period as it pace of implementation is depended on the so called adaptation opportunities arisen from the redevelopment needs and moments. Consequently, the integration of adaptation into the autonomous redevelopments is a transformation process of continuous adaptation.This paper explores the potential role amphibious architecture, design and construction can play in the transformation challenge of Bangkok to become a flood resilient city on the longer term. It will focus on a typical neighbourhood, more importantly infrastructure, building, and public spaces. A typical outcome of this process would be a master plan detailing the improvement strategies. The chosen neighborhood will be analyzed in three steps, explained in the following. First we introduce and characterize the urban structure in terms of flood hazard, exposure and sensitivity. Then we provide a few adaptation measures into the real condition. Finally, approximate when and where these measures can be applied in the future that able to be upgraded to assess the spatial and temporal adaptation opportunities included in terms of different detail of scaling effects such as architecture and urban infrastructure.

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Keywords: Amphibious; Lifespan; Lifecycle; Opportunistic Adaptation

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1. Introduction

Historically, some parts of Thailand have always had issues with flooding. This is also the case in those parts of the city with traditional architecture, where early types of flood protection measures have been applied [1]. Water management in the capital Bangkok is of great importance due to the rapid urban development caused by fast economic growth. This is reflected in the 17 percent increase in GDP of the area around the Suvarnabhumi International Airport between 2010 and 2015, which experienced significant flooding over the last decades [2, 3, 4, 5]. This rapid growth in combination with increased frequency and severity of rainstorms have created an urgent need to enhance flood resilience of these vulnerable, flood-prone areas. Flood resilience can be enhanced through the implementation of flood proofing measures at the level of single buildings and local infrastructures and public space in these residential, commercial and industrial areas of Bangkok. Flood risk has increased because of the loss of land for water storage and agriculture upstreams and in the peri-urban areas of Bangkok, as a result of the rapid expansion of new built-up areas in these wetlands such as being observed in the areas surrounding the national airport. After development these areas are considered to be particularly vulnerable to flooding. However, the city planning law has designated these areas for expansion and allows new development to be build, resulting in a loss of land dedicated to storing and retain (storm)water. Consequently, there is a tension between on the one hand the pressure on land for urban development and to the other hand the need to reserve land for water storage. This tension has a direct effect on the population, architecture, and urban infrastructure. The way surface and stormwater were managed over the years has gradually contributed to the flood issues that Bangkok is observing today. The government has initially chosen a straight-forward approach for solving this issue, mainly focussing on limiting the flood hazard. By focussing on 'engineered solutions', such as increasing the pipe drainage capacity, constructing small flood protection structures like dikes or dams, some flood relieve has been achieved. Yet, the costs of retrofitting the existing structures are relatively high and require large scale interventions. Furthermore, the increased variability in monsoon driven rainfall events makes it difficult to actually impose a standard that would effectively limit or even remove the impact of pluvial flood hazard in the area. An alternative approach might be to gradually retrofit the urban areas by adopting the assets to accommodate floods. By gradually replacing or upgrading structures that reached the end of their functional, economic or technical lifespan, flood resilient constructions can be integrated in a possibly more cost effective manner. This so-called opportunistic or synergistic adaptation (Veerbeek et al., 2013, Zevenbergen et al., 2008) mainstreams flood adaptation with the actual urban dynamics. An advantage of the approach is that new insights and subsequent standards can be integrated continuously, which safeguards the approach against massive under or over investments since it does not necessarily rely on long term future climate change predictions. The approach can be combined with the application of immediate retrofitting actions in areas that suffer from annual flooding, but still have a significant lifespan ahead. The actual measures themselves depend on local flood conditions and include amphibious constructions that are dry during most of the year but can accommodate monsoon driven flooding.

Communities in central Thailand and Bangkok have traditionally been very resilient and possessed much knowledge about coping with regular flooding. Many urban communities are well organized and are participating in local water management projects. But today's local wisdom that communities have gathered over the centuries of living with water has disappeared. This partly is because these neighbourhoods consist of new residents, no longer living in a traditional way and modern types of houses are less resilient that the traditional houses (raised on stilts or temporarily (amphibious) and permanent floating). The challenge at a small scale is to reintroduce local knowledge and indigenous technology to cope with floods and become more resilient. This paper will focus on the challenge of opportunistic adaptation and the potentials offered by amphibious architecture and design to support the transformation of an existing neighbourhood in Bangkok.