

The flood problem in ho chi minh city, vietnam

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' Vehicles were submerged under water within 10 minutes, 21 parking lots in the city were attacked, thousands of automobiles and motorcycles were damaged.' This is how people remembered the flood of September 2016 in Ho Chi Minh City (HCMC). In recent years, annually flooding is becoming a major problem that people in HCMC suffer from. To combat floods, the city government has installed pumps in flood-prone spots in the city and constructed canals, dykes and flood-control dams (Bangkok, 2018). However, even with all these efforts, the situation in HCMC has not been changed. Plenty of tasks are waiting to be figured out, such as lack of long-term strategies on city development, excessive urban expansion, and weak flood defending infrastructure.

What factors lead to the floods in HCMC?

Climate change is always the first answer coming into people's mind. And it indeed is part of them. Coastal areas are generally at risk from climate change. From Monre's study, it is already very evident in Vietnam with temperatures increasing by 0.5 degree centigrade and sea-level increasing by 0.2 meters over the last 50 years (2009). According to another study, the southern Vietnam is likely to be affected by rising sea water levels in South China Sea, where the water level will increase up to 13 centimeters in year 2030 at the rate 2.56 millimeters per year due to the global sea level rise in region and the world. Under such prediction, the region becomes one of the most vulnerable regions to sea level rise around the world. In addition, climate change means more frequent climatic and weather extremes. High intensity or prolonged heavy rainfall easily causes pluvial flooding (floods caused by rainfall). Flooding events can occur individually, but, more

commonly, they appear in combination with high tides and fluvial flooding events. High water levels in watercourses of HCMC caused by tides and overburdened or blocked drainage and sewage systems exacerbate the flood risk.

Furthermore, climate change alone cannot fully explain the serious flooding in HCMC. Unprecedented urbanization and precarious growth situation of the city over the last decades can be seen as a non-climatic driver that exposes HCMC to flood risks. The southern Vietnamese city of HCMC, one of the most dynamic examples of rapid urban development of the past 20 years, is an example of an emerging coastal megacity with increased climate risks. Since the industrialization following the Doi Moi reforms (a domestic reform that the government aimed at developing economy) in 1987, HCMC has undergone a fast process of urbanization. From 1986 to 2010, the population of HCMC approximately doubled from 3.78 million to 7.1 million. This figure, however, does not include the estimated additional 2 million unregistered migrants in the city. From 1997 to 2003, to meet the living demands along with this high rated urbanization, the HCMC government expanded the urban boundary, leading to the establishment of six new urban districts. As a result, the total urban area of HCMC increased from 142.15 square kilometers to 494.00 square kilometers in 2008. Fifty five percent of the current urban area of HCMC lies 1 meter above mean sea-level and only 28% is above 2 meters. This makes the city particularly vulnerable to inundation from even small changes in future sea-levels. Moreover, urbanization has caused the degradation of valuable multifunctional natural areas in the urban periphery. This means the creation of more hardscape

features and the loss of space for water. And the result is the growing susceptibility and exposure to flood risk for both populations and assets in existing settlements, which were once significantly less exposed to flood waters, as well as the addition of new flood risks situated in recent developments in the flood prone low lying areas.

Facing serious flooding problem, HCMC is vulnerable in terms of both environment and economy. There are at least three main problems in HCMC resulting from increased flooding. Firstly, the floods expose the inequity about facilities and services among residents. People living in poor areas are more vulnerable to flood risks, resulting from lack of environmental services and backward infrastructure condition. Secondly, polluted floodwater damages road, housing and properties. And people also face the risk from electrocution (killing by electric shock). Finally, regular floods have brought polluted water closer to people's life. Poor people mostly use water from wells and rivers and discharge wastewater directly into canals and Saigon River without any treatment. As a result, when floods occur, they face more risks to floodwater and pollution. Pollution caused by poor people also increases the health risk of rich people. And lack of health facilities also worsens the situation.

It is apparent that more works need to be done by HCMC. While a certain rise in sea-level, as well as climate change, may be inevitable over the coming decades, an increase in exposure to flood risks is not. According to Storch and Downes, the current and future city will ultimately require a combination

of “ hard” (flood defenses) and “ soft” measures (spatial planning) to manage the increasing risks of climate change.

For “ hard” measures, a large amount of options can be adopted by the local government (2010). For example, Scussolini et al. (2017) suggest constructing ring dike, and implementing elevation and dry-proofing projects. In detail, a ring dike can be designed to encircle the inner part of HCMC, where more population and economic activities are located. The estimated height of the ring dike is 30 centimeters higher than the water table during a present-day 100 year flood event (as recommended by the Vietnamese government, Ministry of Construction, 2008). This also is, on average, 230 centimeters above the current mean sea level. Elevation means to construct new buildings at a higher elevation than the surrounding older buildings, by raising the ground level with sand. The approximate height that the elevation needed is similar with that of the ring dike. Also protecting building from immersing in floodwater, dry-proofing projects aim at making buildings watertight until 1 meter of flood depth. Other advices include formation alongside big rivers with abundant canals from mainland to the sea, creating and improving floodwater and rainwater storage facilities, improving drainage systems in the city and so on.

As for the later part, the government of HCMC should consider about more sophisticated spatial planning strategies in order to effectively manage and minimize current and future floods risks. The principle of such strategies is the reorientation of land use planning, by focusing new developments away from the low-lying areas, and safeguarding natural mitigating functions. To

be more specific, effective control of planning (for instance, planning restrictions as well as to some extent building regulations), the integration of adaptation measures into urban development and land-use planning are essential for managing risks against the background of rapid urbanization and climate change. Given the current situation in HCMC, where vast new urban development is underway in areas only a few centimeters above mean sea-level, future flooding could have potentially catastrophic consequences.

For the government of HCMC, those “hard” measures might be more effective for dealing with imminent flooding problem. While constructing ring dike will cost a huge amount of investment and time, implementing elevation and dry-proofing projects are more practicable. Both those solutions can directly and efficiently protect assets from damaging by floodwater and minimize people’s losses. However, all these “hard” measures cannot intrinsically reduce the city’s burden on floods. HCMC really needs a more environmental friendly model of development, instead of aimless expansion and occupying periphery areas around the city. Even consider the impact of climate change, the nature land still has capacity to some extent to handle the flooding. Areas such as natural wetland, lakes and river courses can play a vital role fulfilling the task. As a result, transforming those natural lands into urban lands significantly weaken the region’s capability on protecting itself from the floods. This is what the city government should focus on in a long term development plan.

In the contemporary world, the government of HCMC is not the only one facing difficulties in the floods problem. Resulting from globally climate

change, as well as sea level rising, nearly every major costal city is facing similar risks right now. HCMC city is a typical example, which is meaningful for others to learn. Although short term solutions are helpful to reduce economic losses, long term environmental friendly and sustainable developing plans are the key to solve the problem.