



Flooding not only due to Climate Change

Often when areas are flooded, articles and discussions point quickly to Climate Change as the cause. Of course, it is a fact that the climate is changing. More extreme weather events as well as a rising sea level, which will have an impact on flooding.

Pointing directly and only at Climate Change is too easy, not correct and insufficient. It is important also to consider flooding due to man-made impacts, which in some cases have an even larger negative impact compared to Climate Change. Man-made impacts are for example, but not limited to: land subsidence, deforestation, urban development / design and maintenance works. Some brief explanations below.

Land subsidence: Land subsidence due to over-exploitation of groundwater is a major problem in many countries worldwide. In many coastal and delta cities (e.g. Ho Chi Minh City and Can Tho City) the negative impact of land subsidence has a more severe impact compared to the impact of sea level rise. Further urbanisation, population growth, increase of economic activities and the absence of proper regulations will further increase the use of groundwater (over-exploitation), resulting in increasing land subsidence and its related problems. Land subsidence is a major contribution to the flood risk in low lying areas but can also result in other problems such as structural damages and high maintenance costs (e.g. roads). The combination of sea level rise and land subsidence is even worse.

Deforestation: Protection the city against floods does not only involve taking mitigating measures in or nearby the city. Especially for fluvial flooding, actions such as deforestation in the upstream areas of the river basin will increase fast surface runoff causing higher water levels downstream. In addition, deforestation increases the risk of landslides. To protect downstream cities against fluvial flooding requires proper land-use management in order to delay the run-off.

Urban development / design: Rapid urban development has a large impact on the drainage capacity of cities. Urbanization increases the impervious surface area, resulting in more (faster) runoff and less storage capacity, which increases flooding. Sustainable developed of urban areas should have flood management solutions that take into account all aspects such as the impact of climate change, surrounding water bodies and land subsidence. For example, in some new development areas in Vietnam roads are already flooded during

spring tide without the impact of rain. Rain, land subsidence and climate change will only increase the flooding problems. House-owners recognise these issues and construct the floor levels of their new houses sometimes about 1 m above road level. Although the houses remain dry, the roads are frequently flooded by dirty water from the adjacent river and stagnant water occurs in areas that cannot be drained, which will increase environmental and health risks. A good urban (drainage) design could mitigate these issues significantly. Prior to provide construction permits, designs should be evaluated in detail to verify if it complies with all design requirements.

Maintenance: It is possible to construct the most advanced solutions to mitigate flooding but lack of maintenance will results that these solutions will not maintain their usefulness / effectiveness in the long run. Proper and frequent maintenance is crucial to keep the system operational and to mitigate future flooding. Sometimes, by law it is indicated that e.g. drainage systems should have yearly maintenance (cleaning and repairing). However, due to insufficient budgets, limited maintenance works are executed resulting in a lower quality and / or damaged system and eventually failing, which increases flooding. It is important that sufficient budget is made available in order to maintain the e.g. drainage systems and keep them fully operational. Maintenance is of course strongly influenced by the solid waste management system in the city.

Governments and people should become aware and acknowledge that floods are not always or only caused by Climate Change but also by different man-made impacts. Developing a sustainable future for cities, all potential impacts from e.g. Climate Change, land subsidence, urban development, deforestation, lack of maintenance, etc., etc. should be considered. Addressing only one aspect will not mitigate the flooding and is not a sustainable solution for the future. Mitigating floods requires an integrated approach considering various aspects!

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