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Mynett, Arthur

Towards flood resilient cities - from flood risk to windows of opportunity

Hydrolink

TOWARDS FLOOD RES
FROM FLOOD RISK TO WINDOW

BY ARTHUR MYNETT

Floods on the rise ... !

Flood disasters have had a major impact on human societies for many centuries already. However, in recent decades extreme flood events seem to be occurring more frequently and with greater intensity. Whether this is caused by climate change impacts or due to anthropogenic (man-made) effects need not be of considerable concern: all indications are that things are likely to get worse over the next few decades.

> **"Many of the coastal megacities of today were not designed with high safety levels in mind"**

As of the year 2008 more than half the world population is living in large urban conglomerates. If the global population continues to grow towards 9 billion in the middle of the century, the world will consist of an increasing number of mega-cities of 20 million inhabitants or more. Mumbay in India, Shanghaj in China, Ho Chi Minh City in Vietnam are just a few top-ranking examples. Quite often these cities are situated in low-lying delta areas where the river meets the coast. With increasing river discharges, intensifying precipitation and rising sea levels, these cities may be in for major flood disasters in the not too distant future.

Adequate protection levels

Many of the coastal megacities of today were not designed with high safety levels in mind. Often originating from small settlements near river mouths where ships would come in and trade goods, these cities have vastly expanded – and so have the value of their economic activities. Typical values for protection standards (if at all) range from 1/100 to 1/1000 in terms of design return periods; only in low lying delta's like the Netherlands, design values of 1/10000 are used as protection levels against coastal flooding.

But in cities like Bangkok, much lower values are used. As a result, extreme river discharges due to prolonged rainfall in combination with high tidal levels at the river mouth already led to severe flooding that made world news in the second half of 2011 – and more is yet to come. Meanwhile the economic value of urban developments and manufacturing industries has multiplied by various orders of magnitude.

ILIENT CITIES
S OF OPPORTUNITY

Prof. Arthur Mynett **is a member of the IAHR Council. He holds a position as full Professor of Hydraulic Engineering and River Basin Development at UNESCO-IHE Institute for Water Education where he is Head of the Department of Water Science and Engineering. He has previously worked for Delft Hydraulics (now part of Deltares) for over thirty years and served on several international panels related to flood risk management.**

Clearly some fundamental changes are required providing adequate protection levels and safety standards against flooding.

From flood risk assessment to adaptive management

During the past decades considerable effort was spent on developing the concept of flood risk assessment, i.e. taking into account the consequences of flooding rather than merely protection levels. In doing so, it becomes possible to quantify the trade-offs between investments required to increase safety levels and the implications of economic damage and loss of lives. This trend is reflected in the EU research programmes on flood risk: rather than assessing and quantifying the risk of inundation without proposing solutions, the focus is shifting towards preparing actual measures that can avoid or reduce the consequences of flooding.

One such example in the Netherlands is the city of Dordrecht which is in open connection to the North Sea and exposed to storm surges as well as effects of sea level rise. The houses in the inner city have recently been flood-proofed and can withstand serious inundation levels without experiencing much damage, if at all. Such adaptive measures are presently being explored both in research and in pilot projects. In fact, the entire concept of adaptive management is receiving considerable attention, since it allows for implementing actual measures only when really needed, while at the same time allowing multiple (real) options for future decision making, depending on changes in external conditions and internal needs.

The multi-level safety concept

Rather than relying on one superstructure to protect the hinterland, the concept of multi-level safety is receiving considerable attention at present, certainly within the European Union. In the Netherlands, this concept involves: (i) an outer dike system intended to provide the first 'line of defence' against potential flooding; (ii) spatial planning and lay-out of roads and transportation infrastructure in such a way that access is assured to shelters and safe havens; (iii) emergency planning including early warning systems to provide advanced notice for emergency response units and for the public at large. This approach is very much in line with the recently developed EU Flood Directive which propagates three major levels: 'Protection-Prevention-Preparedness'.

Windows of opportunity

The number of large flood disasters is increasing each year and flood damages rise by about 5% annually. Yet urban development in the expanding (mega)cities of the world is largely unplanned (UN, 2007). Urban settlements predominantly grow 'organically' and even if spatial planners are involved, they by-and-large ignore flood risk and are not developing urban expansions with flood resilience in mind. This is where economic investments are at steak and the potential for severe disasters becomes a serious threat.

At the same time, dealing with possible effects of climate change can provide windows of opportunity for urban re-development. Following the concept of 'Living with Water' in cities like Boston and Rotterdam, former harbour areas have been transformed into attractive waterfront housing with valuable property that is in great demand. New concepts like Water Shore Habitats provide opportunities for urban redevelopment 'shaped by the water'.

There is even an increasing trend towards 'farming in the city' by developing Urban Agriculture as an integrative factor of climate-optimised urban development. The city of Casablanca in Maroc provides such example. Health food production and peri-urban tourism are other examples of reducing the water footprint and global carbon emissions. The 'Green Roof Concept' in cities like Singapore aims to reduce urban flooding by temporarily storing water on rooftops covered with vegetation, at the same time making tropical urban cities more pleasant for living by lowering the temperature and reducing urban hotspots – yet another example of turning flood risk into a window of opportunity.