Using buildings for flood protection

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Buildings, car parks and roads could, alongside their "regular" functions, have a role to play in protecting the rest of the city from flooding. According to researcher Bianca Stalenberg, this concept could be very useful for the Dutch cities along the River Rhine, for example. Stalenberg will defend her Ph.D. thesis on this subject on Wednesday, Sept. 8 at Delft University of Technology.

Climate change and, more especially, the economic expansion of the last few decades have meant that existing flood protection systems in a number of cities along the River Rhine are now in need of improvement. At the same time, riverfronts remain subject to changing urban trends and the wishes of the local population and policy makers.

'Unfortunately, this makes improving flood protection and redeveloping urban riverfronts very complicated', says PhD candidate Bianca Stalenberg. 'My research poses the question of whether it is possible to combine the urban functions of buildings with that of flood protection.'

This is indeed possible, according to Stalenberg. It all depends on the concept of AFD (Adaptable Flood Defences). Buildings, car parks and roads can be designed in such a way that they can protect the urban area behind them from flooding, alongside their regular urban functions.

These innovative construction techniques can also be adapted to the circumstances in the long term. This will enable flood protection systems to take account of external influences such as climate change and economic development.

Stalenberg looked at cities including Nijmegen and Tokyo as case studies. The Nijmegen case study showed that the AFD concept could be used in cities along the banks of the large rivers that flow through the Netherlands. The case study that looked at the Japanese capital city, Tokyo, revealed that AFD also has potential in highly developed countries outside the Netherlands.

Tokyo's 'super-levee' is an example of where the AFD concept has been put into practice. The 'super-levee' is actually a very wide dyke (hundreds of metres across) with a very gentle inward slope. A ten-metre-high dyke would, using these proportions, be 300 metres wide, providing improved stability and a much smaller chance of failure compared to a standard dyke. From the urban planner's point of view, the advantage is that the inward slope can be incorporated into the urban landscape, so that these 'super-dykes' can actually add to the quality of the urban environment.

Stalenberg has also developed a decision-support model, the Urban Flood Protection Matrix (UFPM). This tool can assist water authorities and municipal government when it comes to the development (or redevelopment) of riverfronts and the improvement of urban flood defences by combining these two elements. A demo version of the UFPM tool is available on http://www.urbanriverfronts.com.

Provided by Delft University of Technology