Space reservation required for flood embankments in urban areas

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(2.3 Permanent protection of slopes against erosion. Rivers and shorelines)

Flood embankments in urban areas are often used for a variety of functions. Sometimes, the presence of these other functions, like transportation infrastructure or houses, is so dominant that the function of flood protection is easily overlooked by the general public. As long as the flood level and other hydraulic boundary conditions do not intensify, this need not be a problem provided that the flood protection is well maintained.

However, if the flood level rises, problems may occur. In some cases, these problems can be solved by taking measures elsewhere, as for instance the Thames Barrier near London and the Maeslant Storm Surge Barrier near Rotterdam, which both prevented costly improvements to urban flood embankments. But in most cases, such improvements are the only viable solution.

In a number of strategic studies for different polder areas in the Netherlands, detailed analyses have been performed to determine the extent of the area required to ensure safety from flooding, now and in the future. As flood embankments are threatened by more failure mechanisms than overtopping alone, this includes not only the visible embankment profile, but also the area required to ensure sufficient seepage length and stability, i.e. a wider area where excavations cannot be allowed. For efficiency reasons, the analyses were only possible by the development of several artificial neural networks for piping and slope stability. Furthermore, constructions should be avoided in the area where dike improvements lead to significant deformations of the subsoil which may cause damage to foundations. When expensive constructions can still be avoided, this leads to a typical profile as shown in the figure below.

In many urban areas this leads to important planning restrictions near rivers and waterfronts. Early recognition of these restrictions is essential to avoid costly measures (or floods!) in the future.

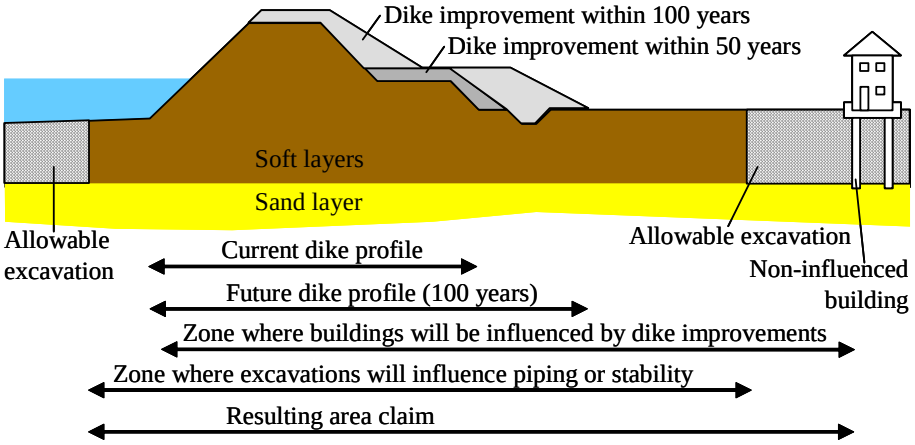

Figure. Typical area claim for flood embankments.

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