Engineering: Building with Nature MOOC

Key aspects of a solution

Case 2: City with Nature

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General Information on the solution	
Title	Room for the river Waal in Nijmegen and Lent
Abstract	An ancillary channel was constructed to reduce high water levels during floods by increasing the discharge capacity. A dike had to be relocated to increase the floodplain of the river Waal.
Location	Nijmegen, The Netherlands
Date	2013 - 2015
Main problem owner	Dutch Ministry of Infrastructure and Environment, City of Nijmegen, district waterboard Rivierenland are also involved in the plan.
Companies & Partners	Royal Haskoning DHV, Antea and Stroming
Costs	351 million euro
Project details	A 3-km-long ancillary channel 10 meter below the crest height of the dike, with a total width of 200 meter (150 m at normal water levels) was created in a new floodplain area by relocating the dike at Lent 350 meters inland of its previous location. The upstream end of the channel is not connected directly to the River Waal so that it does not take too much water from the main channel. Water from the main channel can flow over the barrier separating the river and ancillary channel only at high water levels, increasing the discharge capacity of the river. At the downstream end of the ancillary channel, there is a permanent connection with the river, and the ancillary channel is filled with water, creating an island. The island offers excellent opportunities for the development of specific river biotopes. It can also be used for purposes other than nature development, namely: work and leisure activities.
Safety level	The dike at Lent is a primary flood defence

Approximate Calculation

Existing cross-section at Nijmegen:

— Depth ~ 6 m
— The river is 350 m wide
— Cross-sectional area is determined from the trapezium rule:
  ½depth(sum of the parallel sides) = ½(6 m)(350m+250m) = 1800 m^2

30% of 1800 m^2 = 540 m^2

— Depth 10 m below dike crest (dike height 6 m), so channel depth is 4 m
— The channel is about 150 m wide
— Cross-sectional area: ½(4m)(150m+100m)=500 m^2