Ontwerpend onderzoek als planningsmethode voor 'meerlaagsveiligheid'

ir. Anne Loes Nillesen, TU Delft

Kennisconferentie Deltaprogramma, 23 april 2013

TU Delft

Kennis voor Klimaat

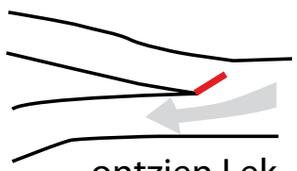
Kaart Randstad en de Delta

Sterke samenhang
ruimtelijke ontwikkeling
en waterveiligheid

Huidige waterveiligheidssysteem Rijnmond Drechsteden gebied

regionaal

keringen



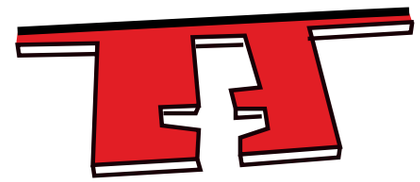
ontzien Lek

dijkringniveau

dijken

wegpompen water polder

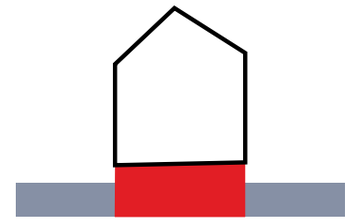
lokaal



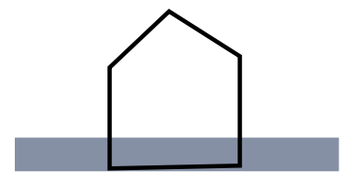
ophogen buitendijks

kering / dijk omleggen

gebouwniveau



bouwen op verhogingen

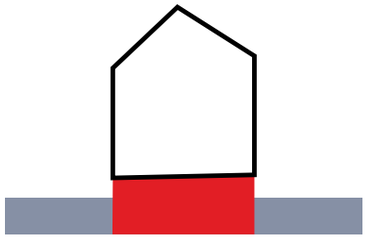


flood proof bouwen

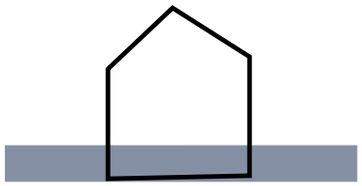
Meerlaagsveiligheid: maatregelen in 3 lagen

- laag 1: preventieve maatregelen
- laag 2: gevolgenbeperkinde maatregelen in de ruimtelijke ordening
- laag 3: rampenbeheersing / herstel

gebouwniveau



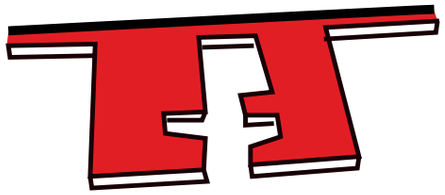
terpen



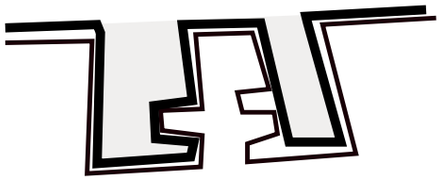
flood proof gebouwen

Terpen / flood proof

lokale schaal



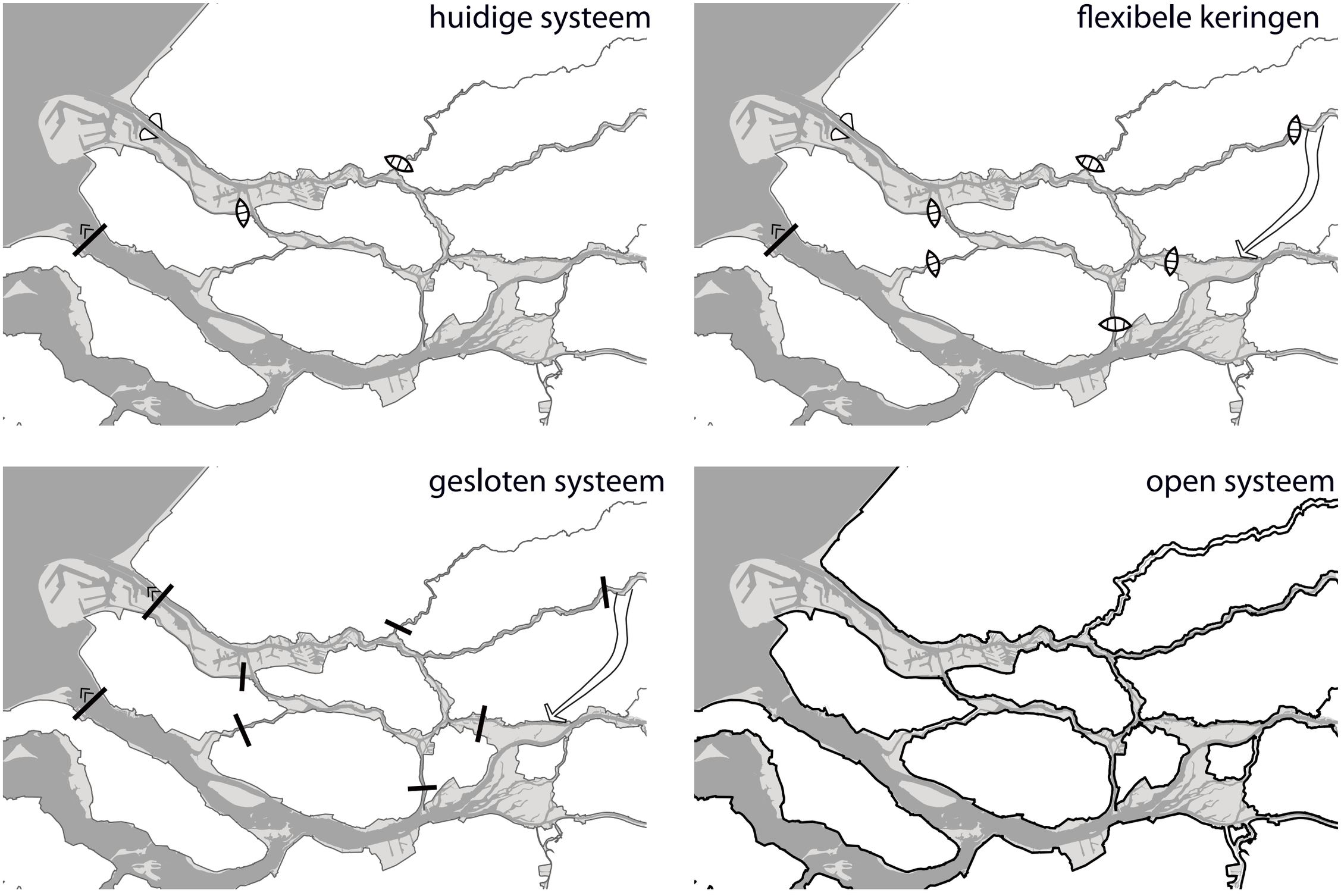
ophogen gebieden



voorlandkering

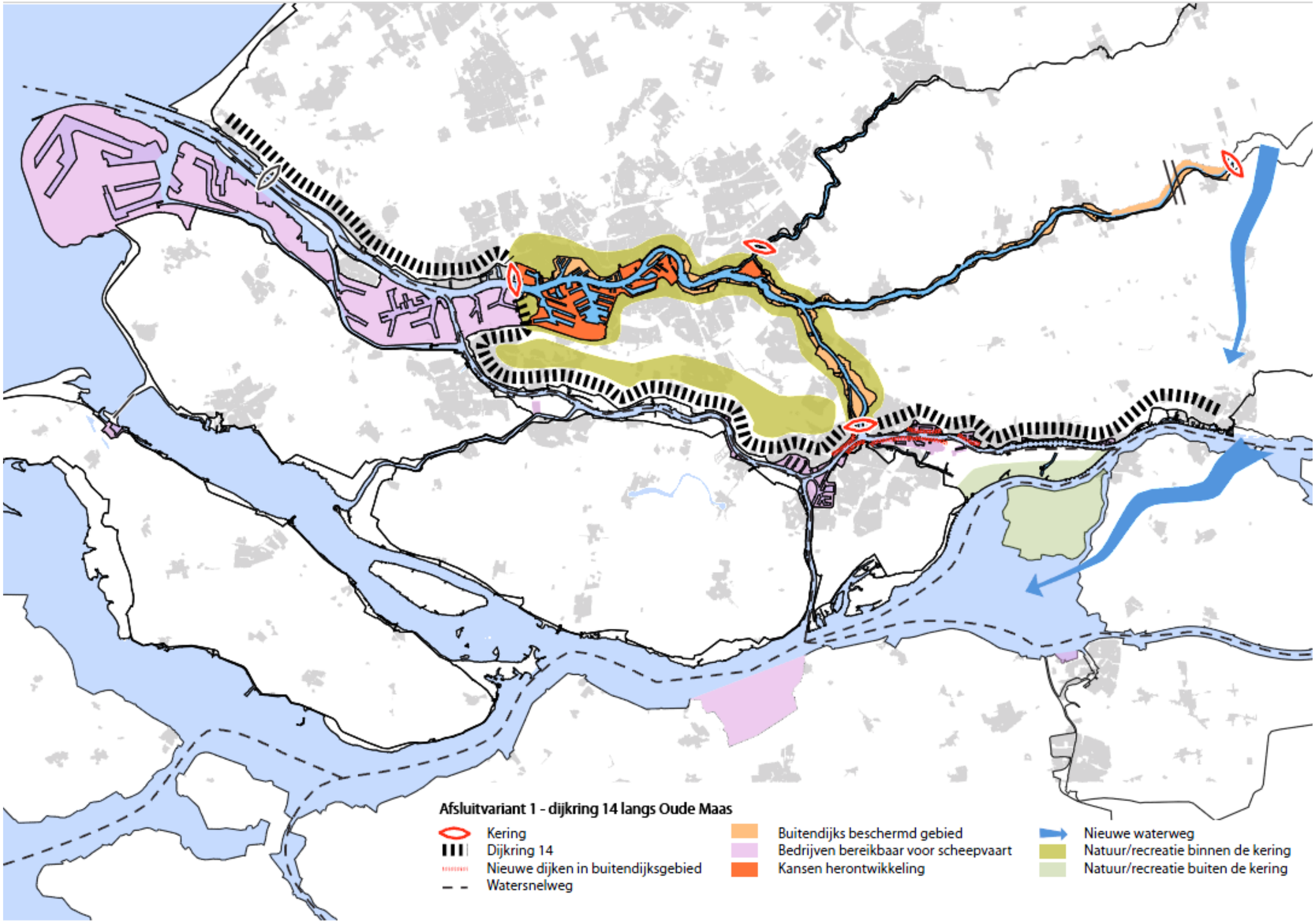
Ophogen buitendijks

Hoekpunten Deltaprogramma

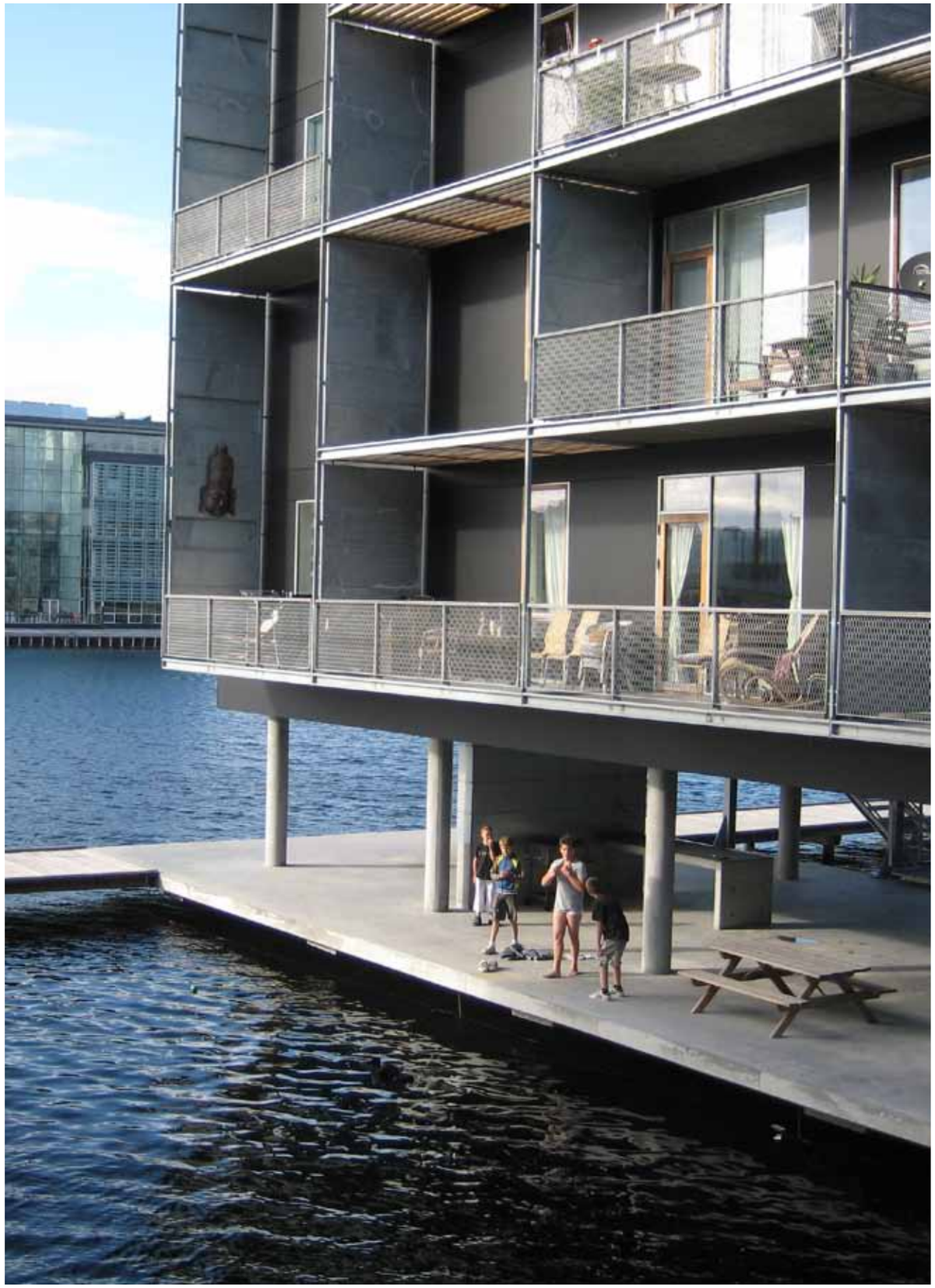


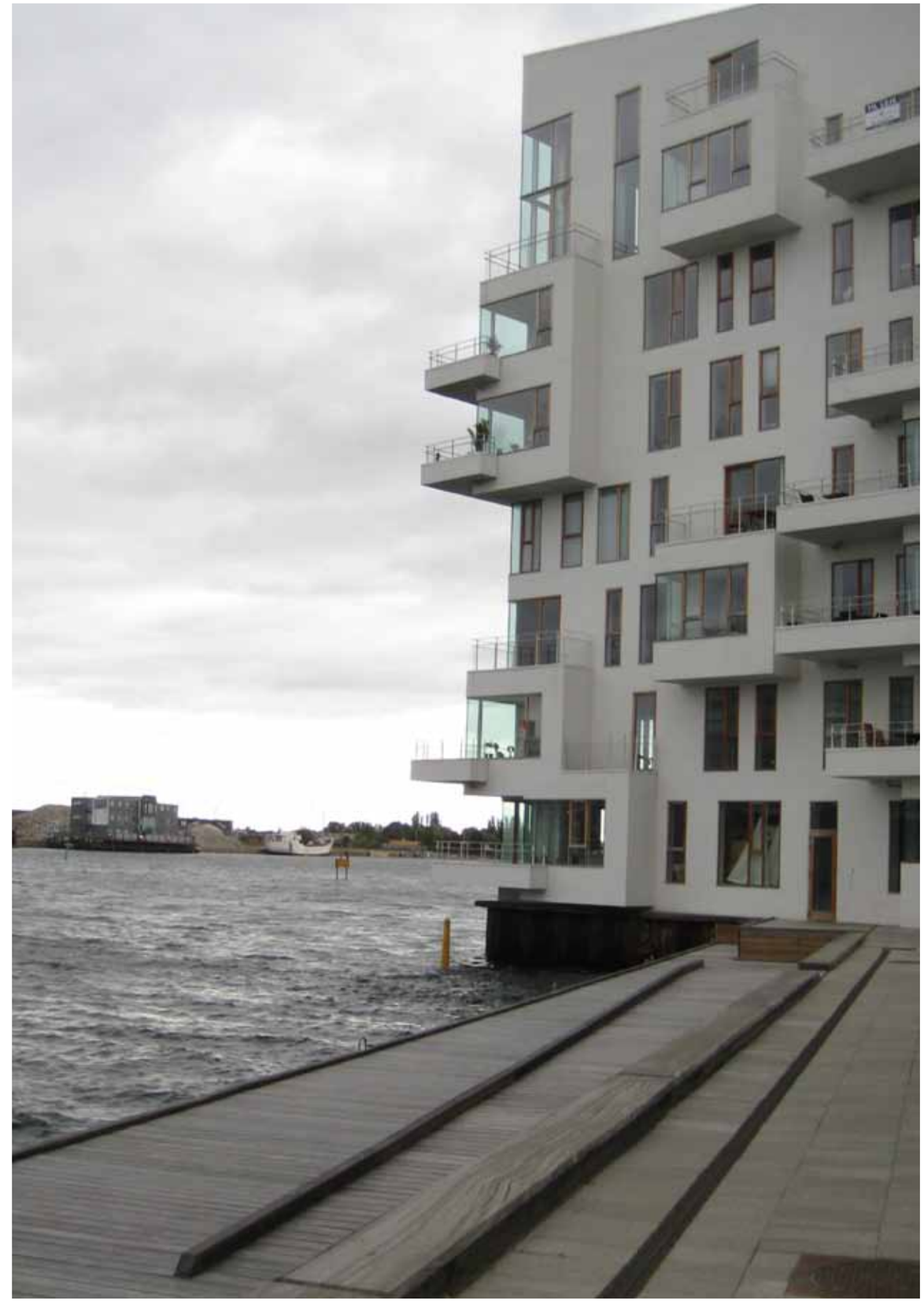
Ruimtelijke verbeelding hoekpunten/scenario's Deltaprogramma

beeld: studio Marco Vermeulen

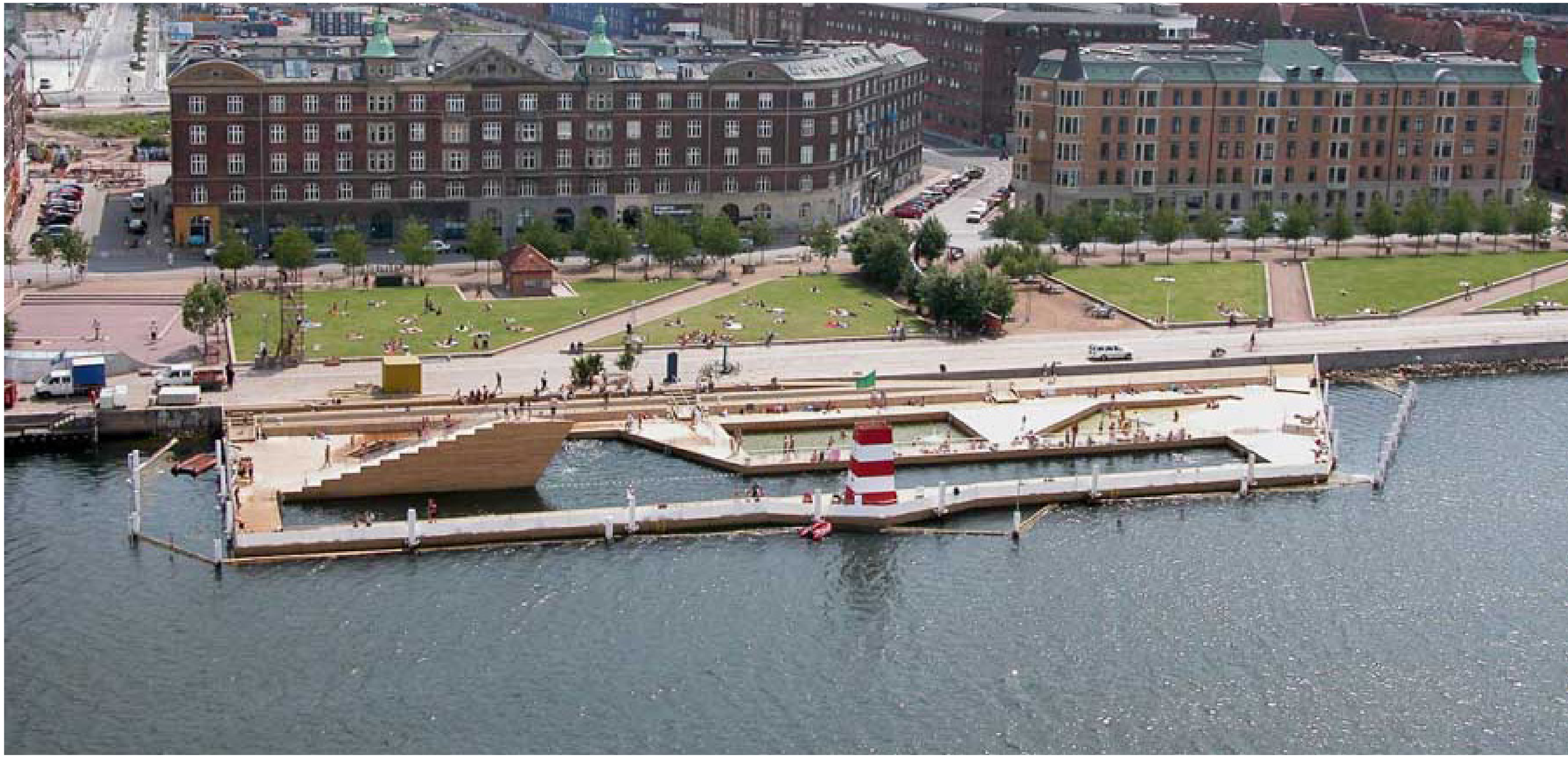


Gesloten Rijnmond





Kopenhagen open - gesloten



Kopenhagen: water als openbare ruimte

Londen Olympische spelen

beeld: De Urbanisten

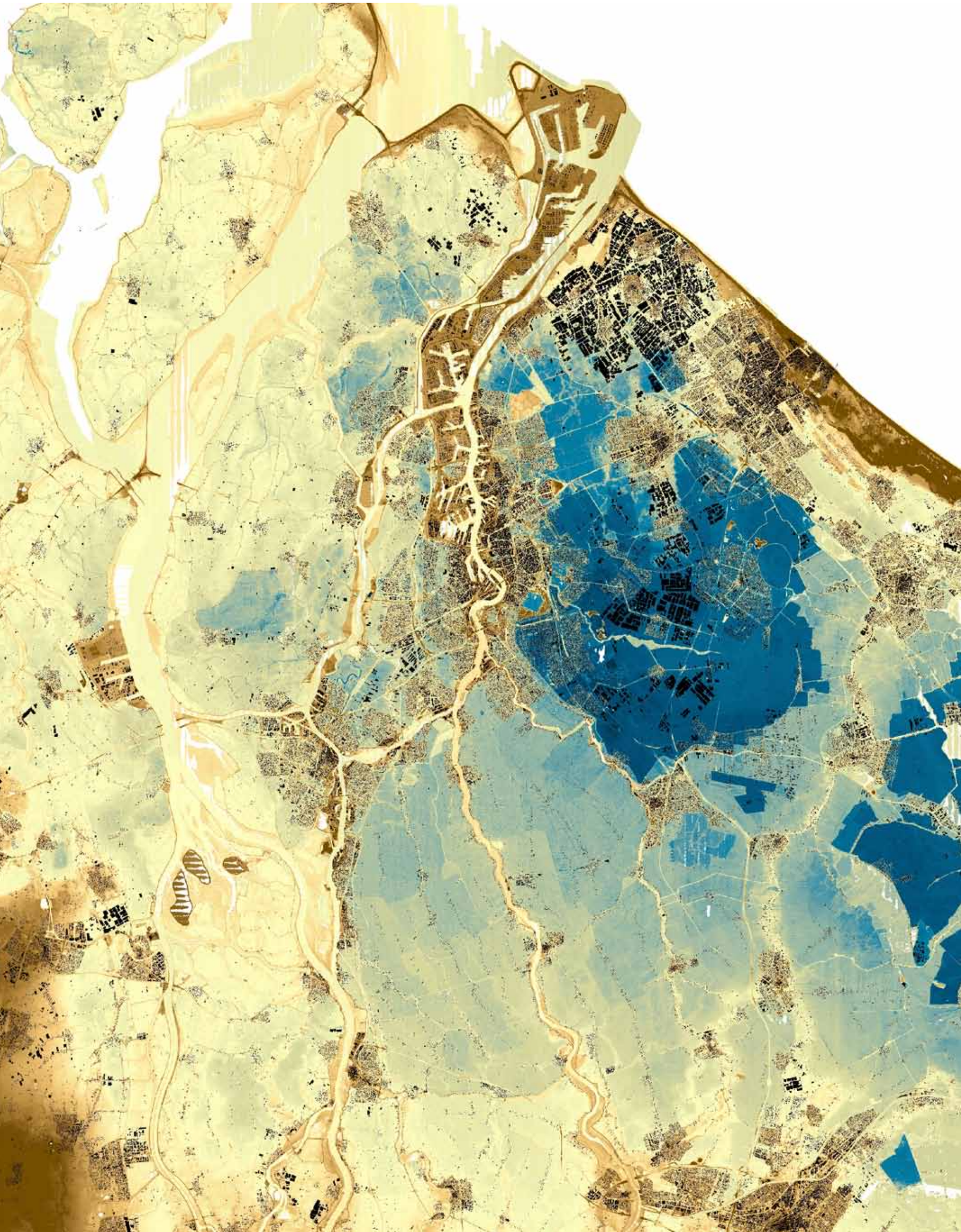
Open Rijnmond: Delta dijken

Japanse Superdijken

Hamburg Hafencity Flood proof deuren

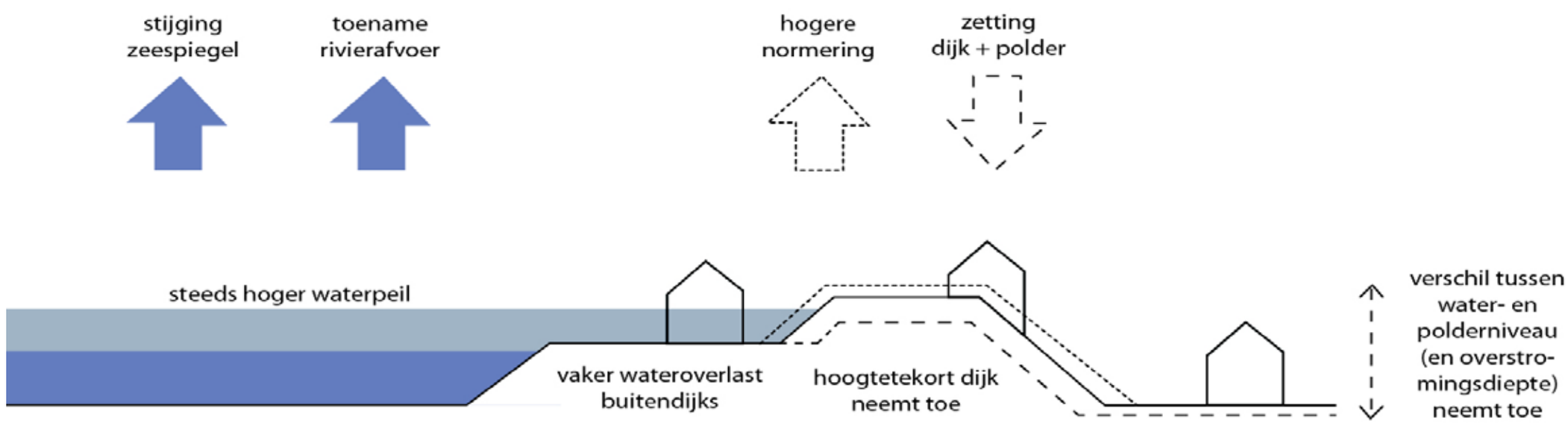
Hamburg Hafencity Getrapte openbare ruimte

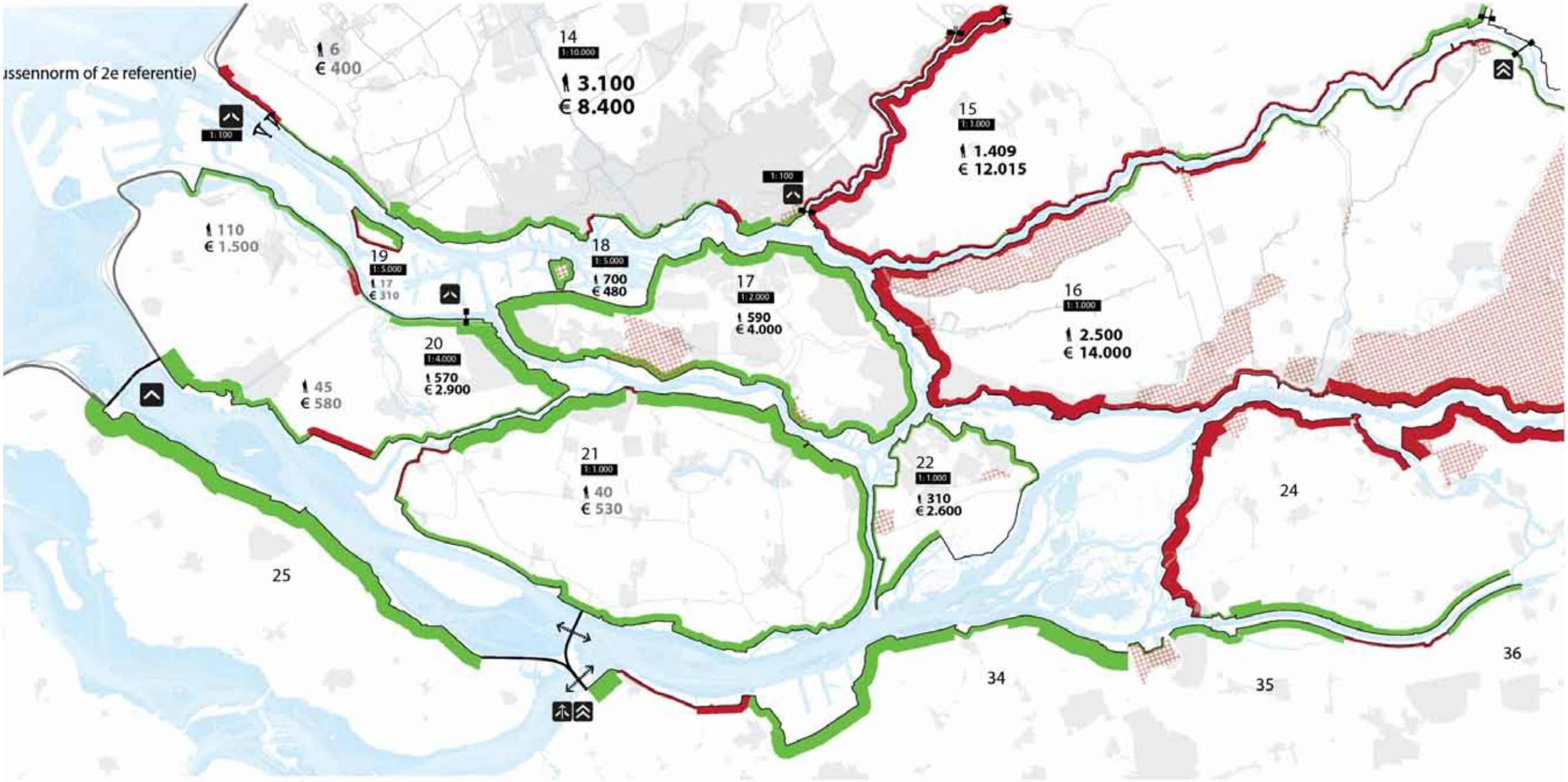
Hamburg Hafencity Evacuatiewegen



Hoogtetekort dijken

-Door zetting van de dijken (in tijd)
-Door de klimaatopgave (>waterpeil in tijd)
-Door een eventuele hogere normering (besluit)
-Door onvoldoende stabiliteit (nog niet in beeld)

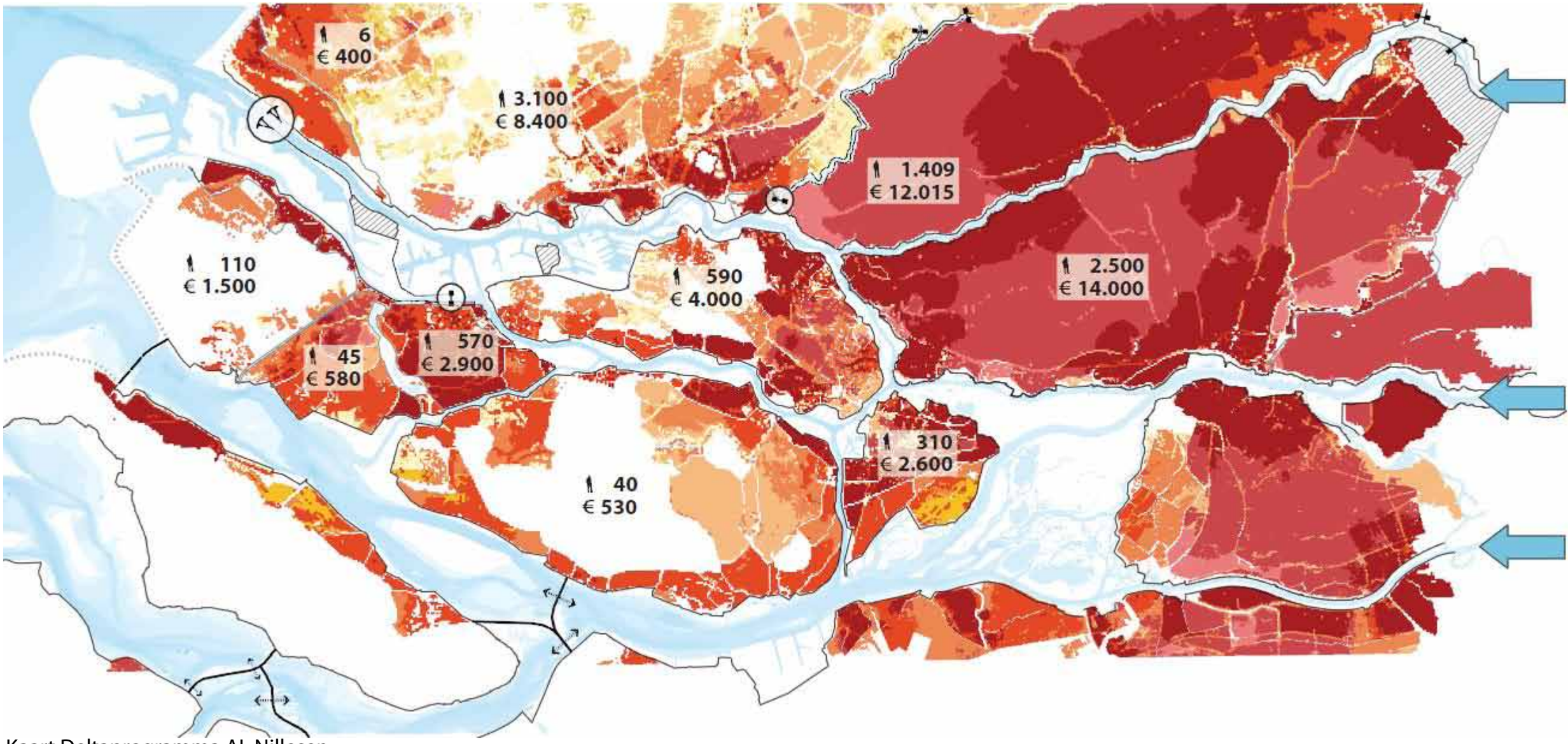




Kaart Deltaprogramma AL Nillesen, DEFACTO & DE URBANISTEN

Referentiesituatie: opgave dijken 2100 (W+)

Maximale overstromingsdiepte, minimale aankomsttijd



Kaart Deltaprogramma AL Nillesen

- zeer diep en meteen
- diep en meteen
- zeer diep en snel
- diep en snel
- ondiep en snel

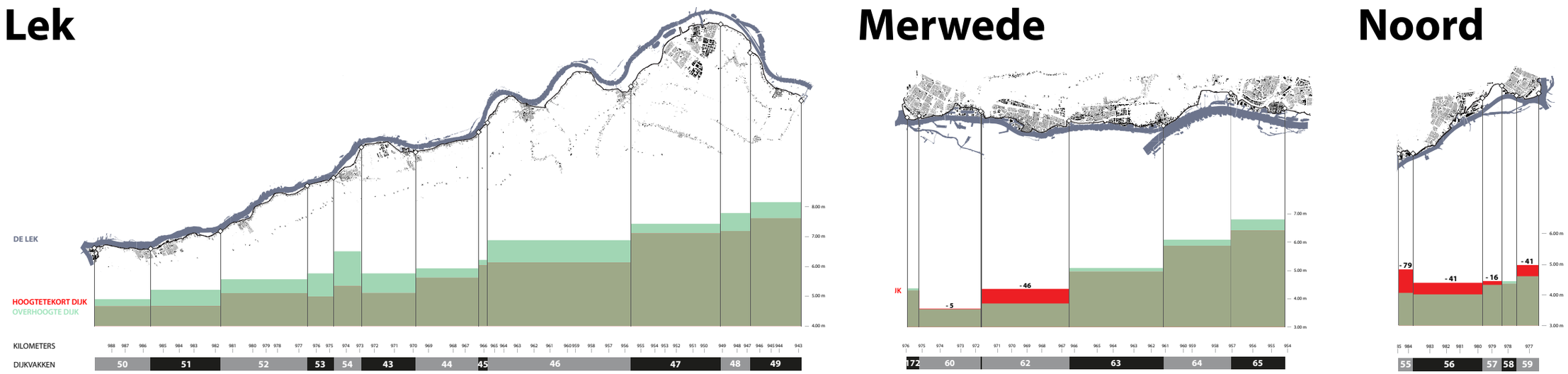
maximale waterdiepte
ondiep = <0,5m
diep = 0,5 >< 2m
zeer diep = > 2m

minimale aankomsttijd
meteen = binnen 6 uur
snel = tussen 6 en 24 uur

Ontwerpend onderzoek deel 1: rek huidige systeem

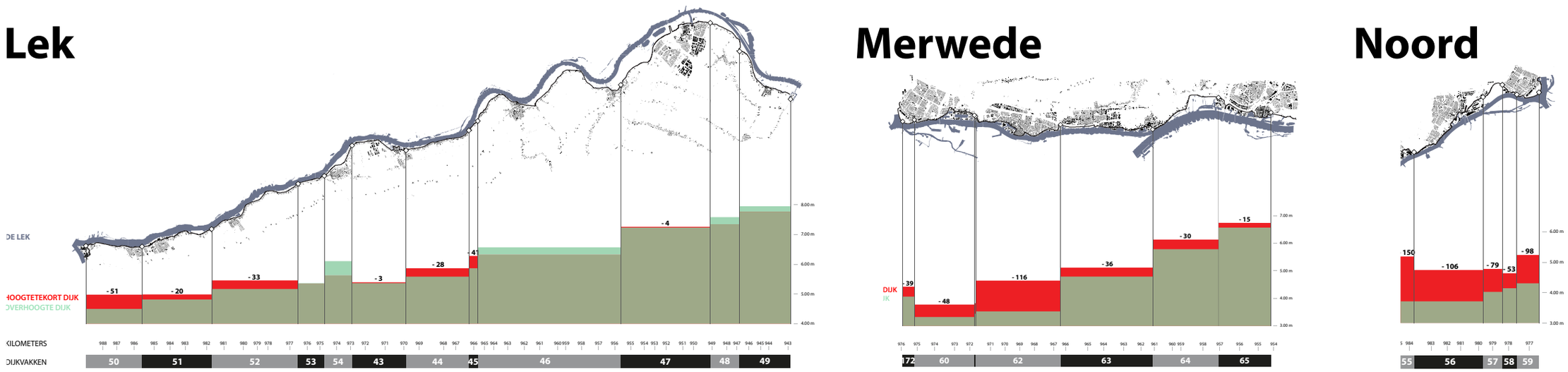
Hoogtetekort dijken (tov huidige norm) door zetting + klimaat

2050



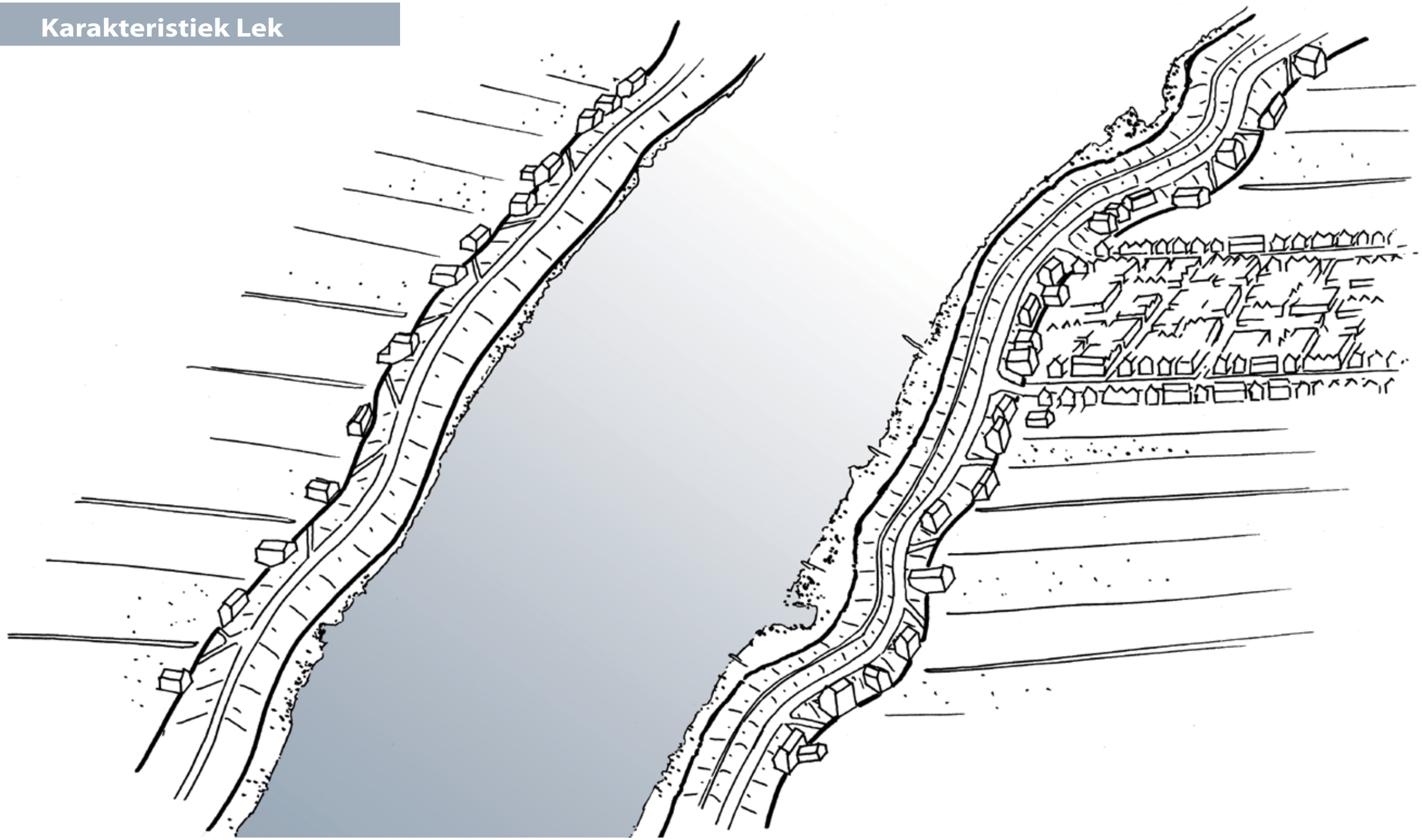
Figuur 3 Hoogtetekort dijken Lek, Merwede en Noord door zetting en klimaatverandering in 2050 (vd Kraan, 2012)

2100



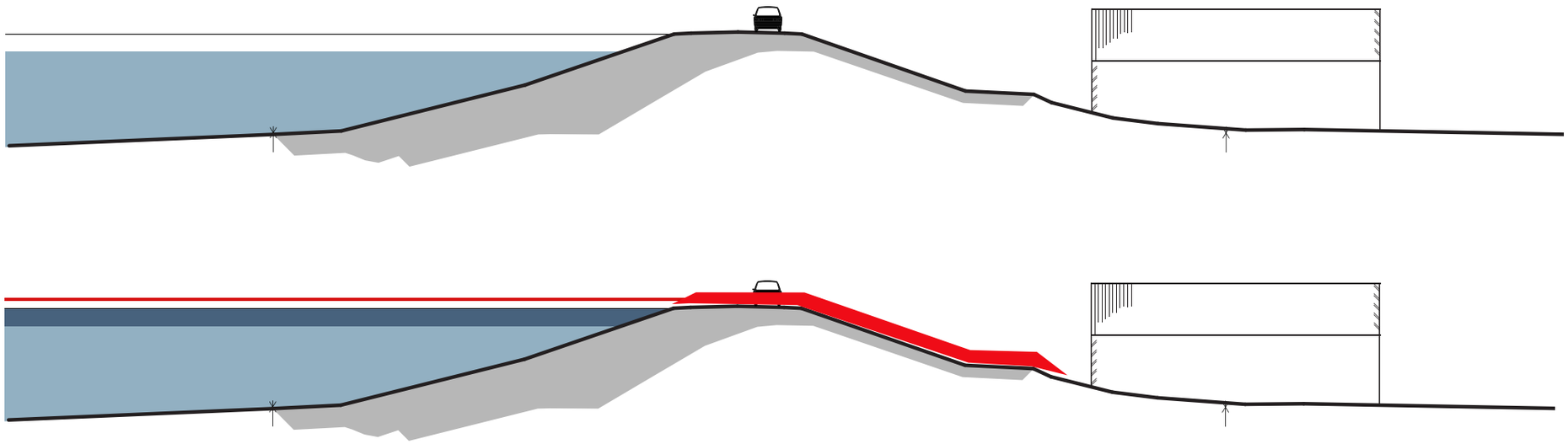
Figuur 4 Hoogtetekort dijken Lek, Merwede en Noord door zetting en klimaatverandering in 2100 (vd Kraan, 2012)

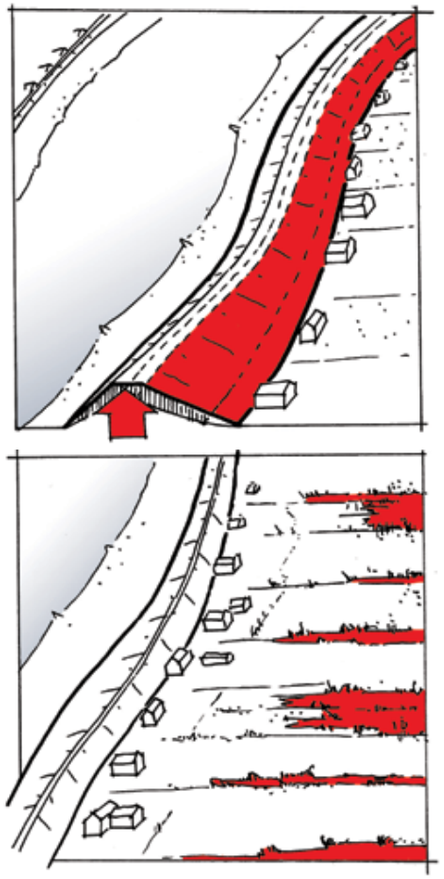
Karakteristiek Lek



Lek bebouwing achter dijk

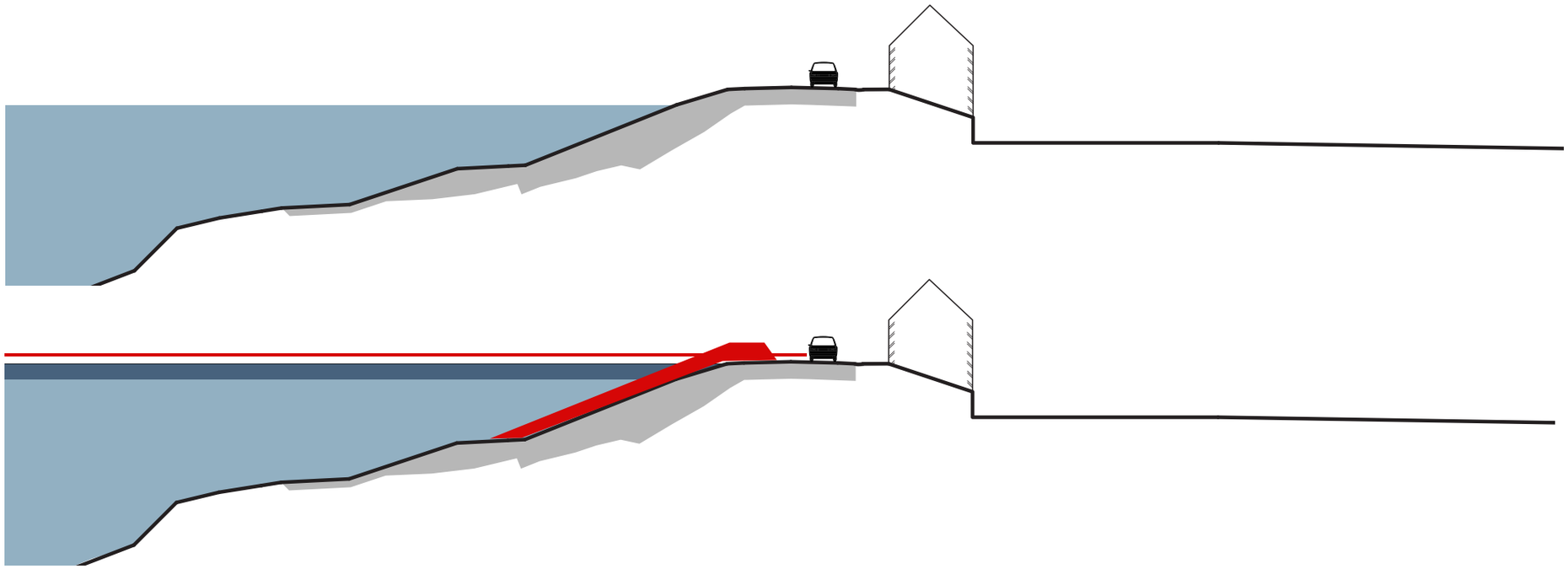
10 km 5-10 miljoen per km 2050 +0,1m 2100 +0,5m

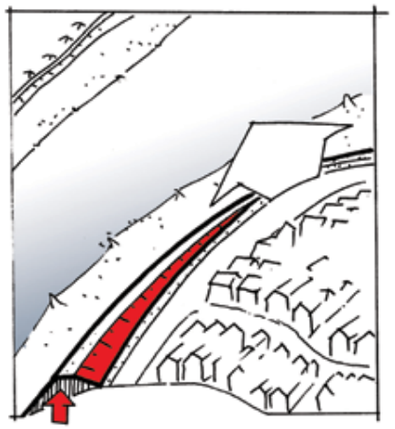




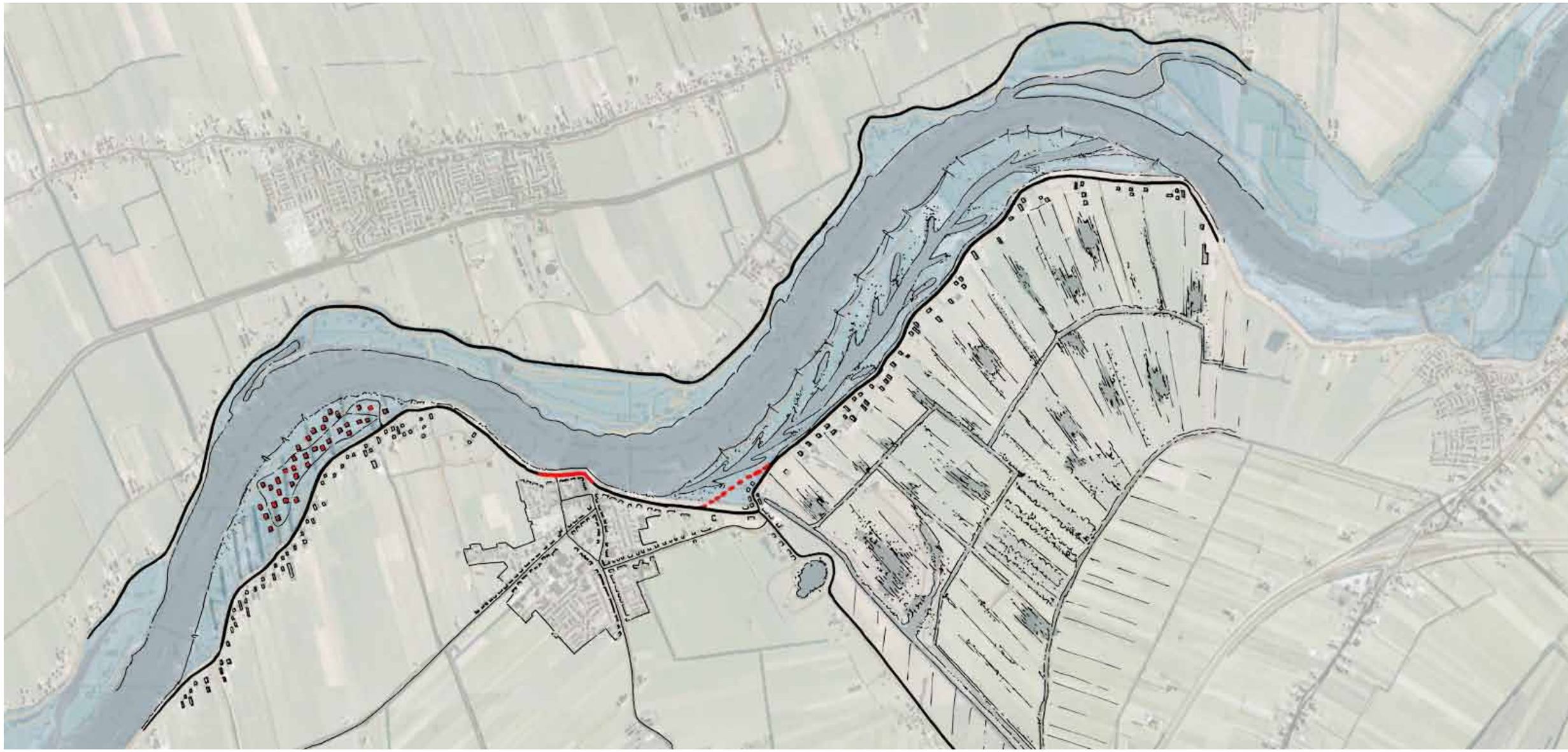
Lek bebouwing aan de dijk

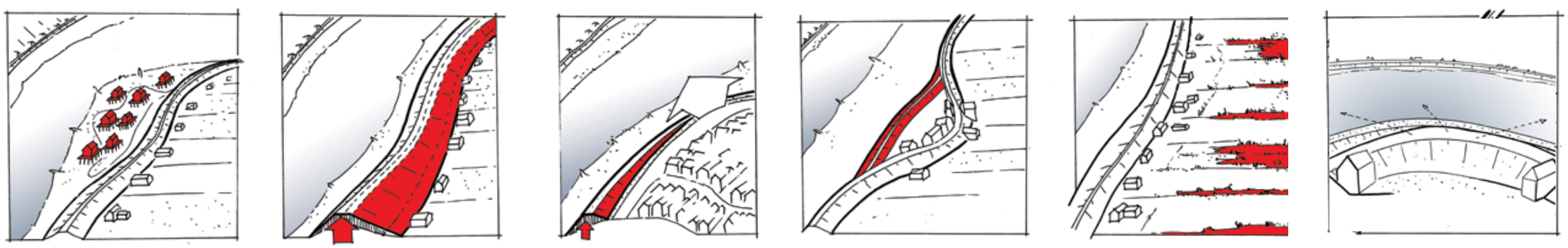
10 km 5-10 miljoen per km 2050 +0,1m 2100 +0,5m



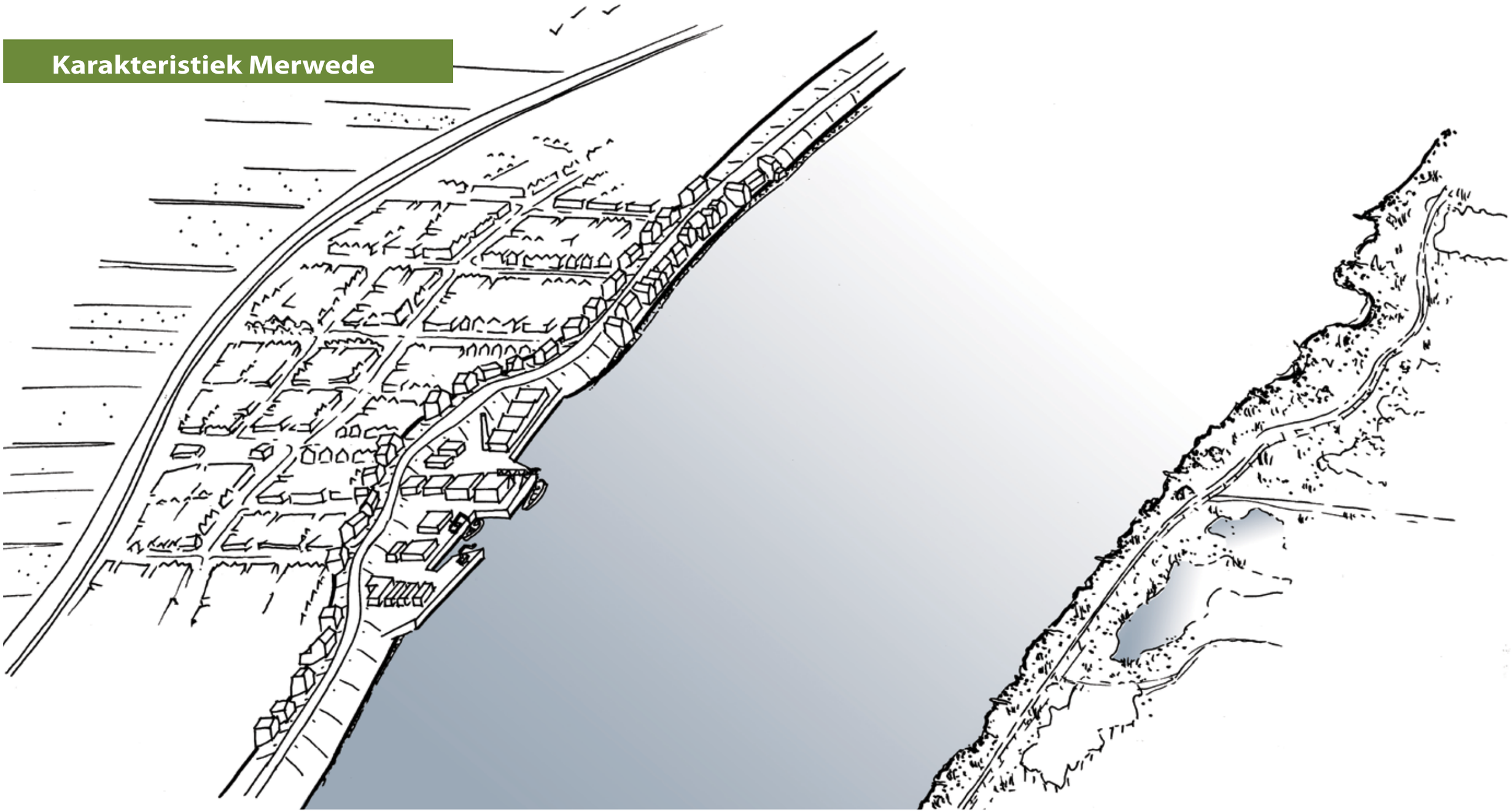


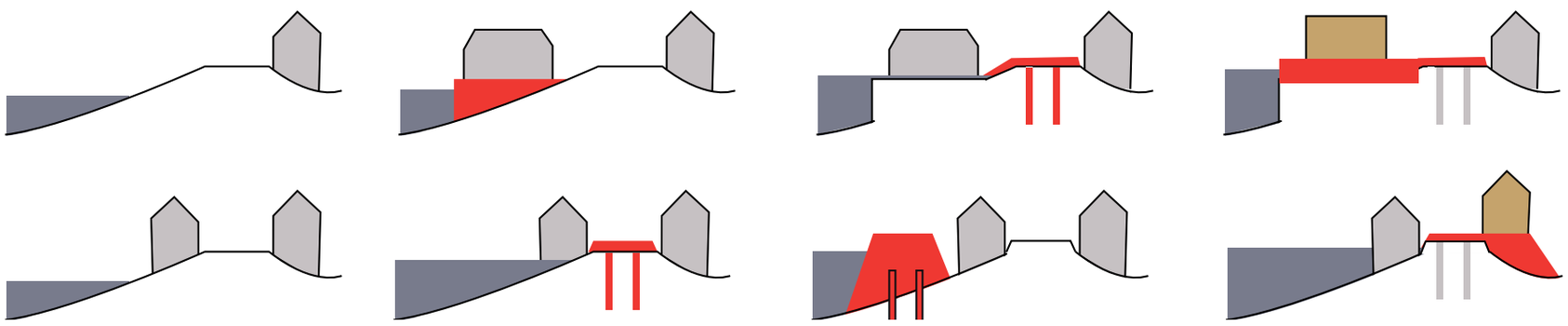
Ontwerpoptimalisatie Lekdijk





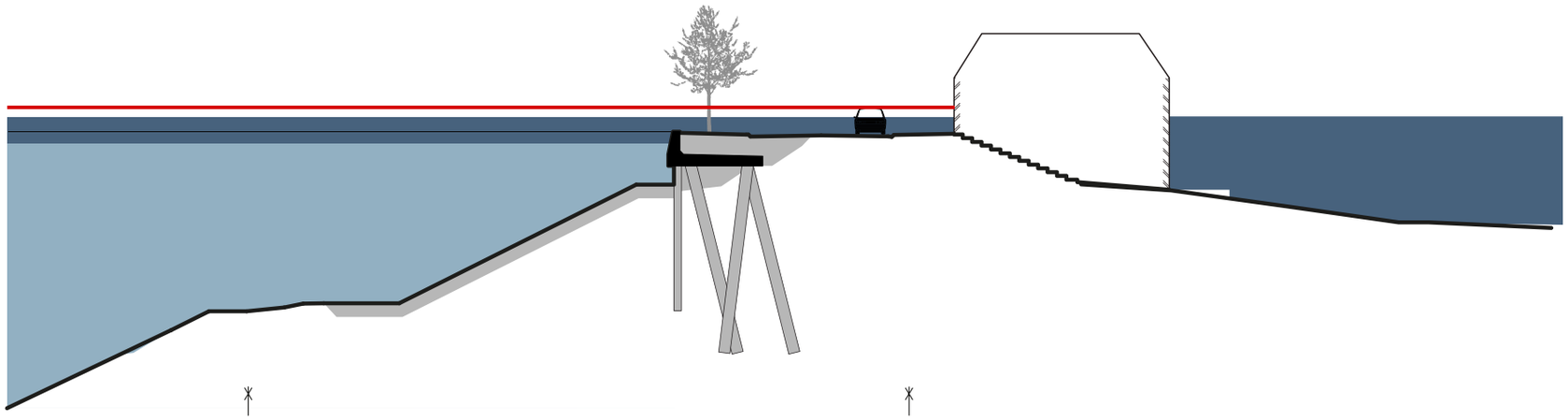
Karakteristiek Merwede

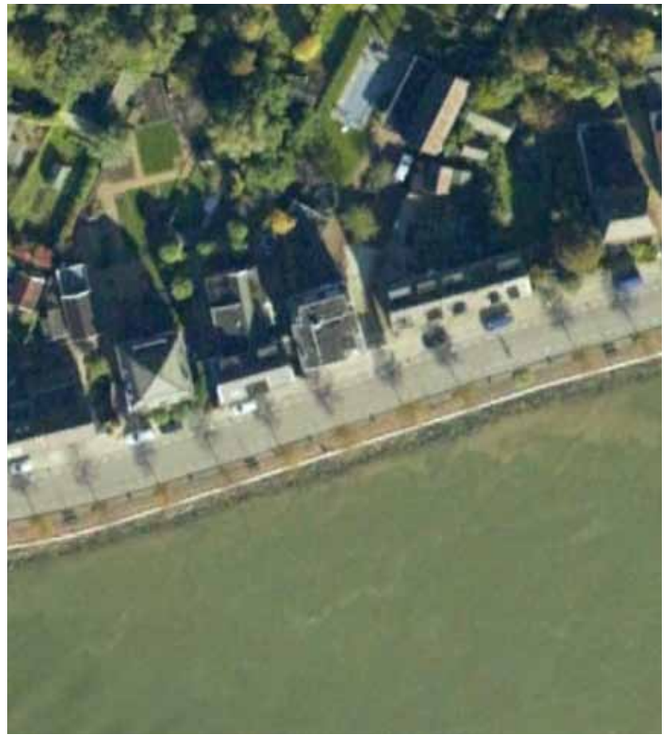




Merwede kade

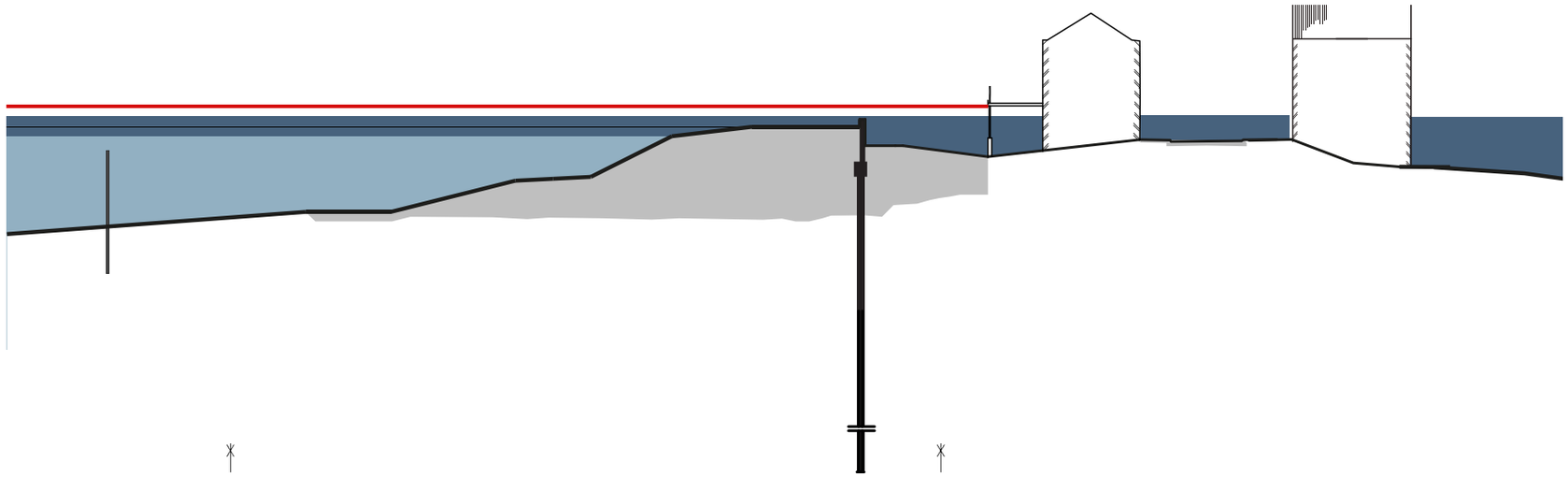
6,5 km 25-40 miljoen per km 2050 +0,5m 2100 +1,2m





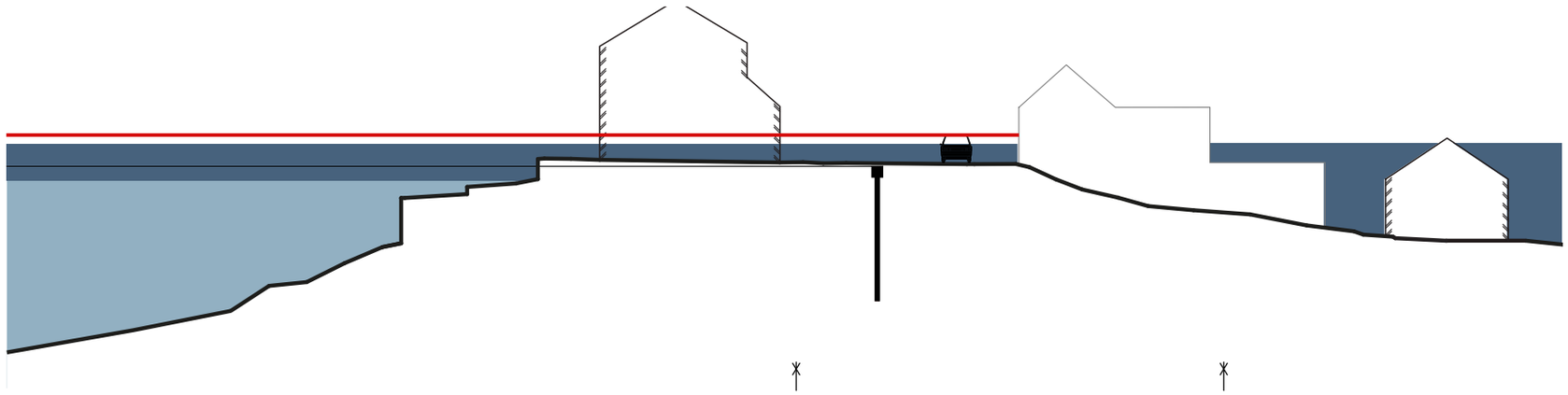
Merwede dijklint

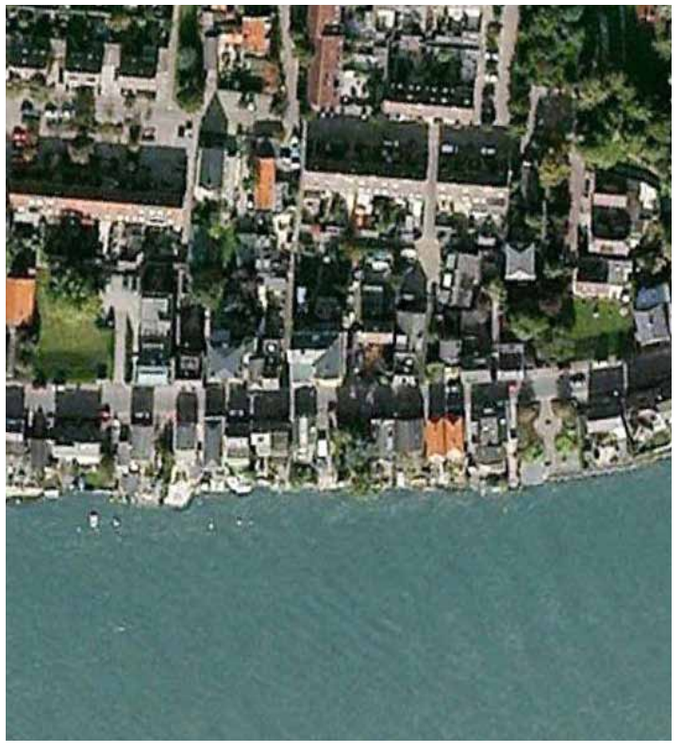
6,5 km 25-40 miljoen per km 2050 +0,5m 2100 +1,2m



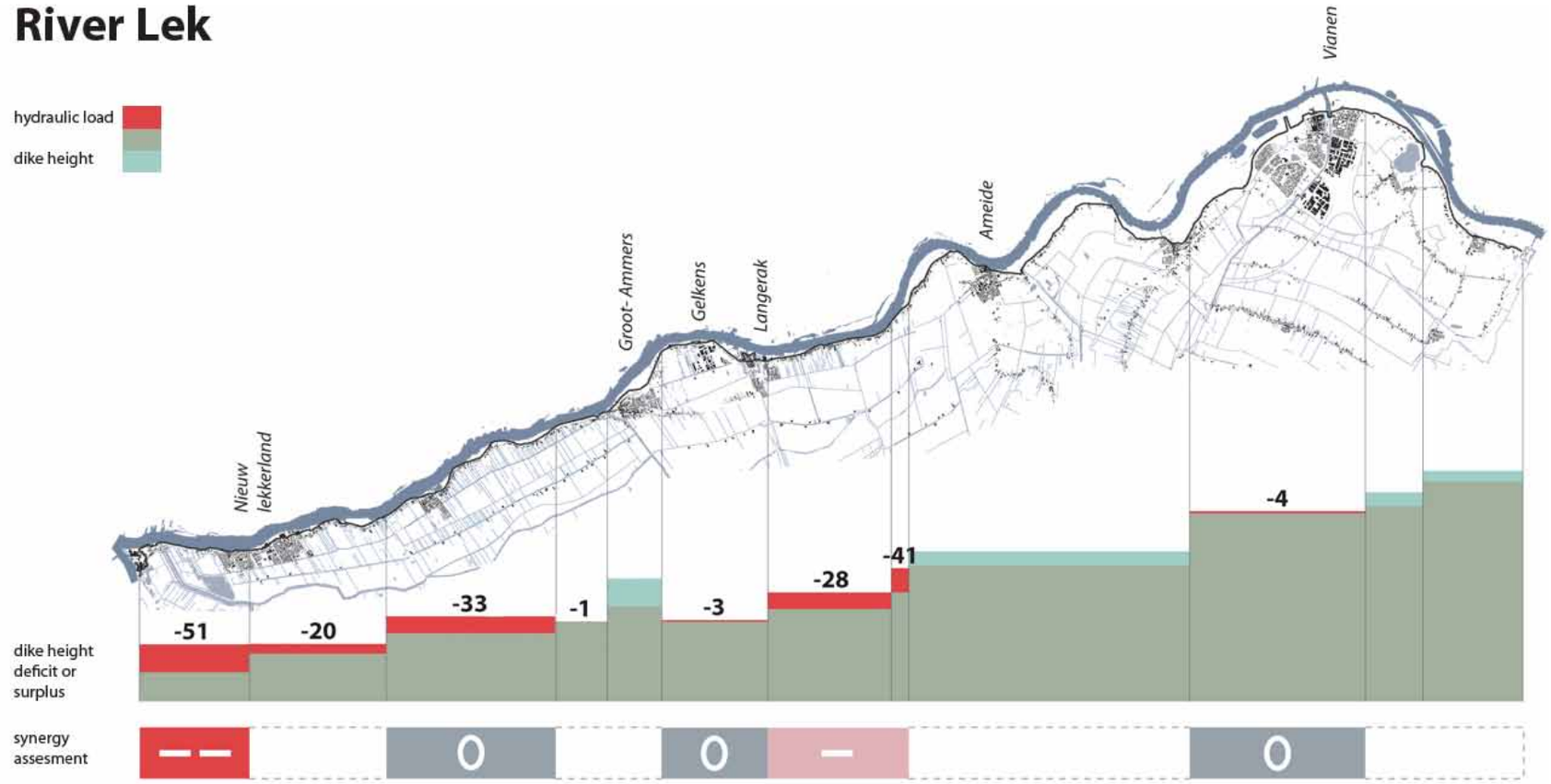
Merwede Dorpslint

15 km 10-25 miljoen per km 2100 +0,5 m

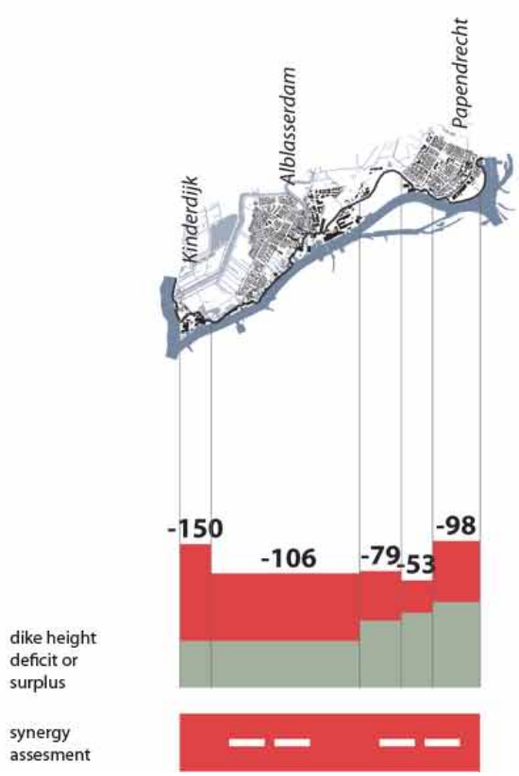




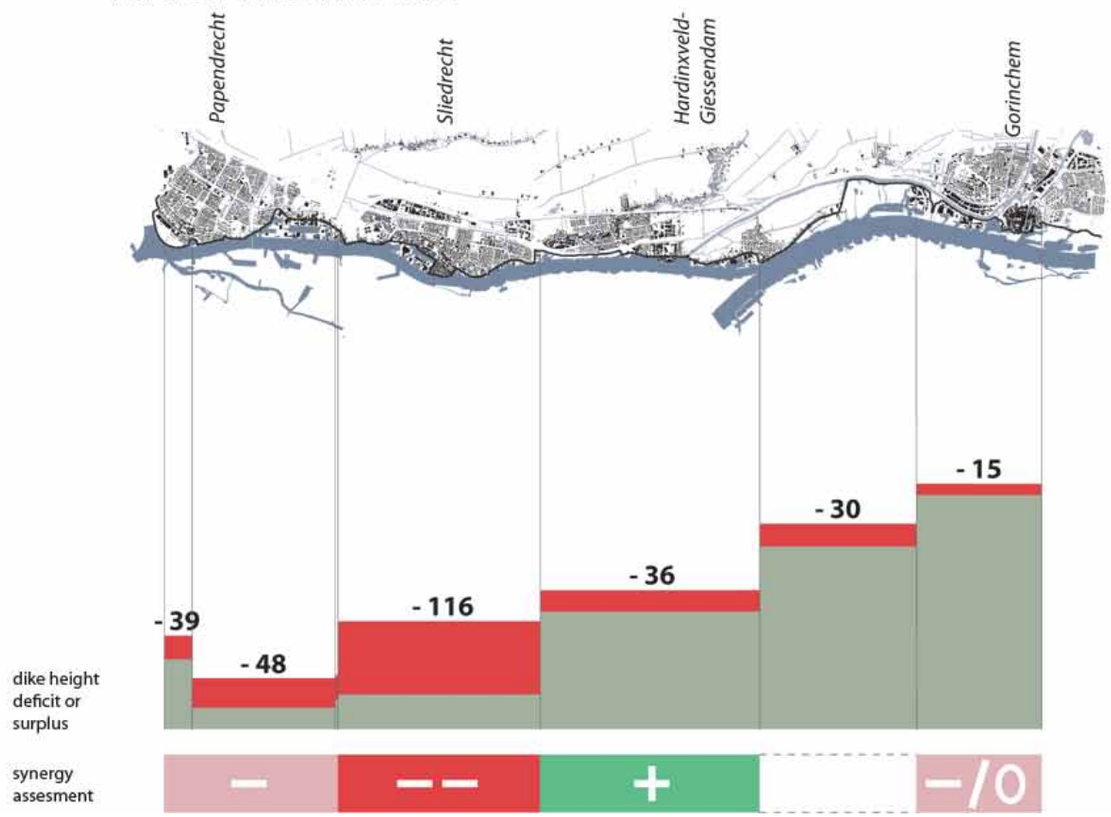
River Lek



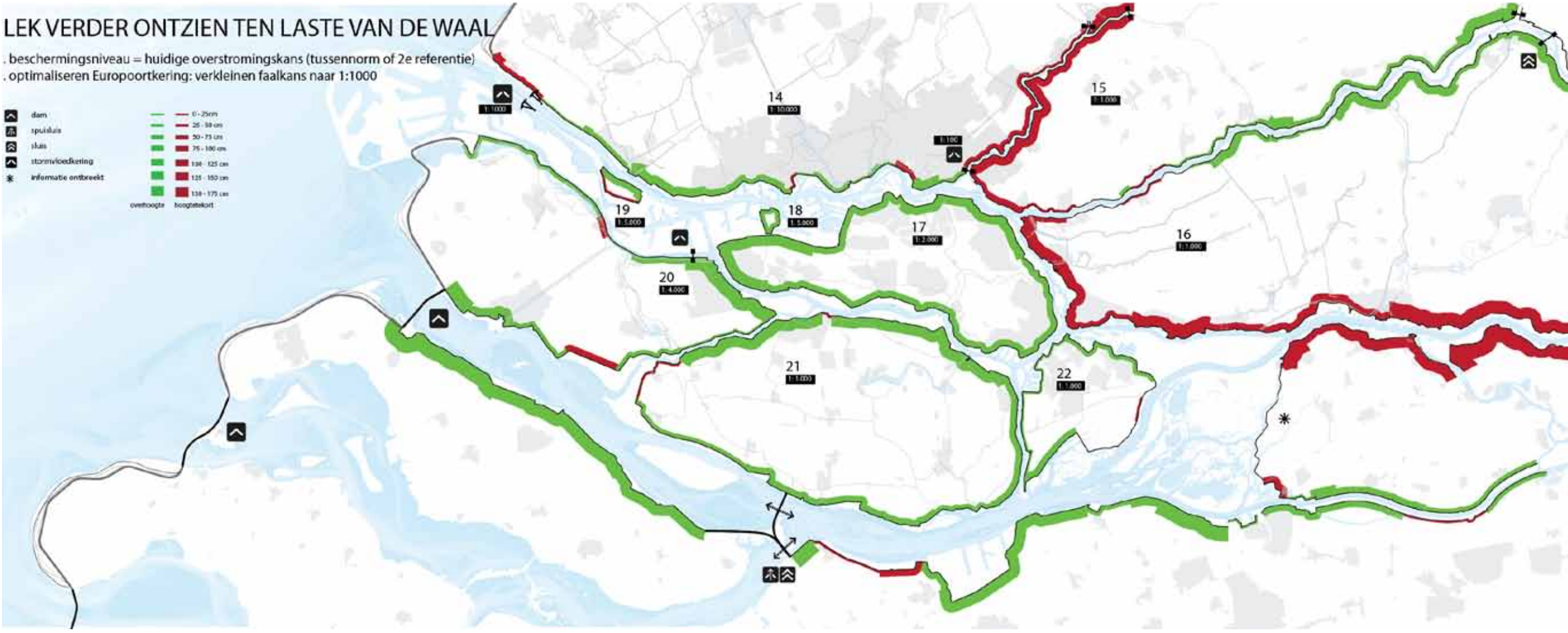
River Noord



River Merwede

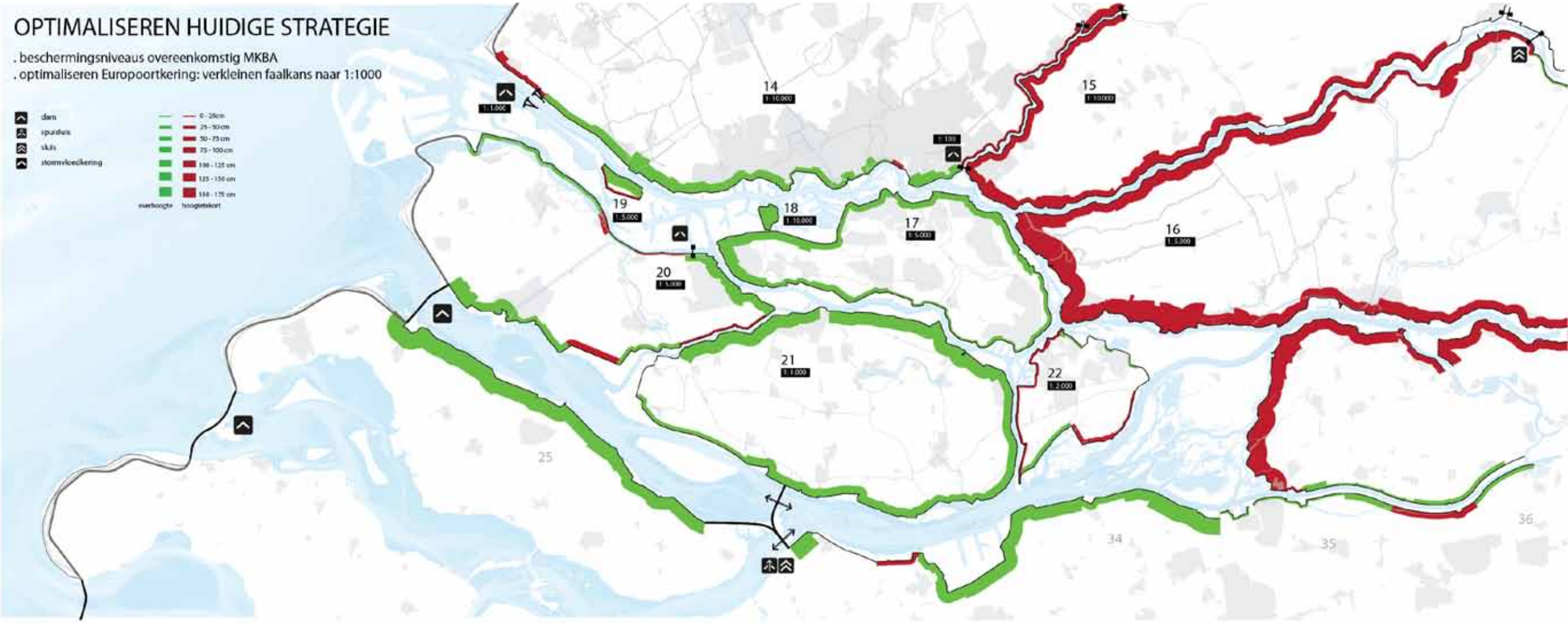


Oordeel ruimtelijke inpasbaarheid



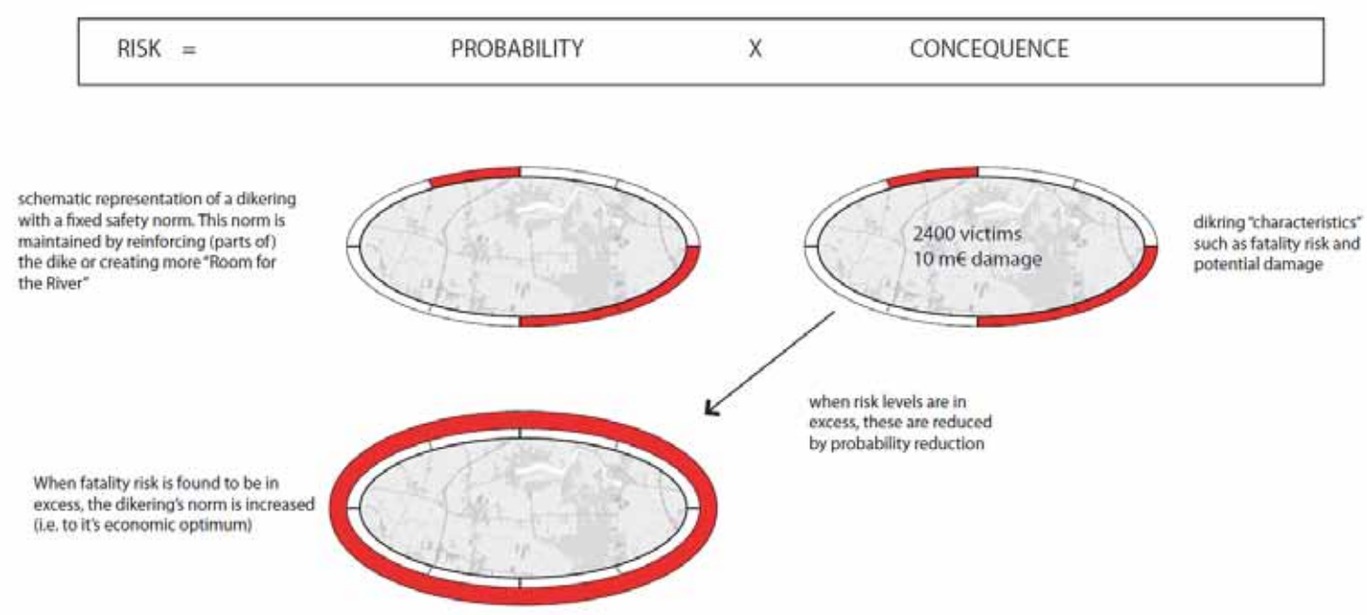
Kaart Deltaprogramma AL Nillesen, DEFACTO & DE URBANISTEN

Kaart Deltaprogramma AL Nillesen, DEFACTO & DE URBANISTEN

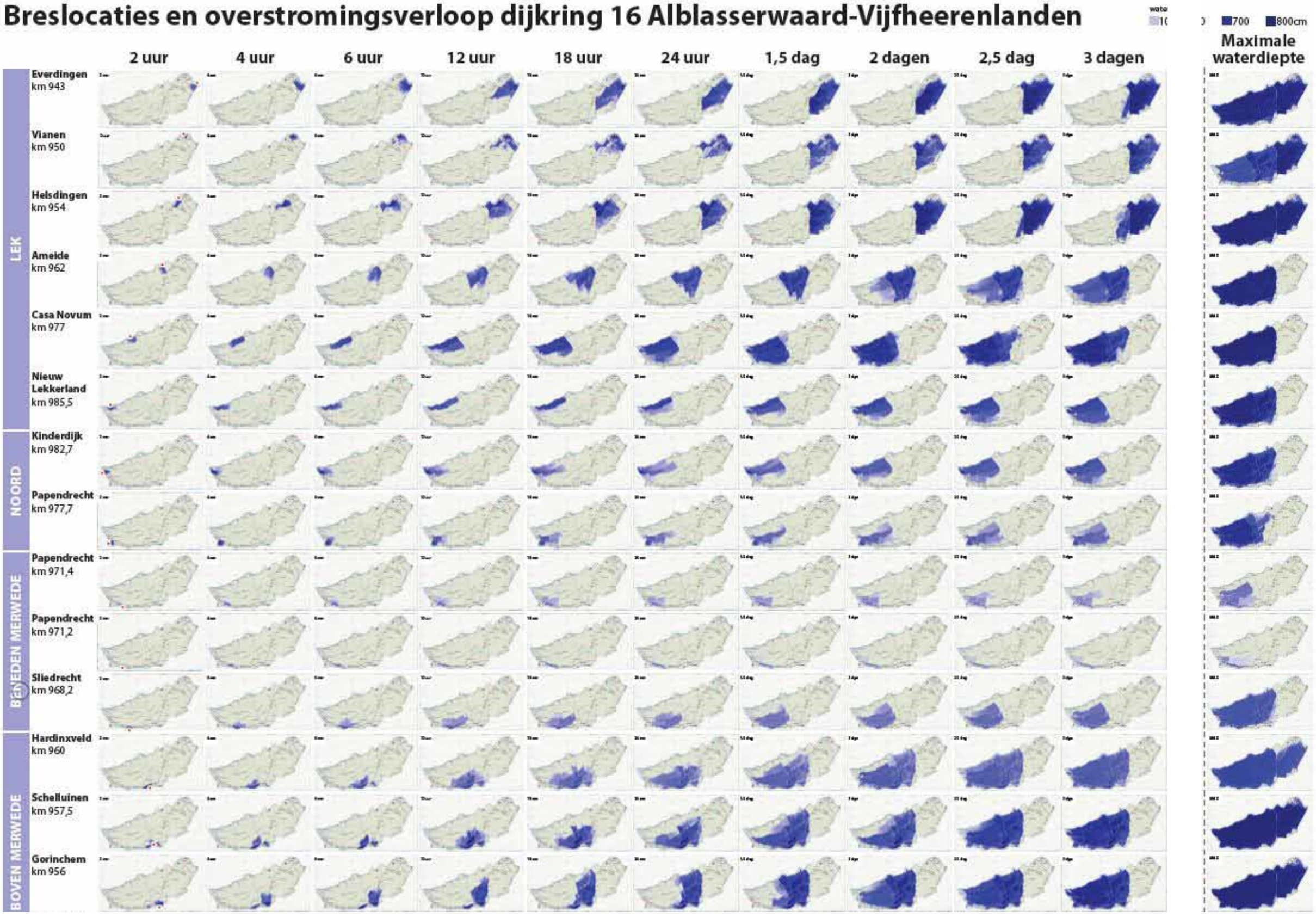


Kaart Deltaprogramma AL Nillesen, DEFACTO & DE URBANISTEN

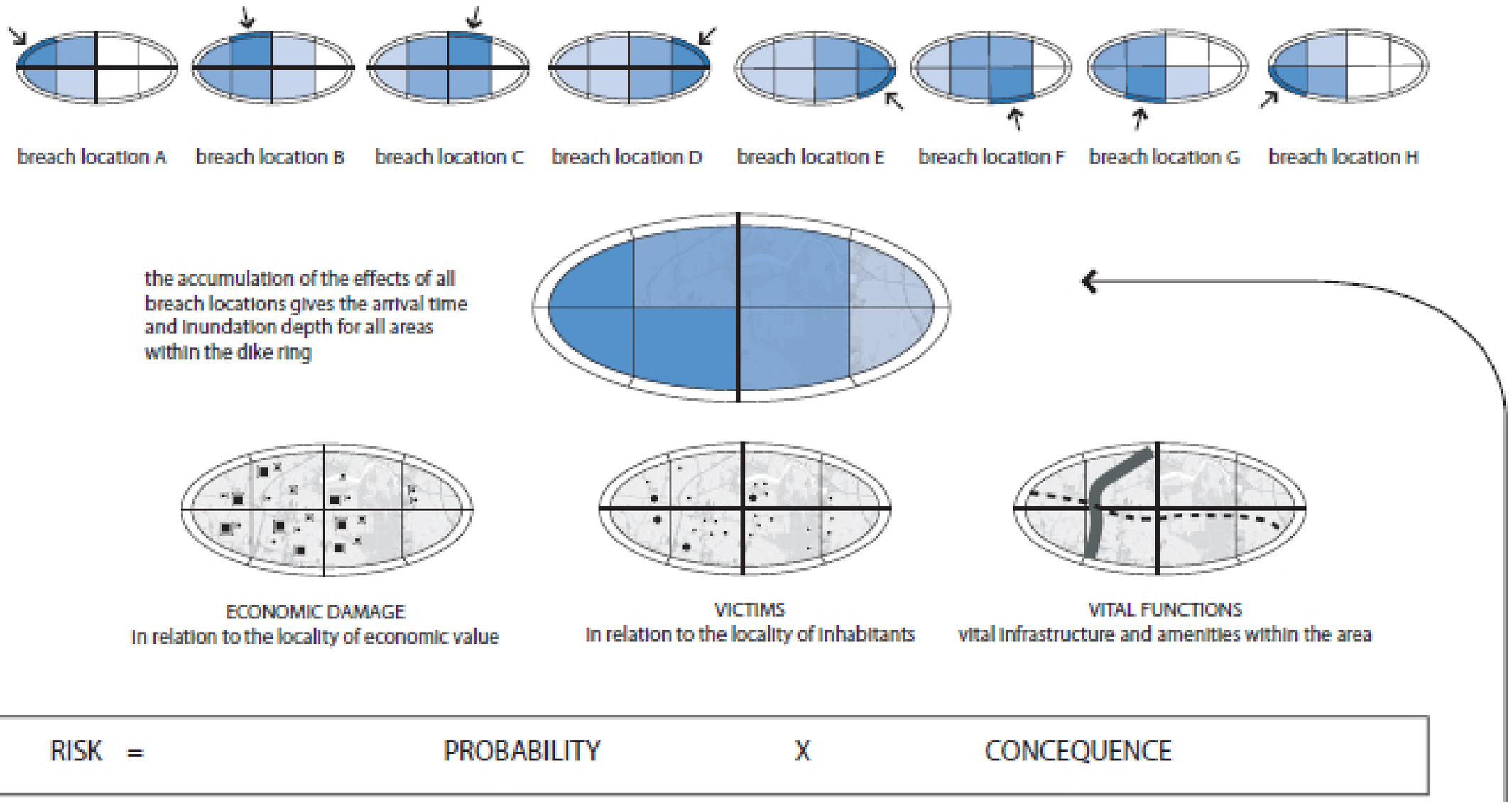
reductie schade / slachtoffers Alblasserwaard zo'n 80%



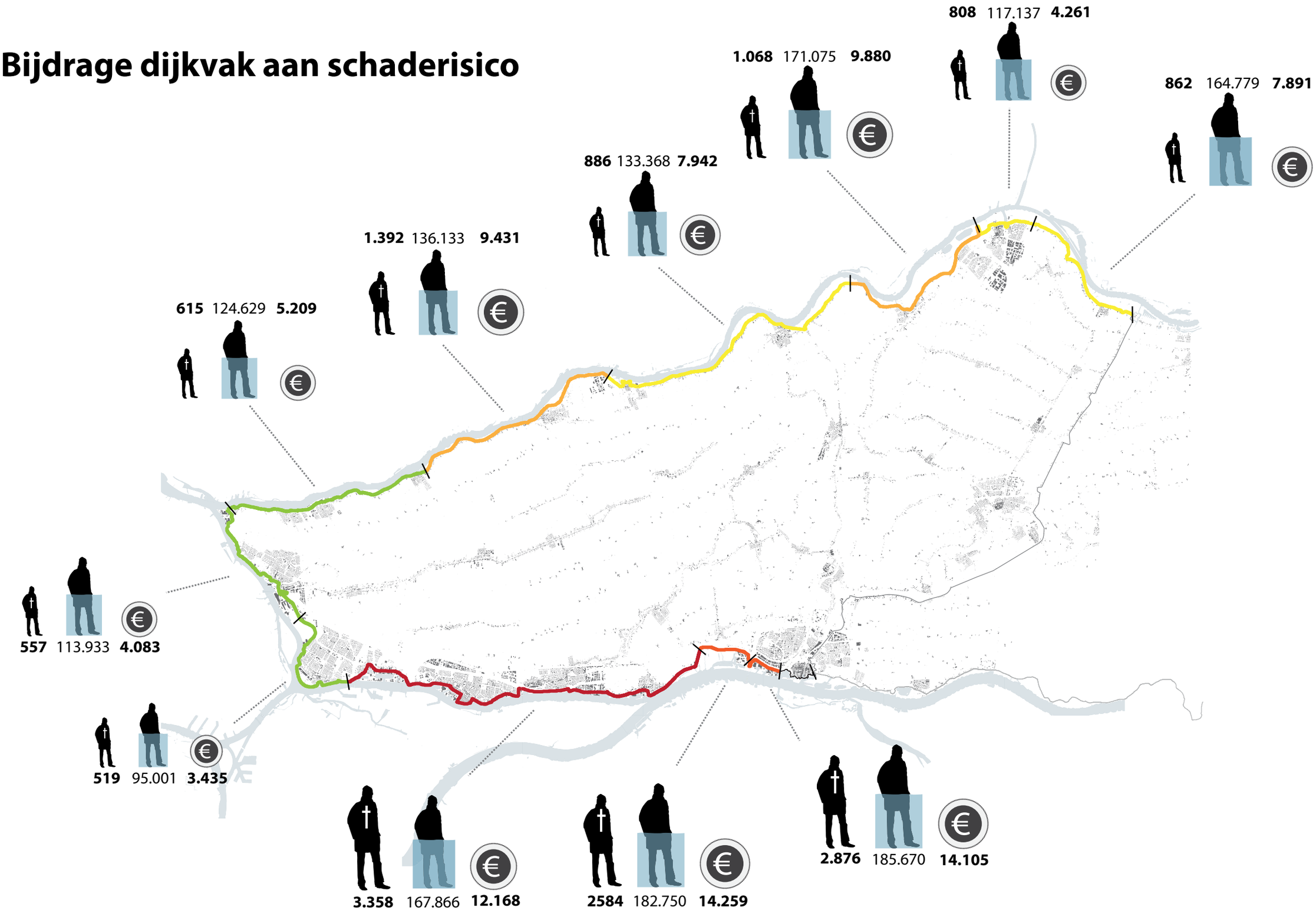
Breslocaties en overstromingsverloop dijkring 16 Alblasserwaard-Vijfheerenlanden



Bron Data: Lizard HKV lijn in water


breach location A
breach location B
breach location C
breach location D
breach location E
breach location F
breach location G
breach location H
the accumulation of the effects of all breach locations gives the arrival time and inundation depth for all areas within the dike ring
ECONOMIC DAMAGE
In relation to the locality of economic value
VICTIMS
In relation to the locality of inhabitants
VITAL FUNCTIONS
vital infrastructure and amenities within the area
RISK = PROBABILITY X CONCEQUENCE

Bijdrage dijkvak aan schaderisico



Dijken versterken waar grote bijdrage risico goed inpasbaar (kans doorbraak verkleinen)

Dijken versterken waar grote bijdrage risico (kans doorbraak verkleinen)

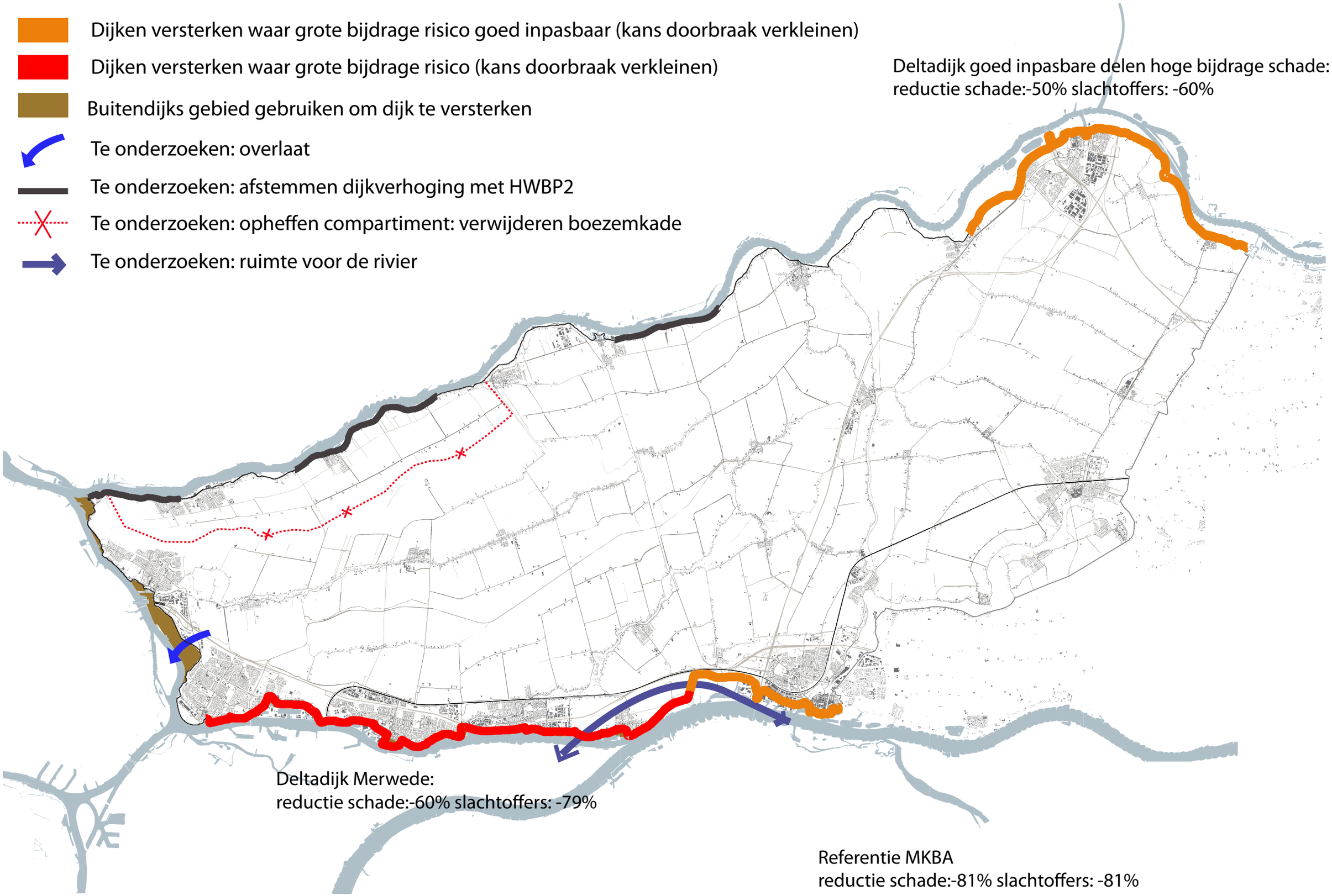
Buitendijks gebied gebruiken om dijk te versterken

Te onderzoeken: overlaat

Te onderzoeken: afstemmen dijkverhoging met HWBP2

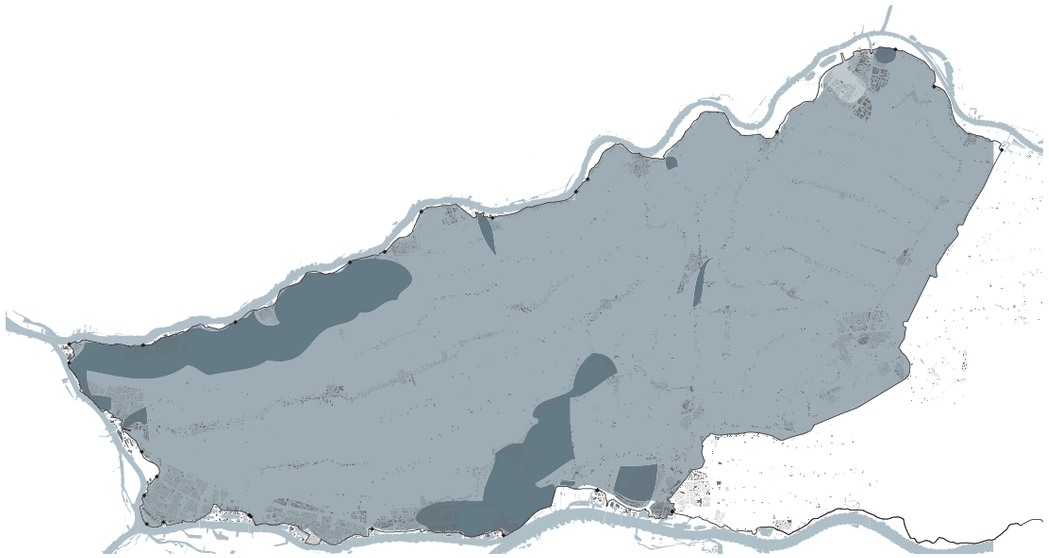
Te onderzoeken: opheffen compartiment: verwijderen boezemkade

Te onderzoeken: ruimte voor de rivier

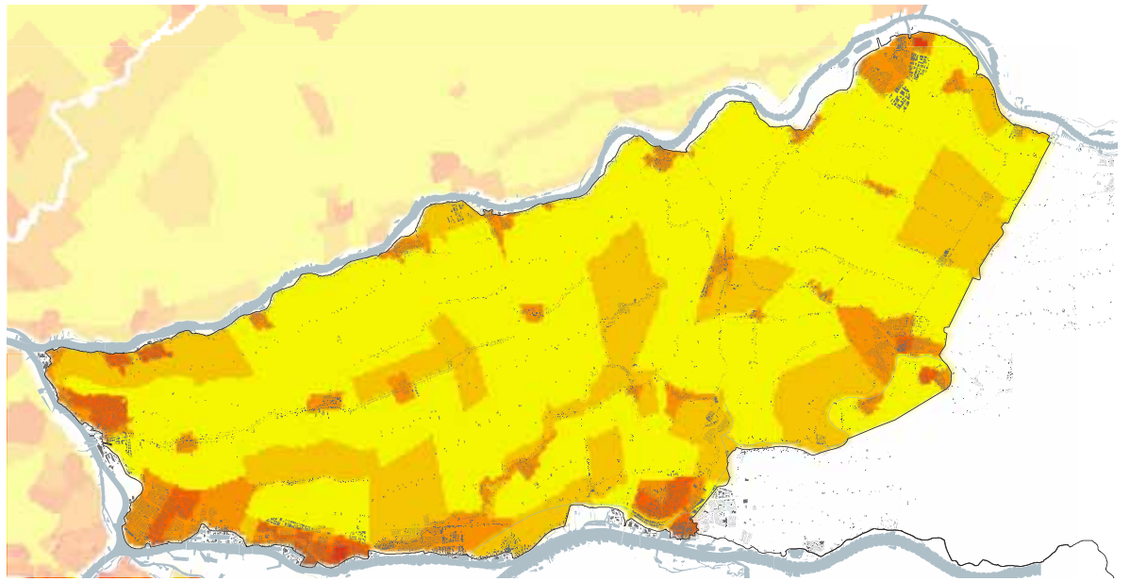


Expertjudgement schadereductie: Deltares

LIR gebieden: hoog risico op overlijden



Dichtheid inwoners: potentiele slachtoffers



Hoeveelheid slachtoffers per km2

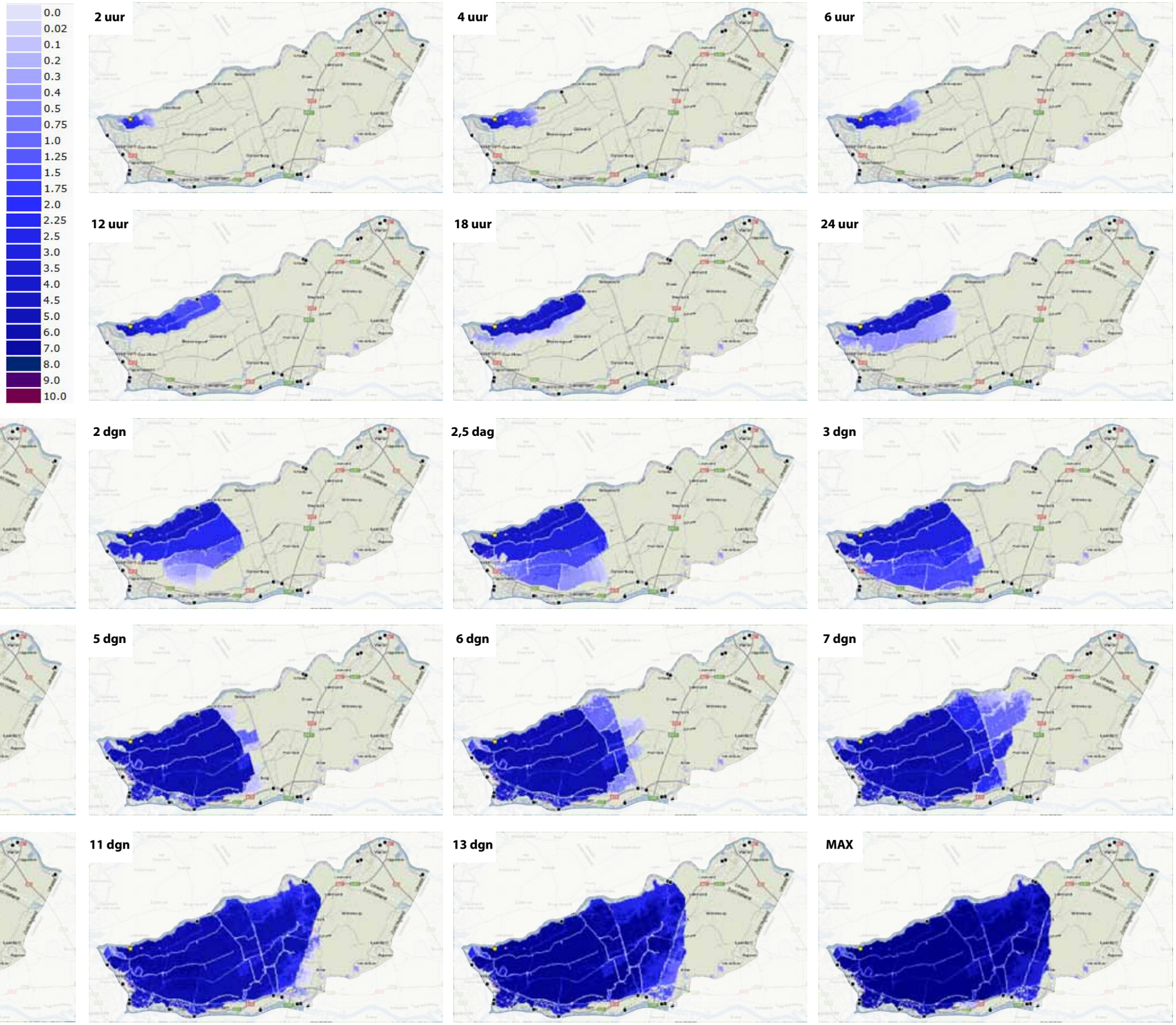
Bron Data: Deltares

Regionale kering creeert ‘badkuip’

Bres Lek 985,5
Nieuw Lekkerland

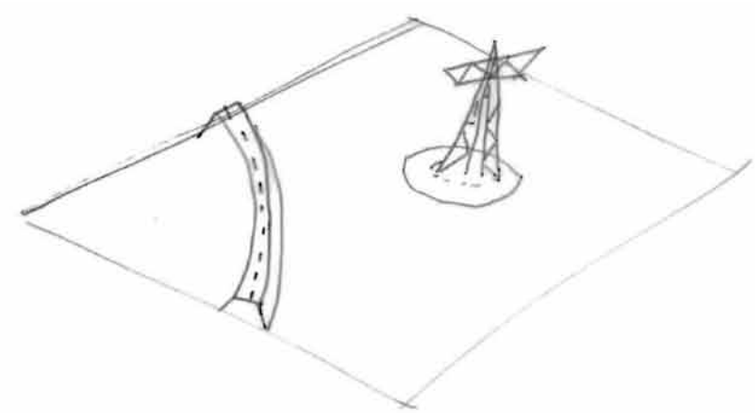
(Dkr 16 dp A171; t=0 op 92 uur)

Bron: HKV, mei 2008, Maasmond: NAP + 2.97 m, Rijnafvoer: 10000 m3/s, Maeslantkering: Gesloten. Schade- en slachtoffers berekend met HIS-SSM versie 2.5 dataset SSM100NL2006

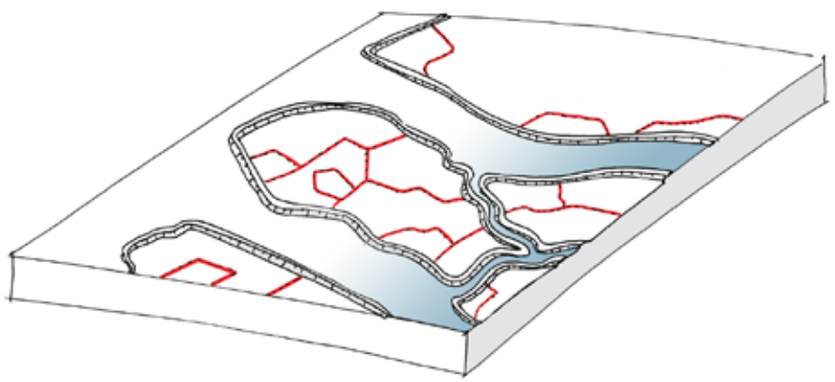


Bron Data: Lizard HKV lijn in water

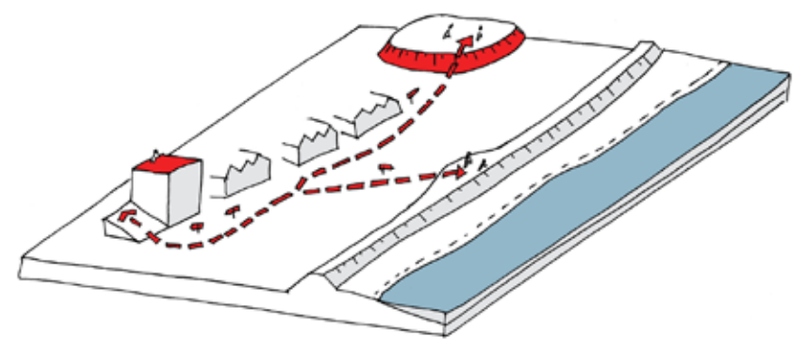
Ofwel dijk versterken (lastig inpasbaar?)
Mogelijke ingrepen 2e en 3e laag



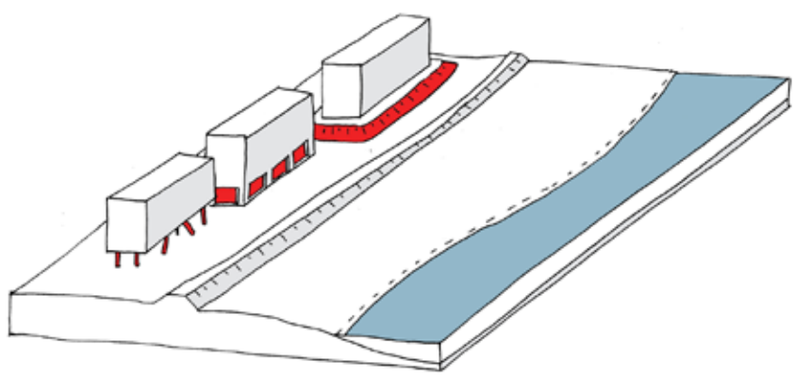
vitale infra en functies beschermen



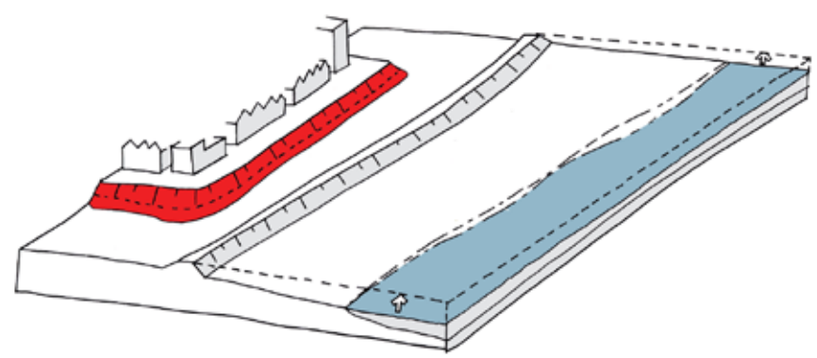
compartimenteren



evacuatiestrategie verbeteren

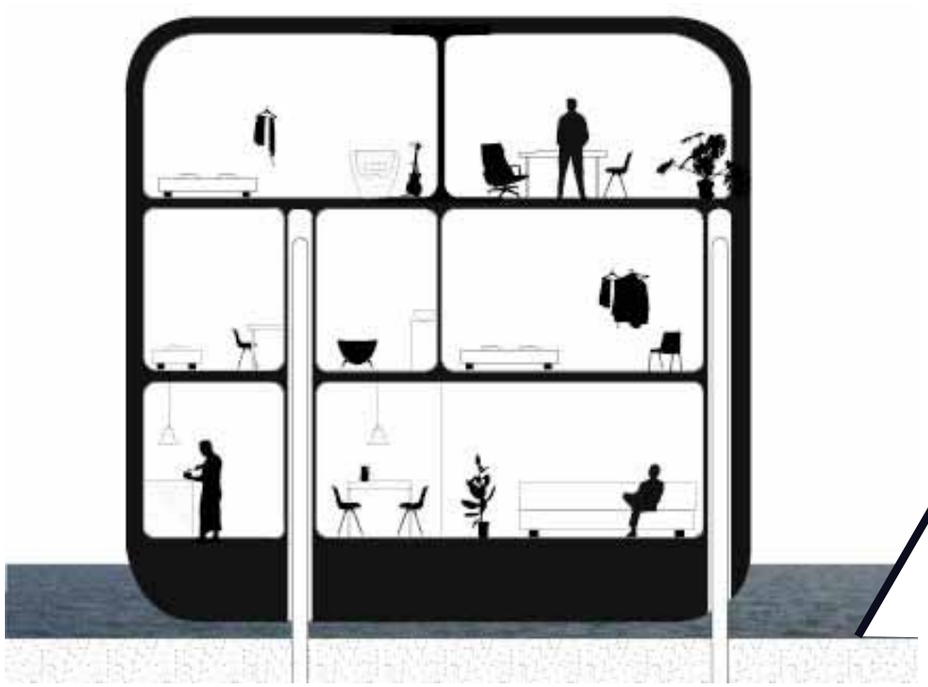


aangepast bouwen



gebieden verhogen

Voorbeelden aangepast bouwen: amfibisch



Vluchtplekken openbare ruimte

Ontwerpend onderzoek als planningsmethode voor 'meerlaagsveiligheid'

ir. Anne Loes Nillesen, TU Delft

Kennisconferentie Deltaprogramma, 23 april 2013

TU Delft

Kennis voor Klimaat