

# Climate Smart Lessons from the Netherlands

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**LOCAL SOLUTIONS:**

*Northeast Climate Change Preparedness Conference*

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# Climate Smart Communities

## Goal:

### **Prepare a Climate Action Plan that:**

- Reduces greenhouse gas emissions by:
  - Increasing energy efficiency
  - Reducing waste
  - Increasing use of renewable energy
- Adapting to climate change by:
  - Altering the built and natural environment
- Saves taxpayer dollars



New York agencies: Department of Environmental Conservation; Energy Research and Development Authority; Public Service Commission; Department of State; Department of Transportation; and the Department of Health.



# Climate Smart Communities

- No cost services provided to municipalities by Climate Smart Communities Coordinators
- Program funding from NY portion of Regional Greenhouse Gas Initiative (RGGI)





# APA Trip to the Netherlands

- Trip organized by the American Planning Association in cooperation with the Netherlands Embassy
- Water management & climate change
- Historic & new approaches
- Soft & hard techniques
- Protection & adaptation

*The yellow provinces are north & south 'Holland'*



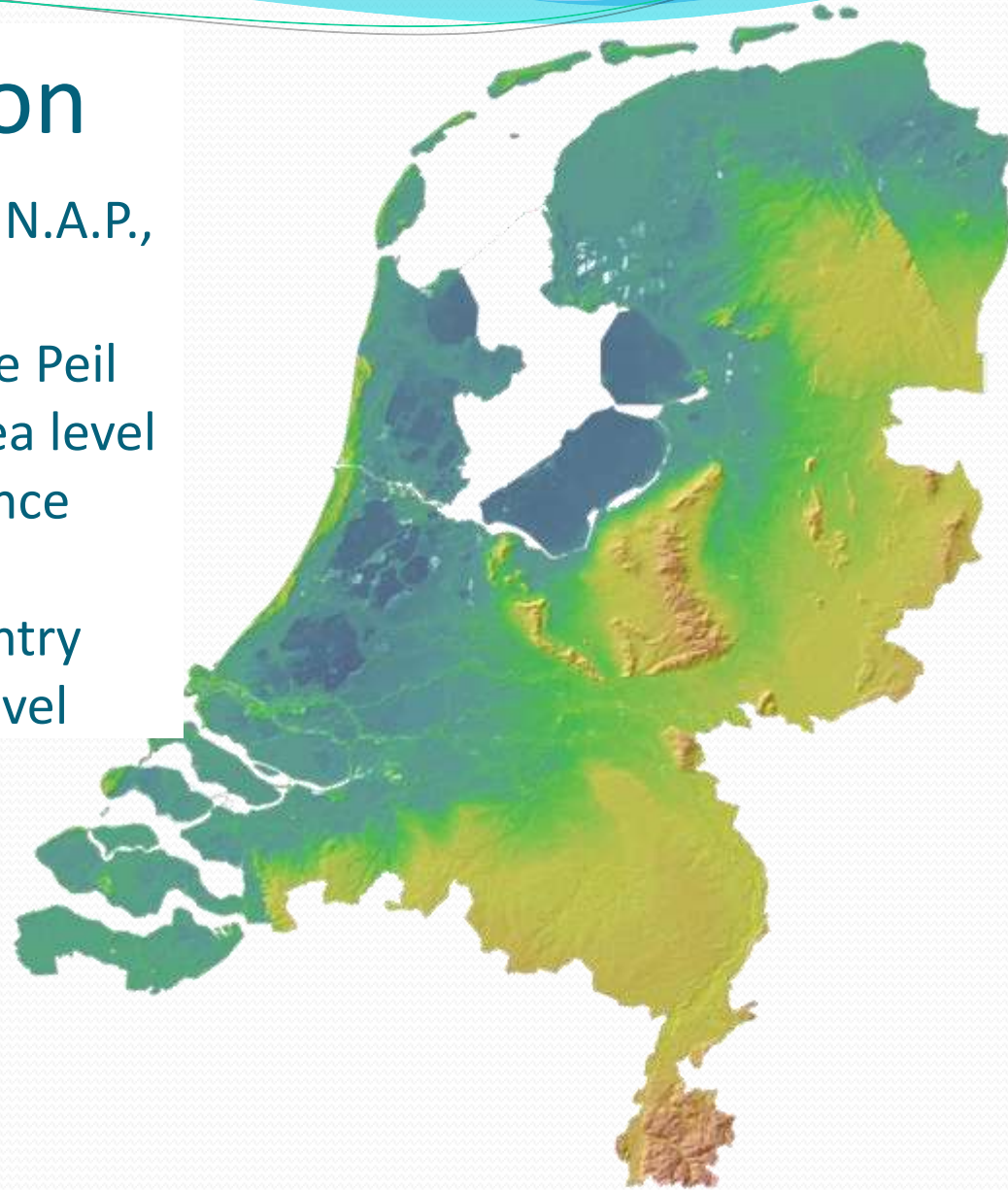


## Legend in meters



# Elevation

- Relative to N.A.P., or Normaal Amsterdamse Peil or average sea level
- Standard since 17th century
- 27% of country below sea level



# Land from Sea

- *God created the world, but the Dutch created Holland (the Netherlands)*
- First dikes over 2,000 years ago
- Dike failure in 1287 created Zuiderzee
- Dike in 1932 created IJsselmeer
- Polders in 20<sup>th</sup> century



# Rivers & the Sea



Possible climate changes for the 1990 – 2100 period,  
according to KNMI'o6 scenarios

## Wet periods

Ten-day precipitation total  
that will be exceeded once  
every 10 years:  
Winter: +8% to +24%



## Dry periods

+7 to +30%  
Potential evaporation



**Sea level at Dutch coast**  
+35 to +85 cm

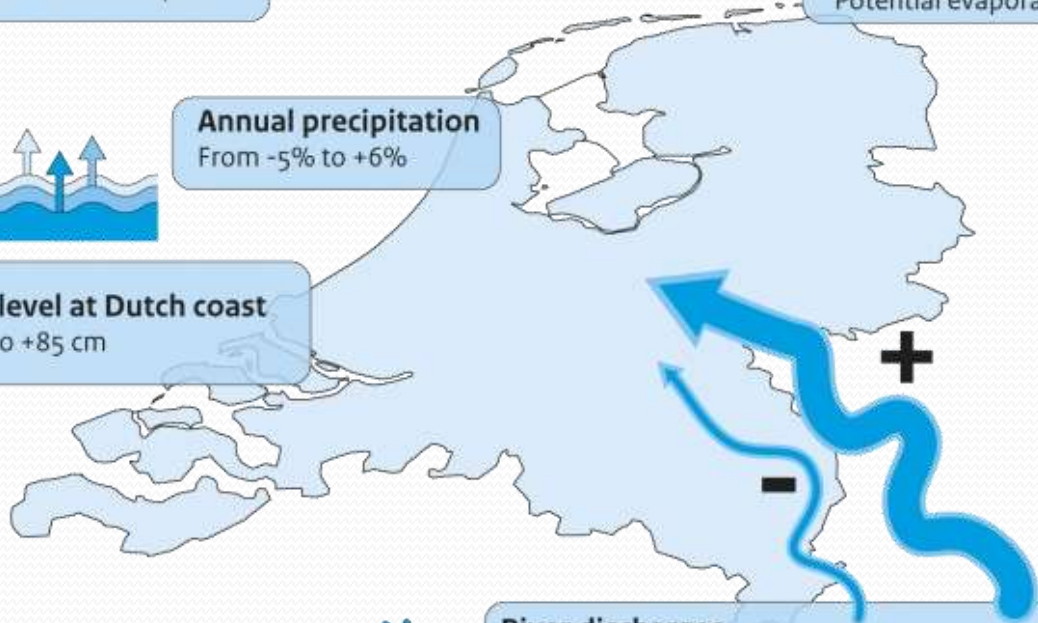
**Annual precipitation**  
From -5% to +6%

**Average annual temperature**  
+1.8 to +5.1 °C



## River discharges

River Rhine average in winter: +12% to +27%  
River Rhine average in summer: -41% to +1%  
River Rhine extremely high discharges:  
4 to 40 times more often



Source:

*The Effects of Climate  
Change in the Netherlands:*  
2012

Netherlands Environmental  
Assessment Agency

Source: KNMI (2006 scenarios).

www.pbl.nl

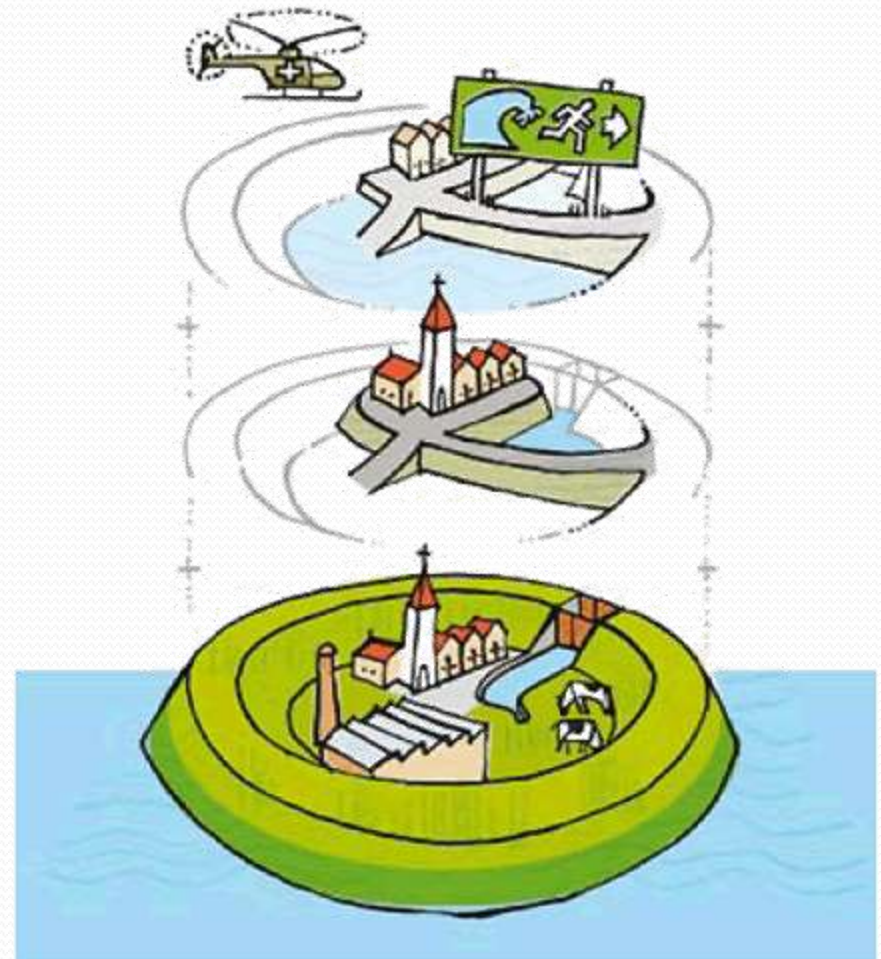


# Dutch Approach

Disaster Management –  
learn from the Americans 3

Spatial Planning & Design –  
new emphasis 2

Prevention - traditional 1





# Dutch Strategies

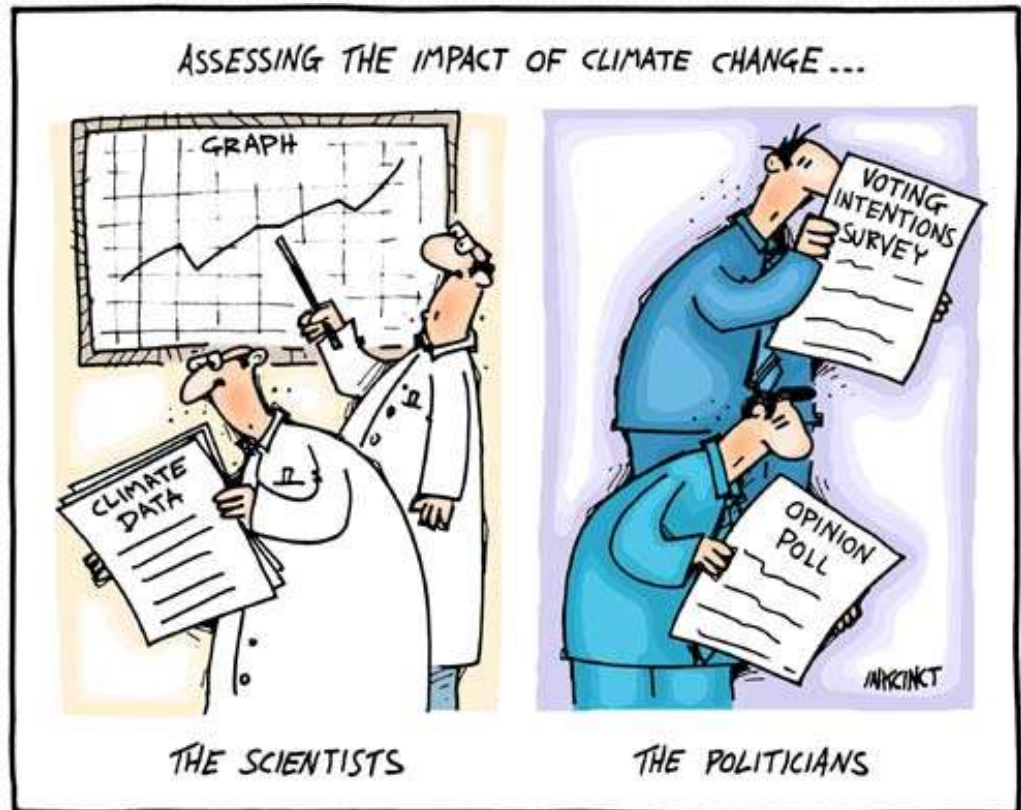
- Knowledge/action/marketing
- Plan well into the future
- Provide protection
  - Strengthen dikes
  - Utilize sea barriers
  - Utilize canals/gates/pumps
- Adapt to climate change
  - Design/build with water
  - Increase stormwater storage
  - Provide 'Room for the River'
- Base on cost/benefit
- Monitor continuously





# Plan Far Ahead for Climate Change

- Dutch plan for 2100
- NYC plan for 2030



# Dikes by the Sea and Inland

- 20-mile dike from North-Holland to Friesland separates IJsselmeer from sea
- Ring dikes surround cities, towns, hamlets



Dike along new island in Amsterdam harbor





# Dikes Part of Urban Form

- Dikes integrated into city landscape
- Pumps move water from series of canals to the sea
- Continuous level monitoring







# Dunes for the Shore

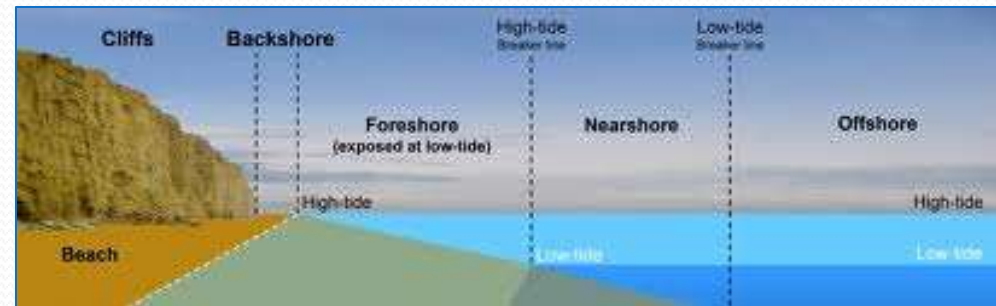
- Natural dunes along North Sea coast
- Additional sand required periodically



# Sand for the Shore – ‘Zand Motor’



- 11 million cubic meters sand pumped from offshore to foreshore
- Current distributes sand





# Dike by the Sea – Scheveningen

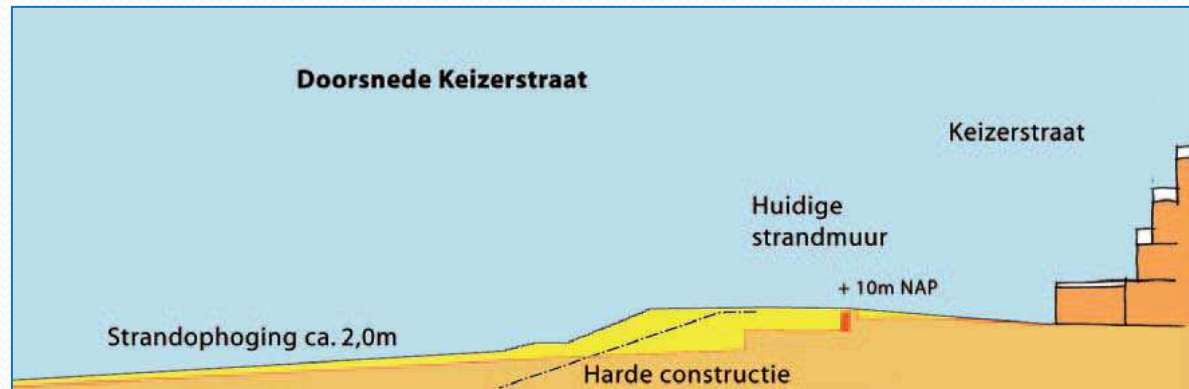
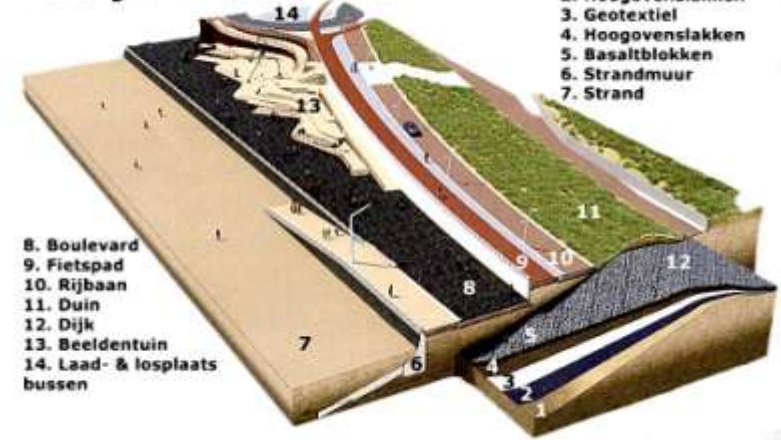
- Seaside resort
  - Hotels, beach pavilions
  - Shops, condos, pier
  - ‘Surf dudes’
  - 18 million visitors/year
  - Similar to Long Beach, NY and Jersey shore
- Challenges
  - With climate, change dike is too low, too narrow
  - Preserve views
  - Integrate active resort



# Dike by the Sea – Scheveningen

- New dike over the old on sea side
- Sand pumped to widen beach
- Hard structure, sand, plantings
- Integration of promenade, boulevard, amenities
- Multiple uses/users
- 900 m long (~1/2 mile), \$90 million

**De dijk-in-boulevard**







# Sea Barriers – Delta Works

- *Here the tide is ruled, by the wind, the moon and us (the Dutch)*
- 1953 flood - 1835 deaths
- Solution - install inlet barriers
- 200-year life; 1:4000 protection
- SCHELDT BARRIER
- 10 years to construct, \$12B, Completed 1987
- 62 open gates, closed 25 times in 26 years



# Sea Barriers – NYC & Long Island



# Adaptation

- Politics, policy, payments
- Water planning
- Water storage
- Build with water
- Blue/green solutions
- Room for the river







# Water Planning - Rotterdam

- 400 km canals, 1,000 pumping stations
- Shallow groundwater
- SLR, greater river discharge and rainfall
- Plan - Rotterdam 'Climate Proof' by 2025
  - Plazas - aesthetics, play, gathering, water storage
  - Canal promenades with water storage
  - Water storage beneath plaza, garage, street

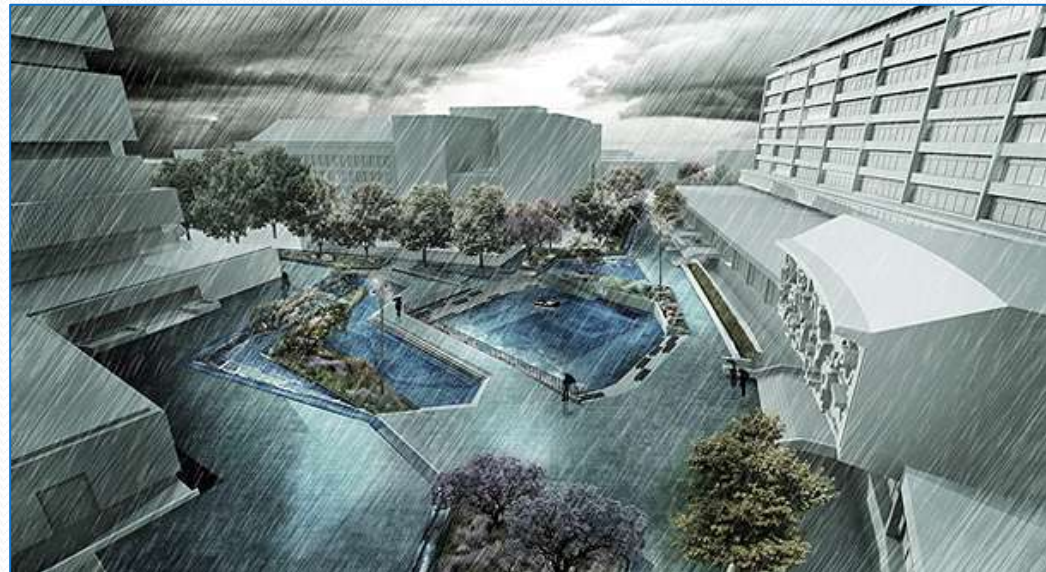






# Water Storage - Rotterdam

- Water - Plaza
- Storage - Recreation
  - 475,000 gallons storage
  - Automated operation
  - Empties in 24 hours



# Build with/in Water - Amsterdam



- Watergraafsmeer polder
  - Reclaimed in Amsterdam harbor
  - Protective dike, canals/pumps/locks
  - On land and in-water residential







# Green Blue Delft

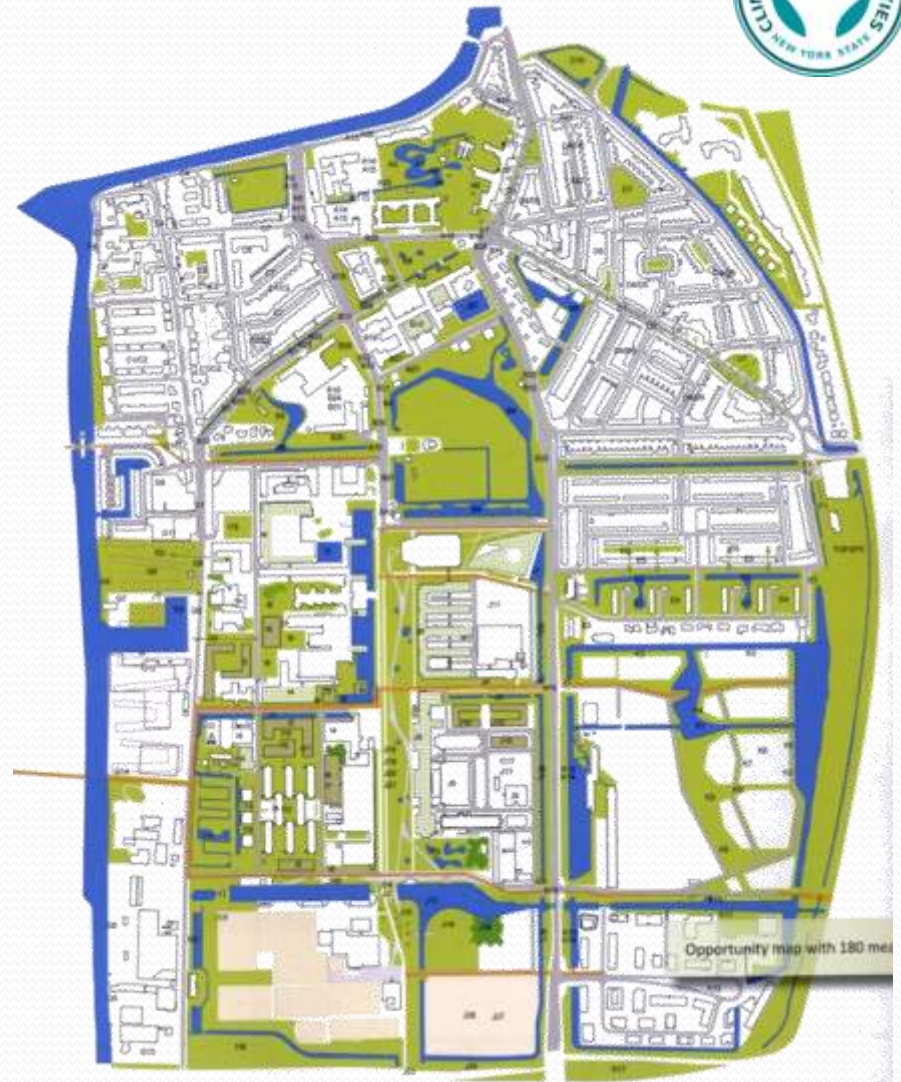
- University requests building permit
  - Permit for density increase if increase quality of life with 'natural' elements
- Issues
  - Flooding from more intense and frequent rainfall
  - Inadequate stormwater capacity
- Project Sponsors
  - City of Delft, Delft Technical University, Delfland Water Board





# Green Blue Delft

- More 'blue' storage
- More 'green' spaces
- More natural treatments



# Technical University Delft - Library





# Room for the River

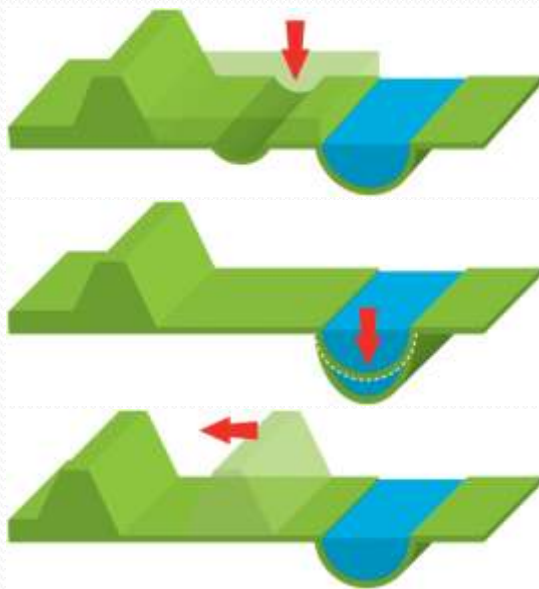
- Rhine, Meuse, Waal, and IJssel Rivers
- Problem
  - Sediments reduced 'room for the river'
  - Floods greater with more snow melt
- Solution
  - Public process/marketing
  - Structural changes
  - 'Green channel' bypass to sea
  - Residential relocation



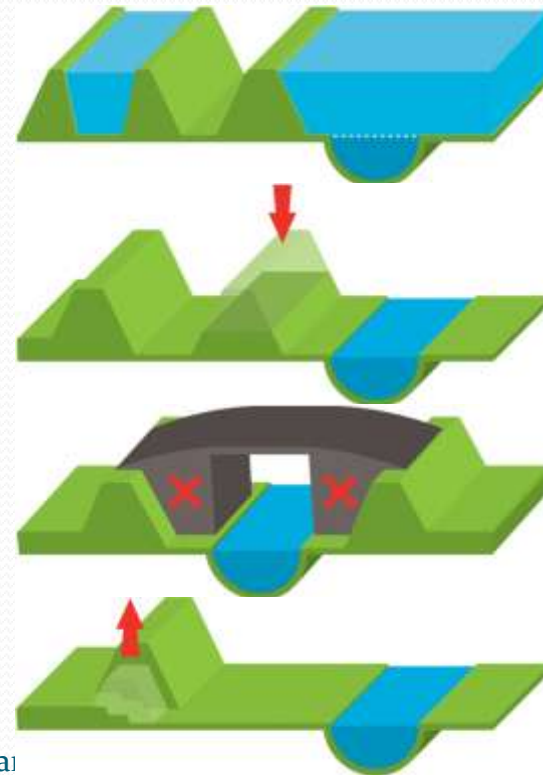


# Room for the River

- Lower floodplain
- Deepen bed
- Relocate dike
- Provide high water channel



- Depolder
- Remove obstacles
- Strengthen dikes



Source: <http://www.ruimtevoorderivier.nl/>

# Windmills



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