Climate Smart Water Management in the Netherlands

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An Independent Contractor to NYSERDA

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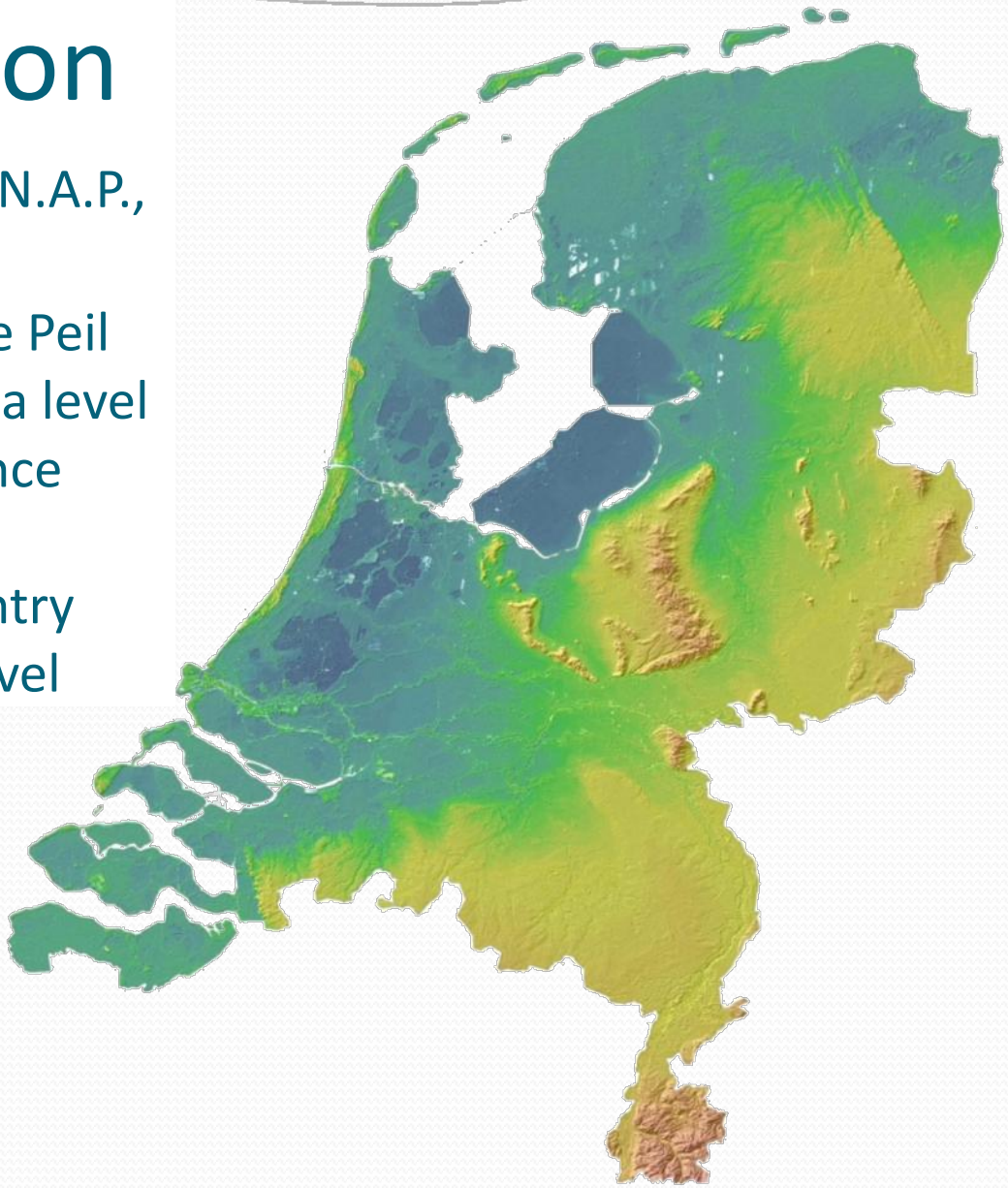
APA Trip to the Netherlands

- 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'

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 20th century

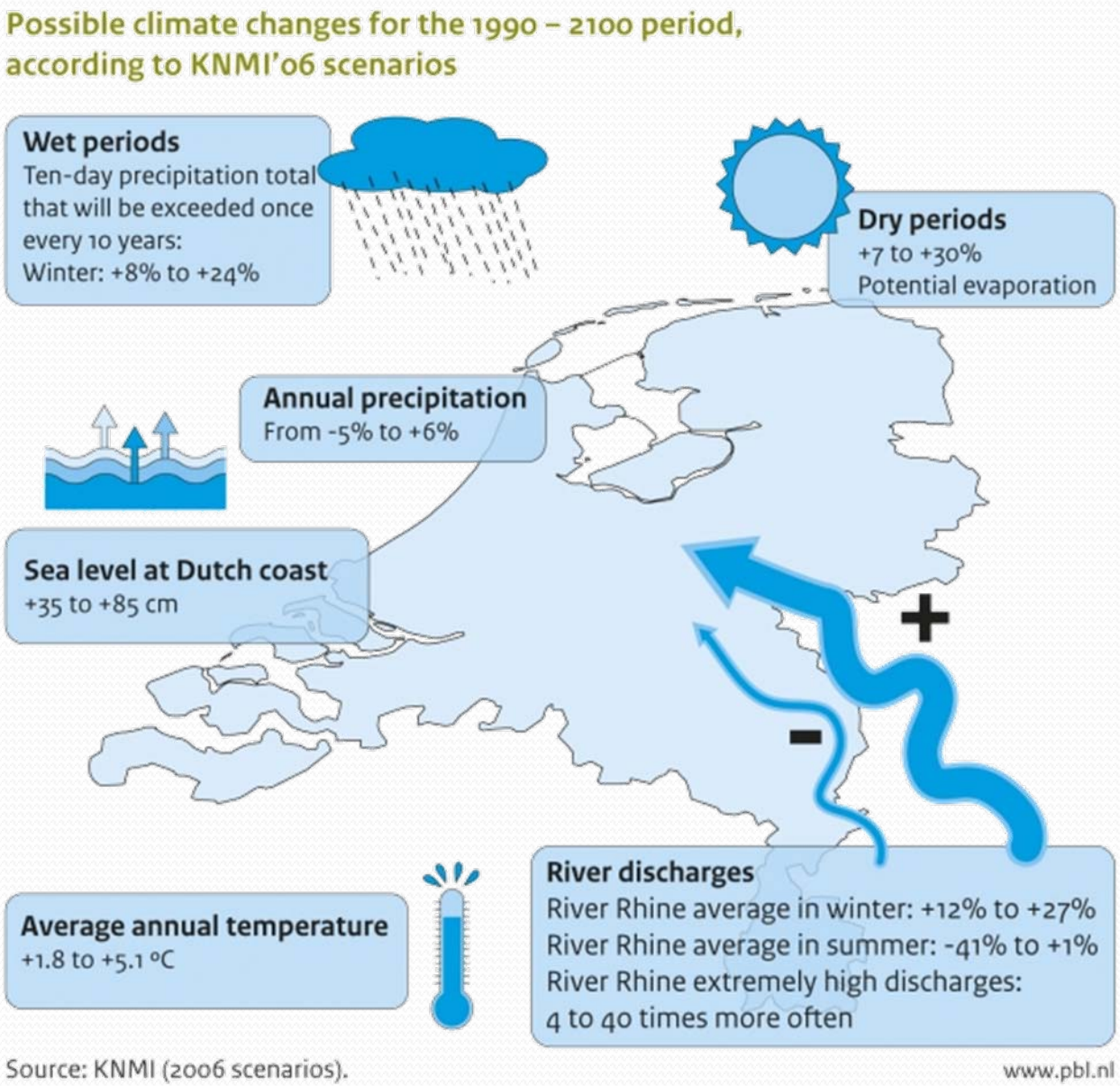
Polders

- *Low-lying area reclaimed from a sea or river and protected by dikes*
- Need for polders
  - Small country needs more land (3rd most densely populated in world)
  - Rich soils for agriculture
- Polder construction
  - Dike installation
  - Water pumping
  - Groundwater and surface water (canal) monitoring

Rivers & the Sea

- Four rivers/deltas
  - Eems River in the north
  - Rijn, Maas, and Schelde Rivers in the south
  - Drain portion of western Europe
- The North Sea

Rivers & the Sea



Source:

The Effects of Climate Change in the Netherlands: 2012

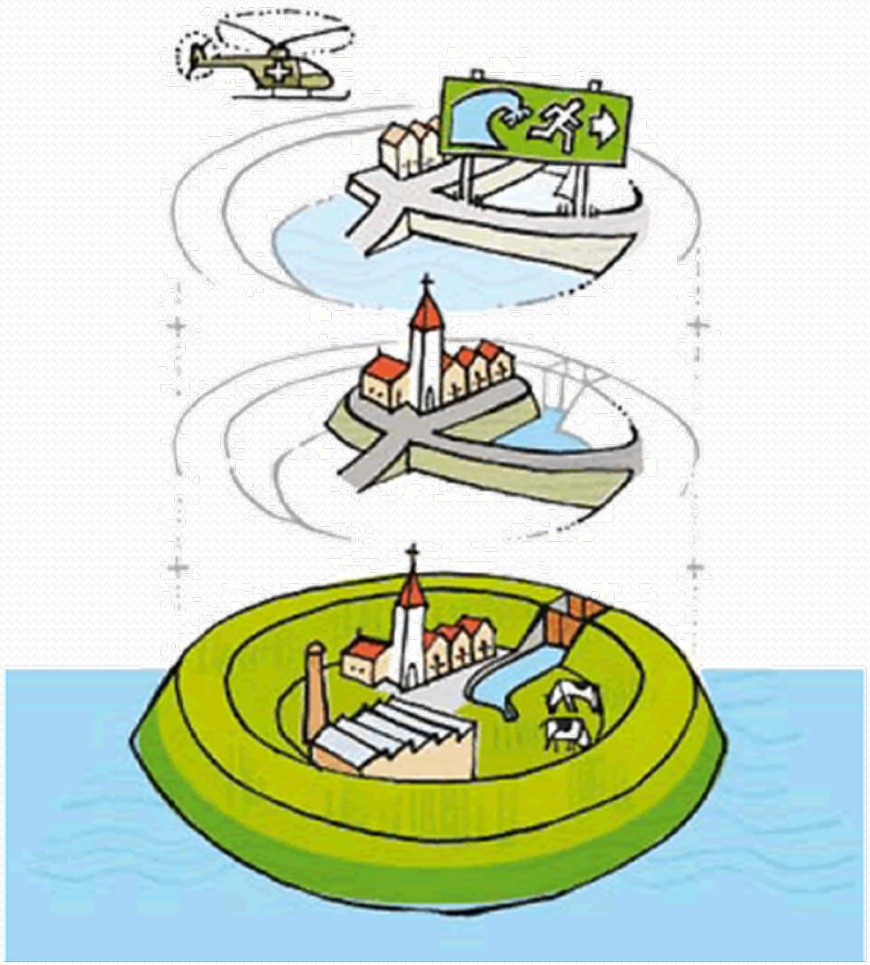
Netherlands Environmental Assessment Agency

Dutch Approach

Disaster Management – learn from the Americans 3

Spatial Planning & Design - new emphasis 2

Prevention - traditional 1



Dutch Strategies

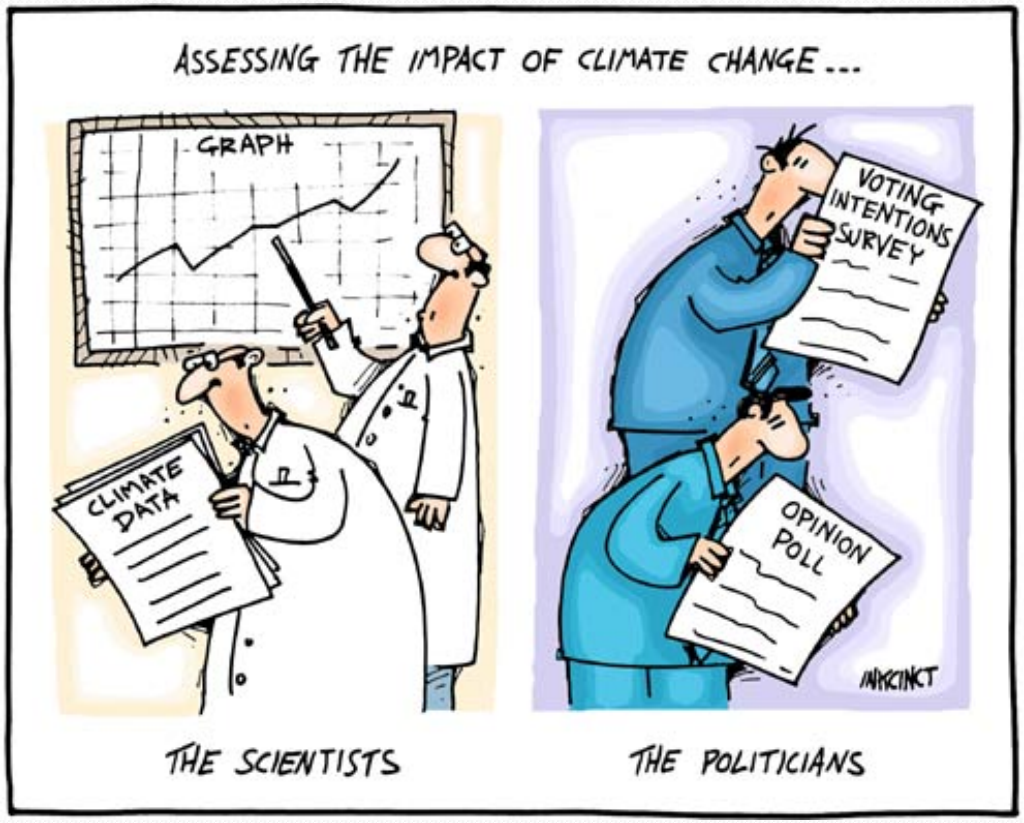
- Learn from the past
- Plan well into the future
- Base design on 'tipping point'
- Provide protection
  - Strengthen dikes
  - Utilize sea barriers
  - Utilize canals/gates/pumps
- Adapt to climate change
  - Provide 'Room for the River'
  - Increase stormwater storage
  - Design/build with water
-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

‘Remember, Learn, Look Ahead’

- Flood Museum
  - 1953 flood – 1835 lost lives
  - New plans for flood protection

Plan Far Ahead for Climate Change

- Dutch plan for 2100
- NYC plan for 2030



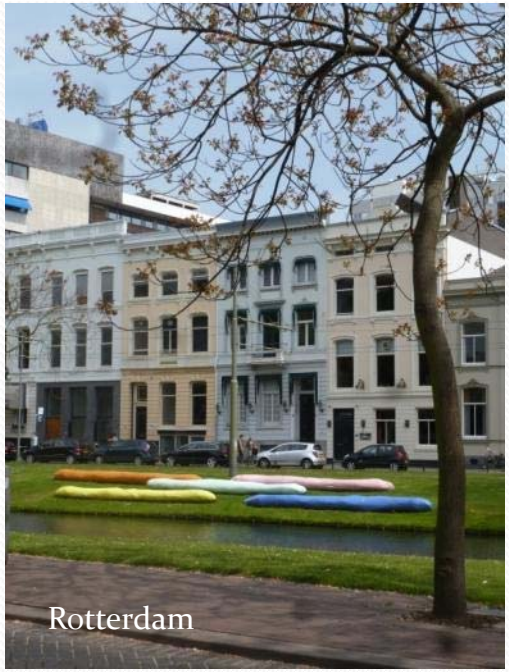
Dikes by the Sea and Inland

- 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

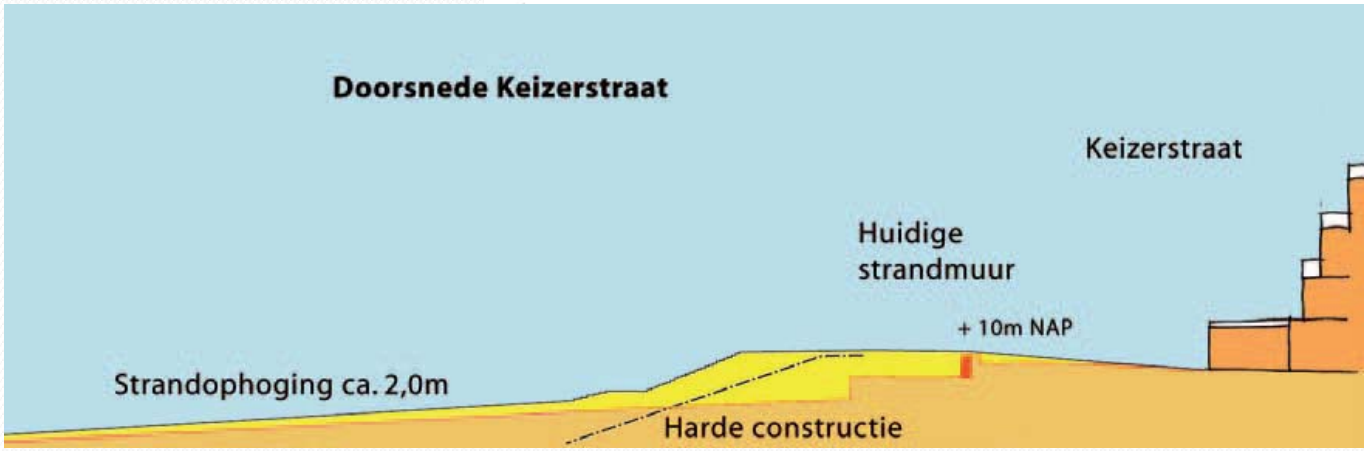
- Natural dunes along North Sea coast
- Additional sand required periodically

Dike by the Sea – Scheveningen

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

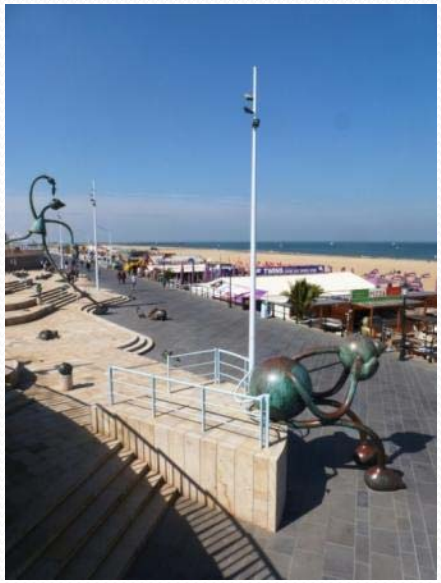
Dike by the Sea – Scheveningen

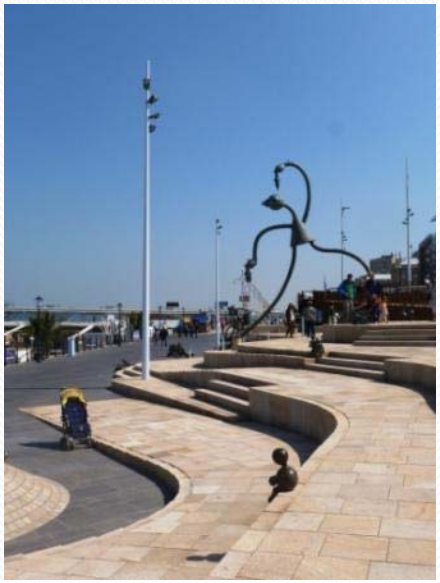
- New dike over the old on sea side
- Sand pumped to widen beach
- Hard structure, sand, plantings
- Integration of promenade, boulevard, amenities
- No dike penetrations
- 900 m long
- € 70 million



Dike by the Sea – Scheveningen

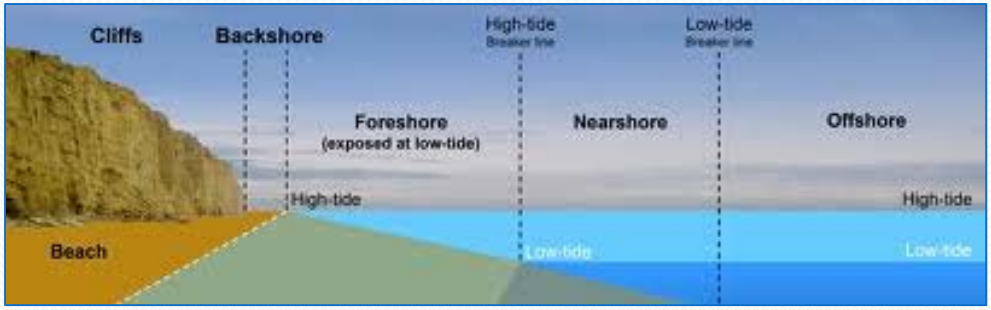
- Features
  - Wider beach
  - Wider/hardened dike
  - Multiple levels
  - Multiple uses/users
  - Public art





Sand for the Shore – 'Zand Motor'

- 11 million cubic meters sand pumped from offshore to foreshore
- Current distributes sand
- Cost savings – cost/benefit
  - Dunes: 10 €/cu m
  - Near shore: 7 €/cu m
  - Foreshore: 2.5 €/cu m
- In US - 'feeder beach'
  - Bayside of Fire Island Sunken Forest 11/2011



Sea Barriers – Delta Works

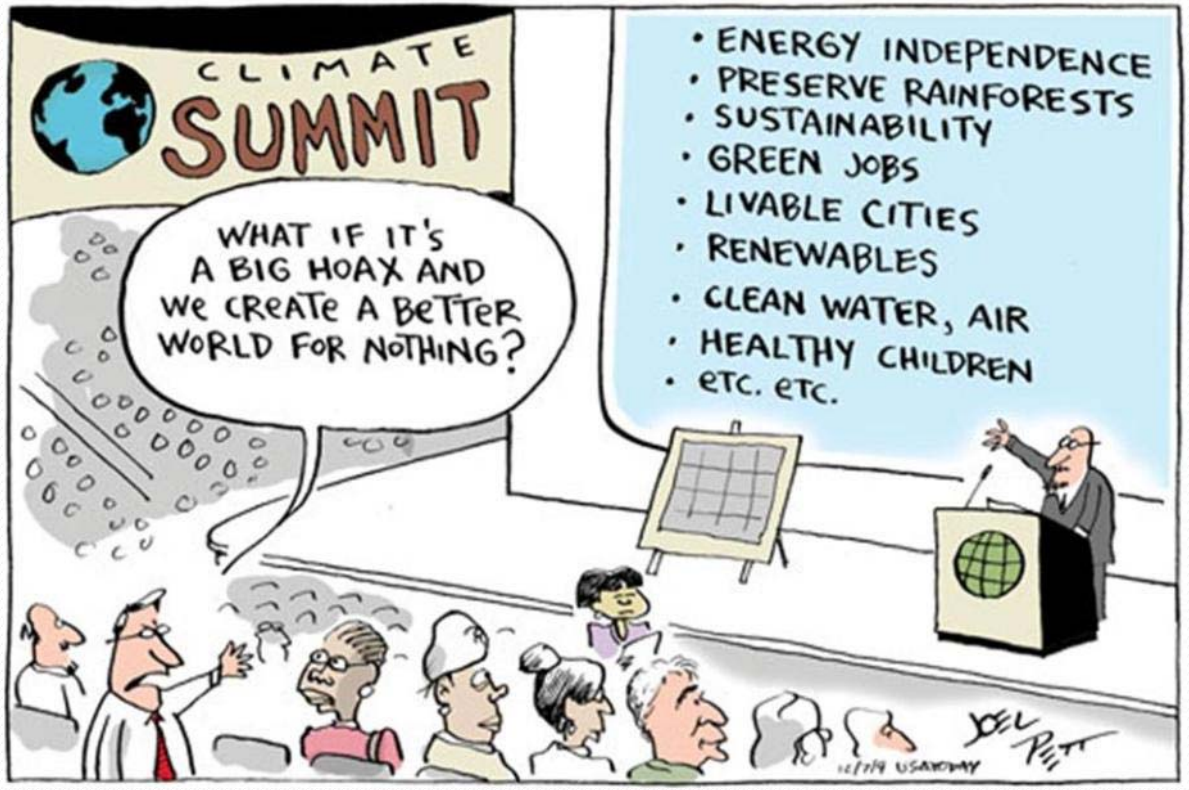
- Rijn, Maas, and Schelde River deltas in the south
- 1953 delta flood disaster resulted in 1835 deaths
  - Delta Committee – 1953
  - Delta Act – 1958
  - Project completion - 1997
- Goal – reduce flood risk
  - 1:4000 in delta region
  - (1:10,000 in central area of country)

Sea Barriers – Delta Works

- Shorten coastline by 700 km by closing off inlets
- Raise flood defenses to 5m above NAP
- Designed for 200-year life
- Designed for 20cm/100 yr SLR
- Now estimate 60cm/100yr SLR

Sea Barrier – Scheldt

- *Here the tide is ruled, by the wind, the moon and us (the Dutch)*
- 10 years to construct, $12B
- Completed 1987
- 62 gates, normally open
- Closed 25 times in 26 years

Adaptation

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