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Coastal Management in The Netherlands: evolutionary best practices

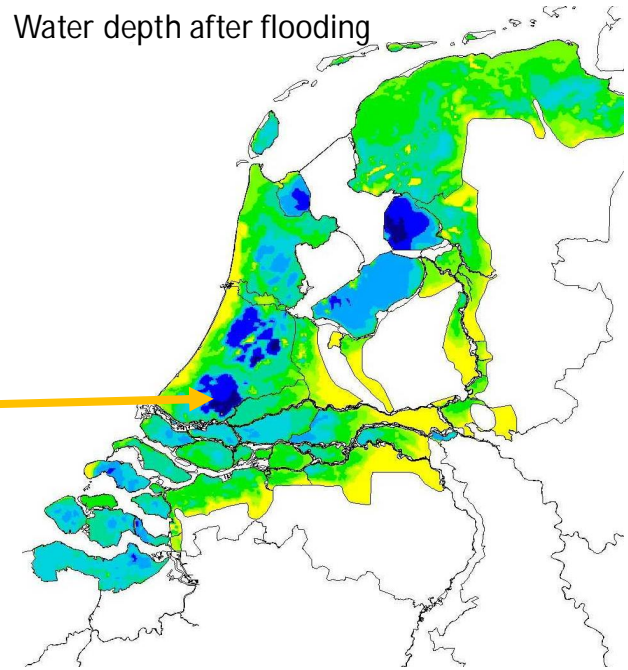
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Climate Change Advisory Council Adaptation Committee Reflection and Learning
Workshop 1: Coasts; 15 September 2021

The Netherlands



Water depth after flooding



Some facts and figures:

- Coastline of some 450 km
- Approx. 60% is at or below sealevel
- 18% of land area reclaimed
- Delta of 4 main transboundary rivers
- Population of 17.4 million (521 / km²)
- Central Government (Ministry of I&W / Rijkswaterstaat), 12 provinces,
- 21 waterboards and 350 municipalities)



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Before 1953

- Single national standard for flood protection (highest measured WL + 0.5m)
- Low professionalized organizations with **limited capacity for maintenance**
- **'Local acceptance' of forces of nature**
- National Government not well manifested / over 2600 water boards (interest – taxation)
- Environment serves as 'playground' for socio-economic developments
- Rural economy, small scale agriculture and fisheries, 'island' economies
- Spatial planning focused on urban development
- Mono-sectoral planning by Rijkswaterstaat (closure of Lake IJssel and ongoing land reclamations)

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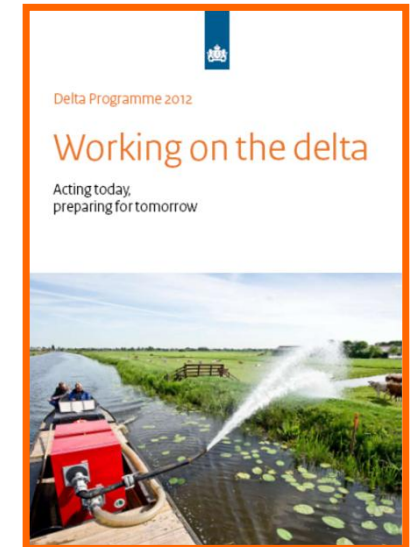
After 1953

- **Standards (per regional compartment) based on a risk assessment approach (i.e. 1:2,000, 1:4,000 and 1:10,000 along the coastline)**
- 'Closing the delta coast' by large scale **engineering works** (shortening the coastline)
- Delta project (as advised by a delta commission) created a higher (sense of) safety; more navigation, agriculture intensifies and tourism and leisure become more important
- Improved maintenance by water boards
- Dealing with major pollution in the delta, increased environmental awareness, establishment of NGO's;
- Turning point: building an 'open' barrier in the Eastern Scheldt to protect the valuable estuarine character
- **Coastal line of defense (1990)** maintained by an annual nourishment programme
- Consolidation of water boards, Rijkswaterstaat reshapes the delta with engineering works and development of policies for nature and environment
- Law on spatial planning, planning of an Ecological Main Structure, growing importance of water in spatial planning and high stakeholder involvements



Present situation

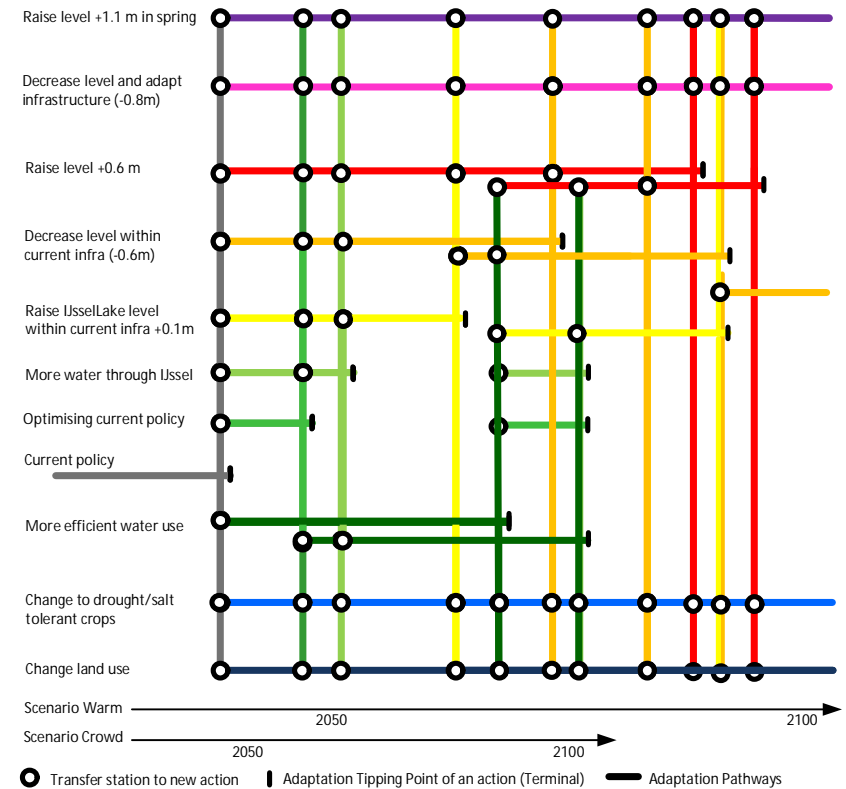
- **Adaptation to climate change**, reconsidering safety standards
- Alternatives for protection (seaward/landward)
- Strengthening through the '**Building with Nature**' concept
- Ecological quality decrease in closed (from sea) basins and returning to the concepts of dynamic estuaries
- Natura 2000 / the compensation concept
- Tourism and leisure become important sectors, while agriculture loses importance, port development
- Further consolidation of Water Boards (at present 21)
- **2nd National Delta Programme** (flood risk management, freshwater supply and spatial adaptation); with delta act, fund and commissioner
- '**Water guides spatial developments**'



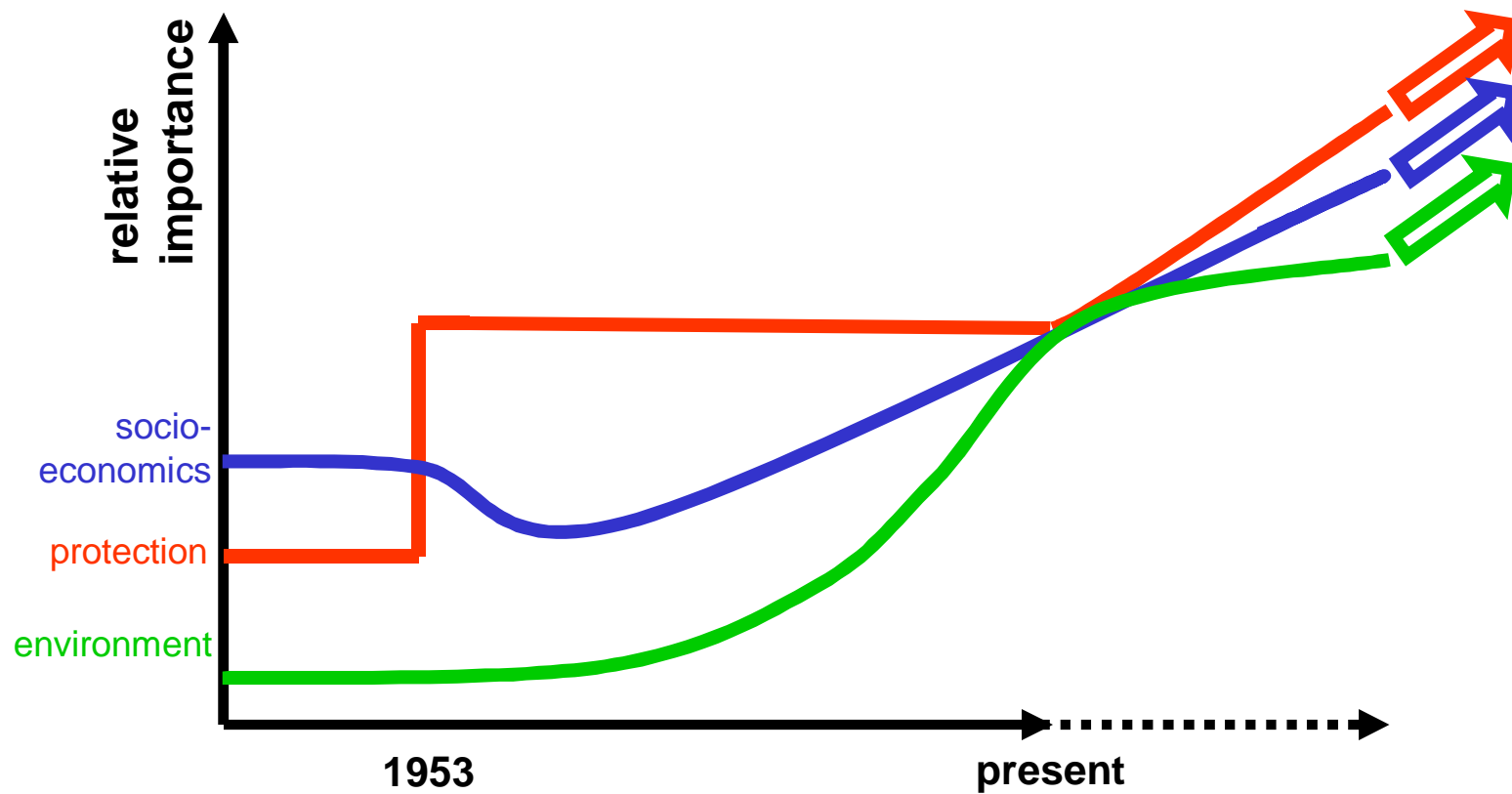
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Future

- **Increased climate adaptation and mitigation / SLR, adaptation pathways (functional lifetime of investments decreases)**
- **Focus on system knowledge and innovative approaches**
- **New risk-based standards (1: 100,000 yr)**
- Environment in balance with safety, land use and socio-economics
- Sector-wide collaboration (and public-private initiatives)
- Intensive use of the North Sea (wind farms, sand extraction, navigation, etc.) requiring new marine spatial planning
- Widening the coastal protection zone with foreshore marshes, oyster beds, islands,also increasing the natural value



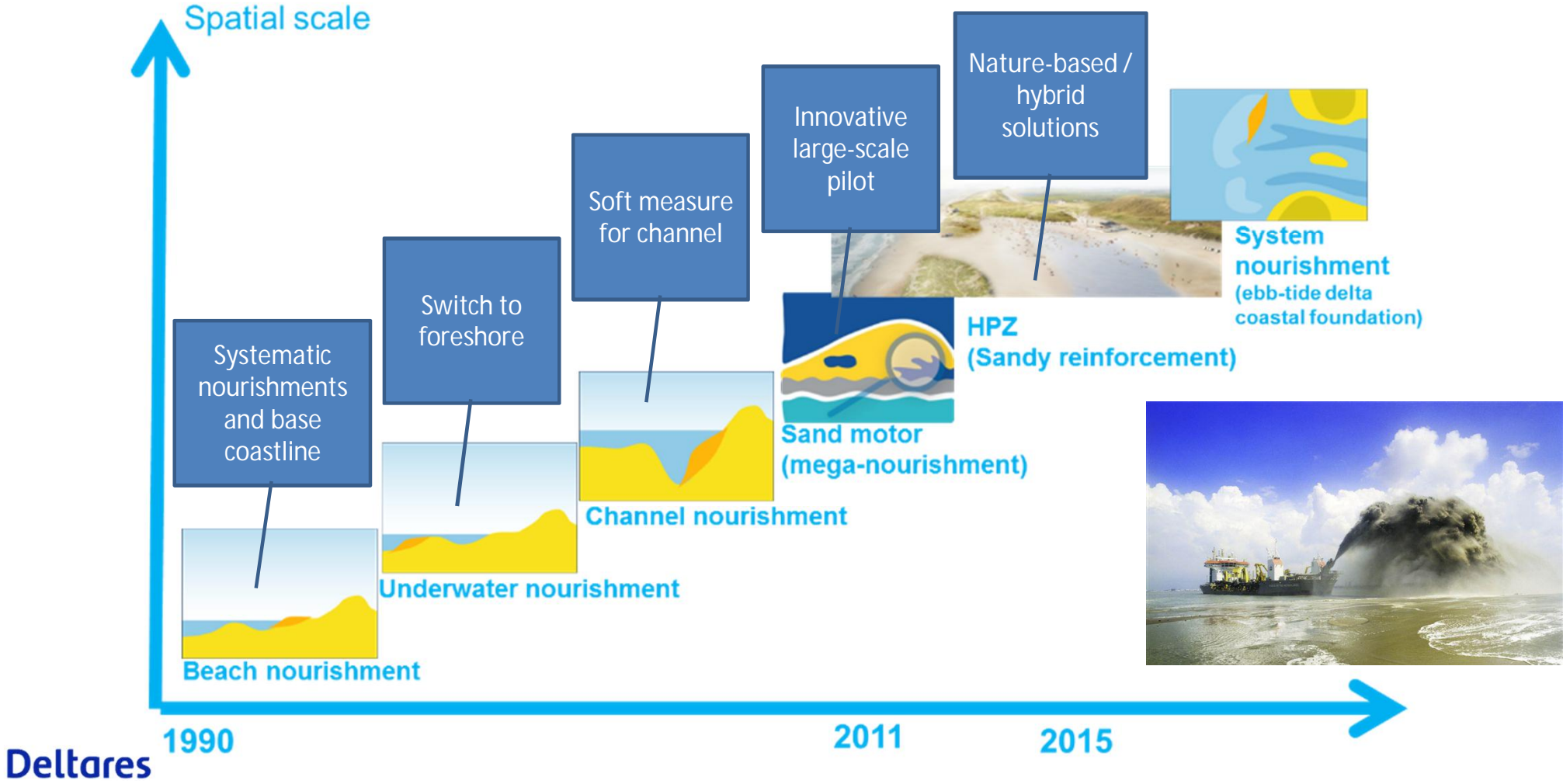
Evolutionary best practices: summary



Evolutionary best practices: summary

	Before 1953	After 1953	Present situation	Future situation
Protection	Development of risk approach (1:100,000 yr to be fully implemented in 2050) for safety leading to stricter regional standards			
Environment	Enhanced environmental awareness. Tendency: from hard to soft land-water boundaries (Building with Nature)			
Socio-economics	Shift from agriculture / fisheries to more diverse multi-functional use (with strong port and recreation sector and full attention for nature development)			
Institutional setting	Upscaling towards a more integrated approach			
Planning	Growing importance of planning processes, with high participatory level and stakeholder involvement			

Example of adaptive coastal management







Cost-effective land water interfaces with 1) ability to adapt with changing forcing conditions and 2) opportunities for ecosystem enhancement.



Multifunctional solutions for adapting coastal defenses: combining functions on top of and near coastal defenses creating added value in densely populated areas.



A clay ripening project demonstrates how (dredged) sediment can be converted to clay soil for dike reinforcements. Levee of ripened clay tested in the Delta Flume at Deltares.



Dike breaches predictable thanks to sensor systems. The smart application of new monitoring techniques leads to significant cost savings and deferred investments for water authorities.



Example of EcoShape | Building with Nature (2008 – Present)

- Sectors working together with a shared ambition
- Test and implement NbS concepts in practice
- Supported with fundamental knowledge
- Translated to practical design guidelines
- Developed in a collaborative network
- Aimed at upscaling and mainstreaming

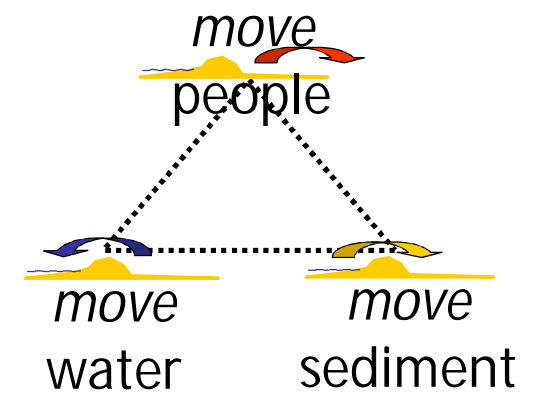
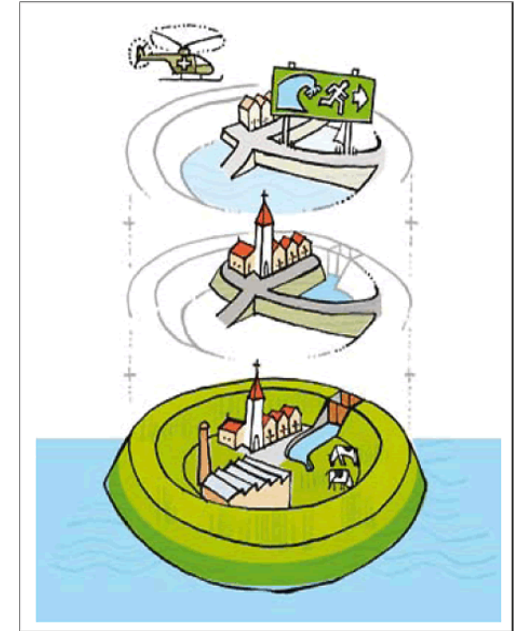


Building with Nature pilots



Dealing with an uncertain future

- Invest in improving system understanding, innovative approaches (Building with Nature) and flood risk awareness (OECD report)
- Formulate robust plans that can be adapted over time (flexibility)
- Establish a permanent fund for long term investments and maintenance



POTENTIAL CONSEQUENCES OF ACCELERATED SEA-LEVEL RISE

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Coast
more sand needed

10 mm/year ~



14 mm/year ~



60 mm/year ~



Coast

More sand needed

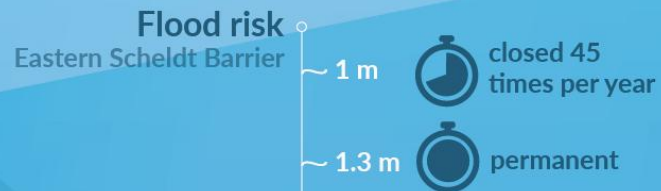
POTENTIAL CONSEQUENCES OF ACCELERATED SEA-LEVEL RISE

Flood protection

Closing frequency of storm surge barriers

Design levels exceed 1:10 years (1.2 m)

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POTENTIAL CONSEQUENCES OF ACCELERATED SEA-LEVEL RISE

Flood protection Increase pump capacity



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POTENTIAL CONSEQUENCES OF ACCELERATED SEA-LEVEL RISE

Fresh water supply Increased demand & reduced availability

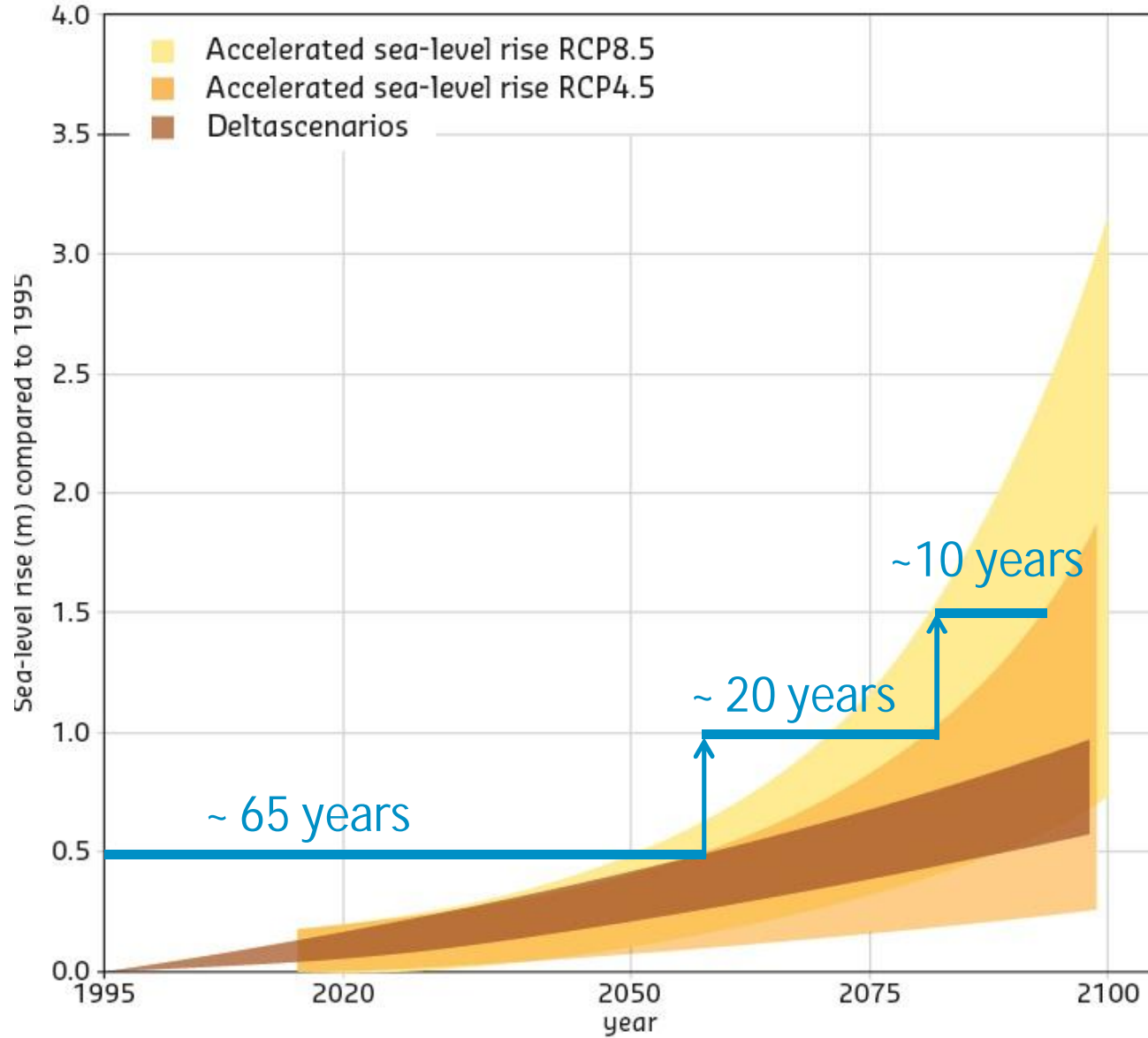
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Drought risk

Increase water demand
to lake IJssel



At 1m:
permanent alternative
needed for supply
route via Gouda



Functional life time of investments decreases:
adapt faster or larger



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*Thank you for
your attention!*

Coastal erosion in Ireland (<http://aqua-monitor.appspot.com/?datasets=shoreline>)

