Deltares
Enabling Delta Life

Towards adaptation measures for current and future drought and water scarcity in the Netherlands

Deltaprogram Fresh Water Supply

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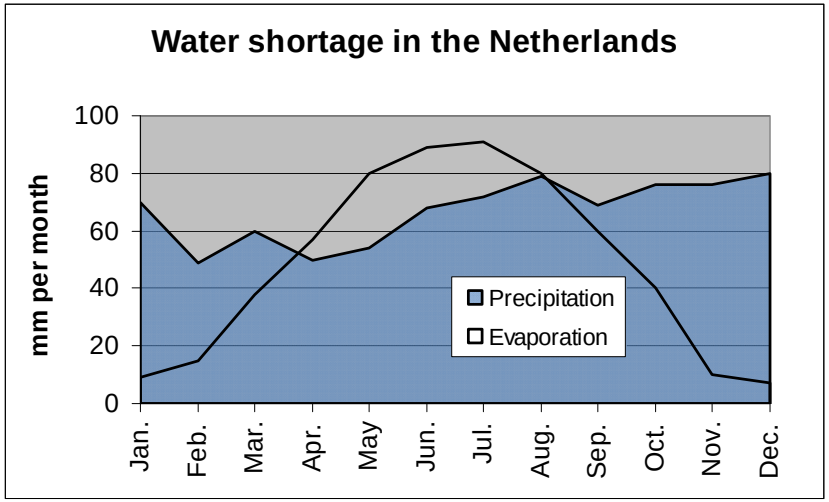
Water scarcity in a low-lying country like?

- In the current situation:
  - drought occurs in extreme dry years (’76, ‘03)
  - scarcity is little

- For the Future this is expected to increase and become more frequent due to:
  - climate change
  - sea level rise
  - socio-economic developments



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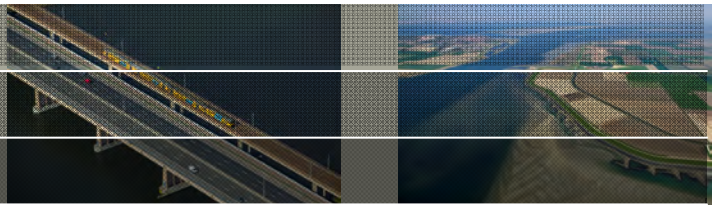
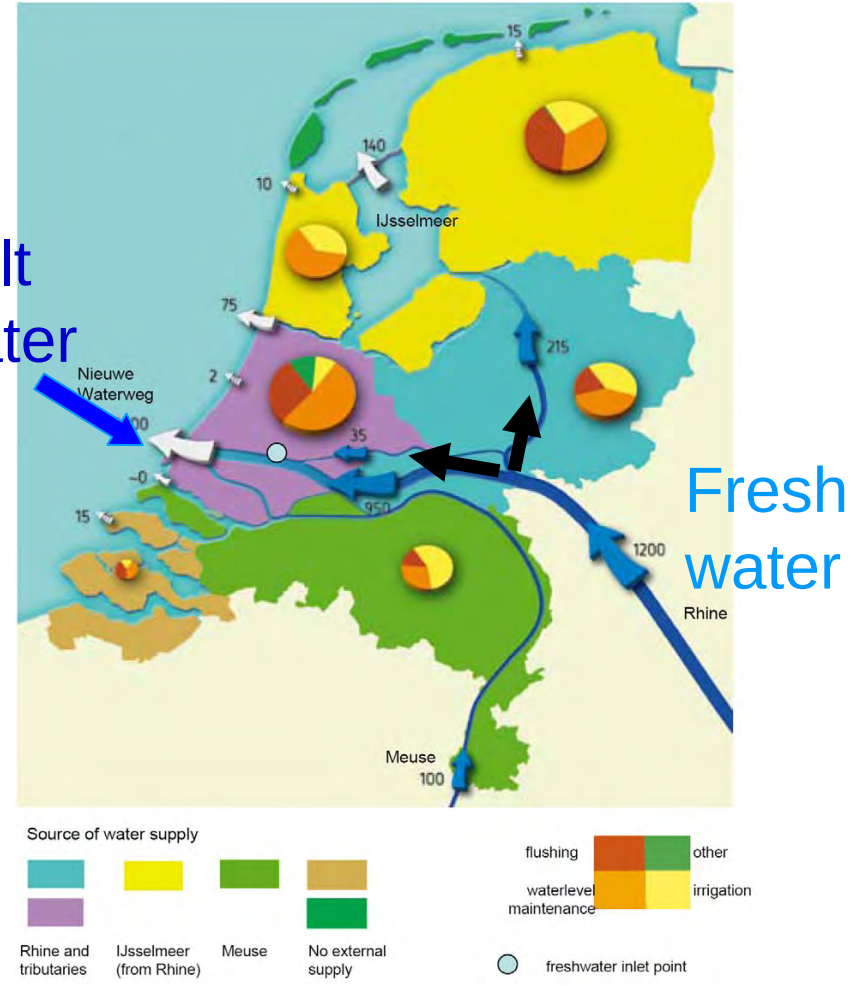
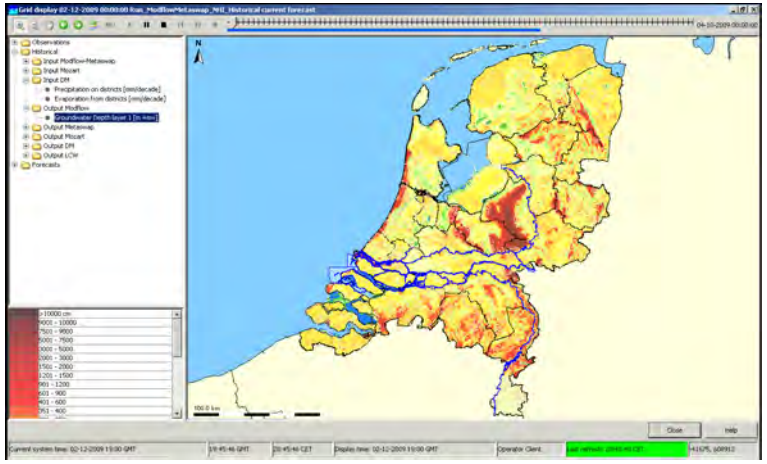
Present policy arrangement





- Physical system of redirecting and distributing water
- Set of voluntary water agreements between neighbouring water managers
- Set of administrative rules for rationing in the case of acute water scarcity
- Drought early warning system



Distribution of river water (m3/s) over the national system and supply to the regional system.
This is the situation in the summer of a dry year (approx 1:10 – 1:15 years).

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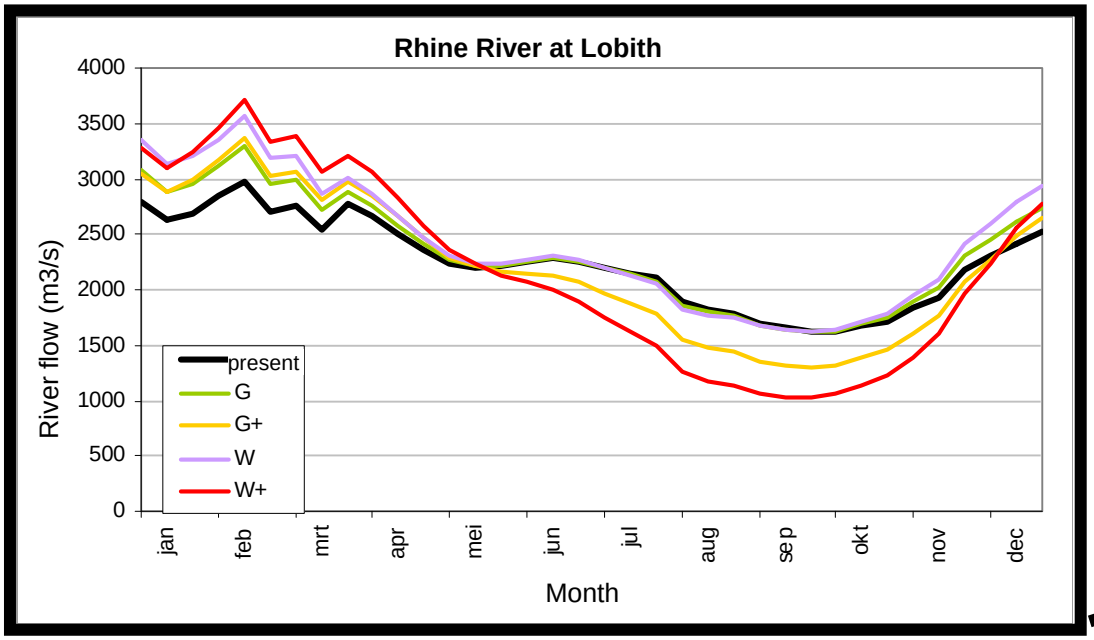
River flow changes…



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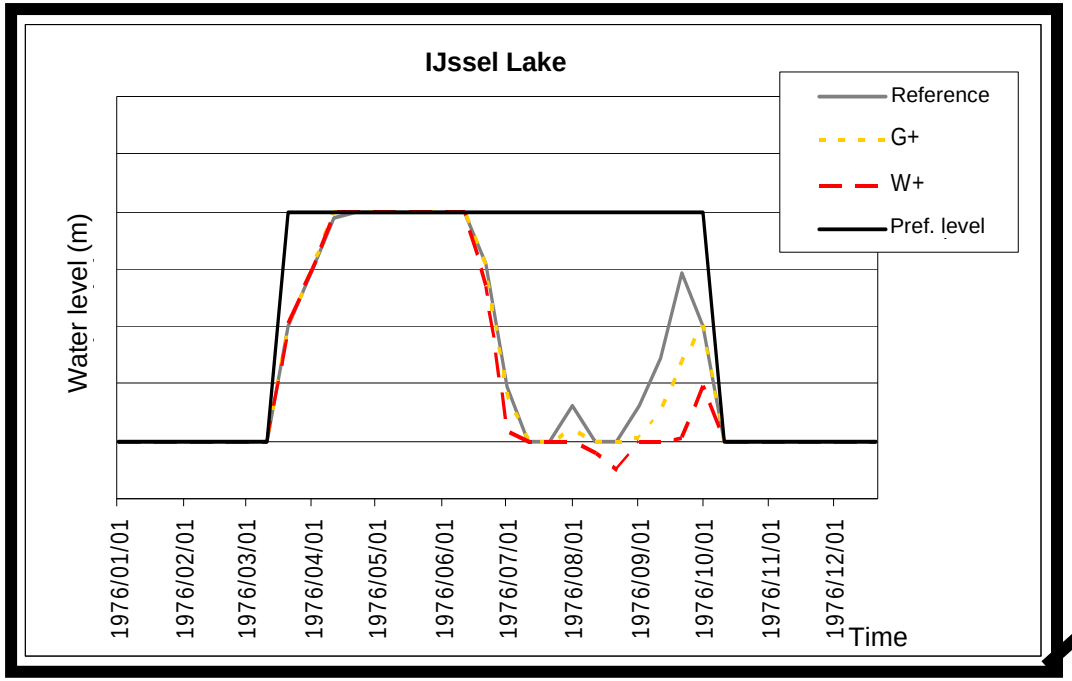
Storage not sufficient…



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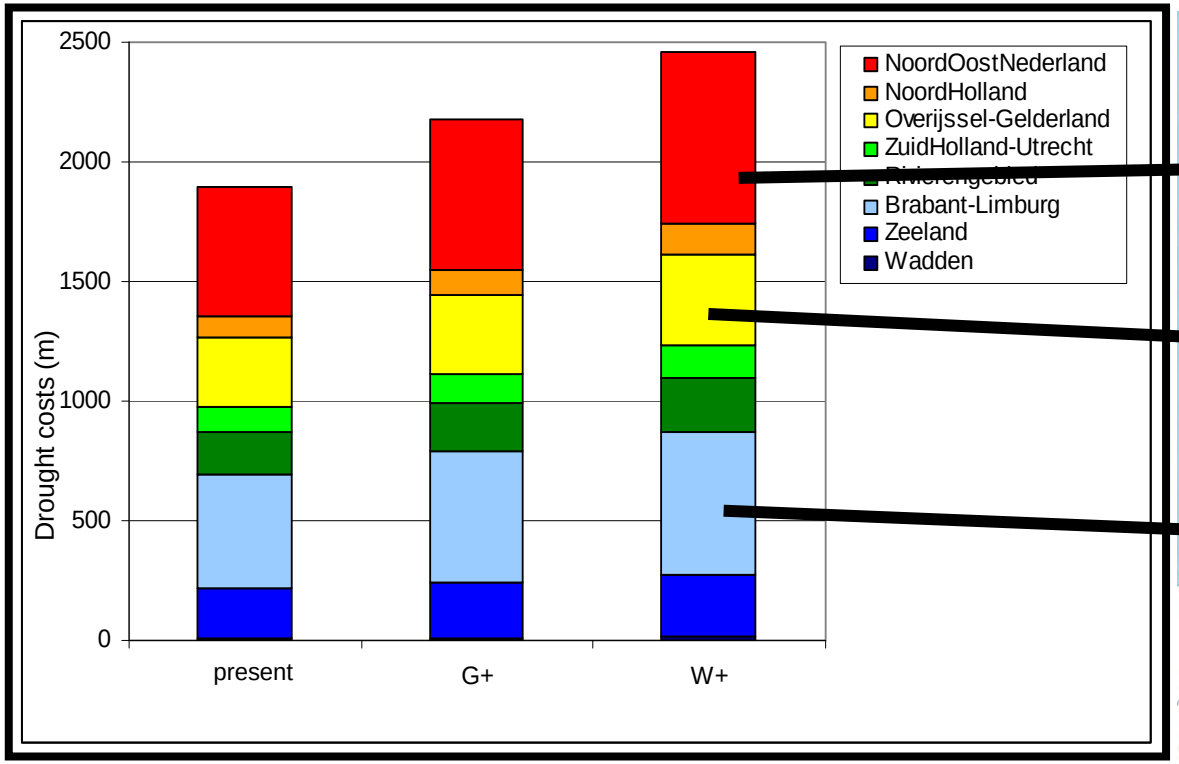
Higher costs…



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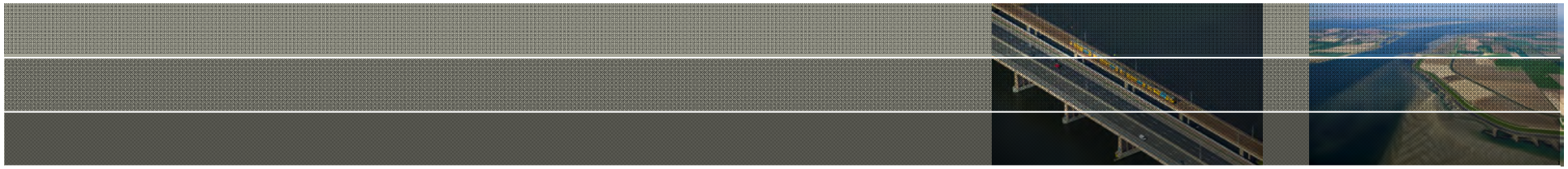
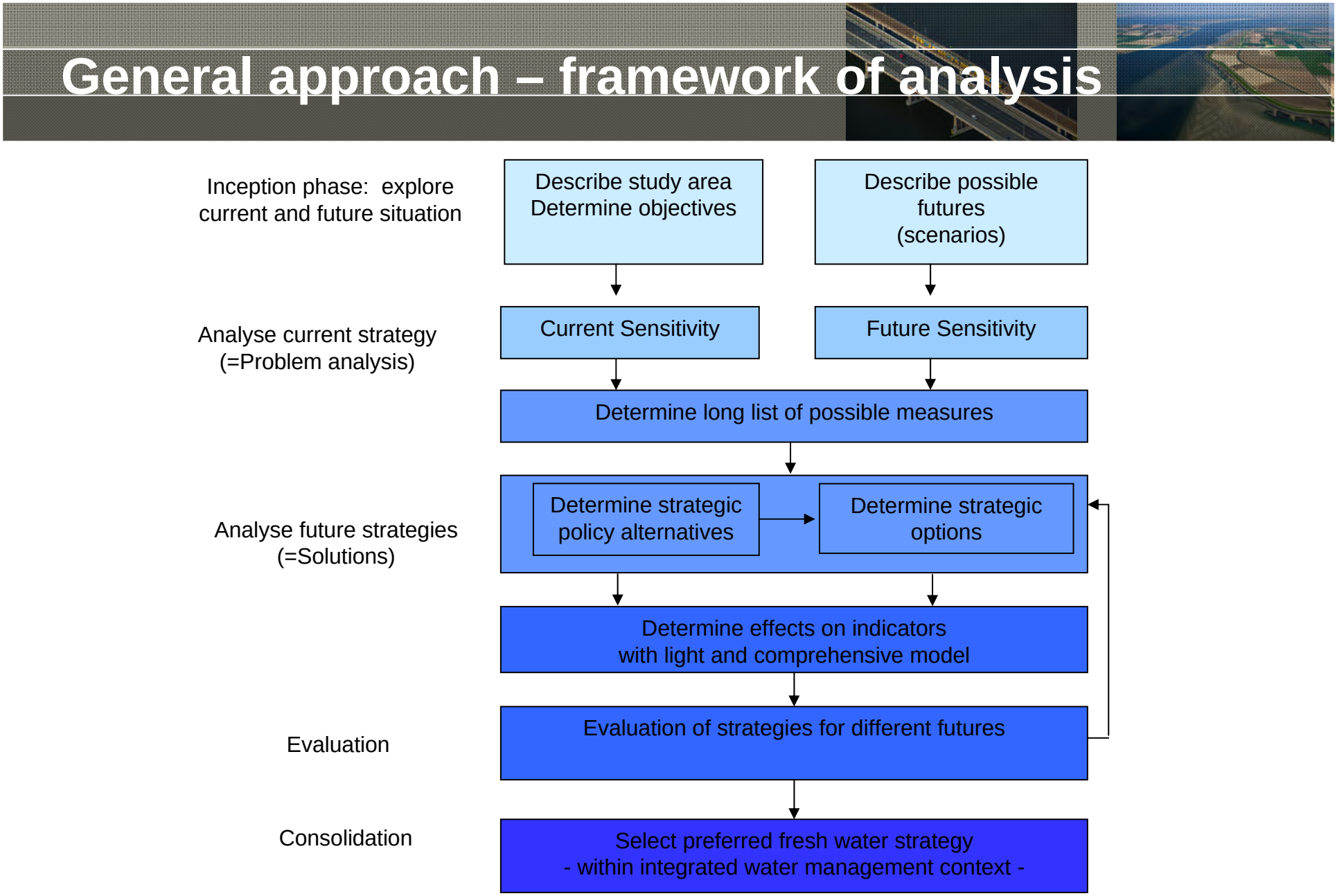


Given the uncertainties about the future, which sustainable strategies can we identify?*

* A sustainable strategy is 1) robust which means it is effective for people, profit, planet under different possible futures; and/or 2) flexible to adapt

General approach – framework of analysis



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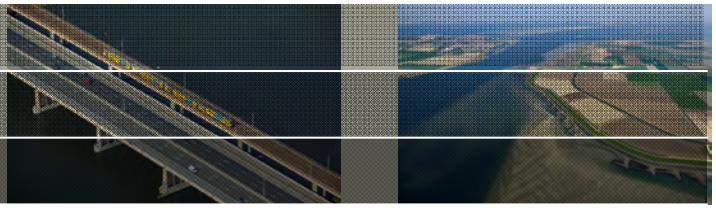
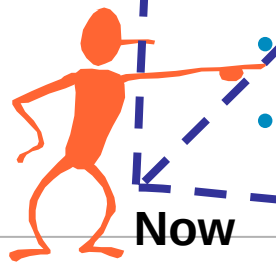
Future scenarios



Scenarios describe possible futures that the water manager cannot control

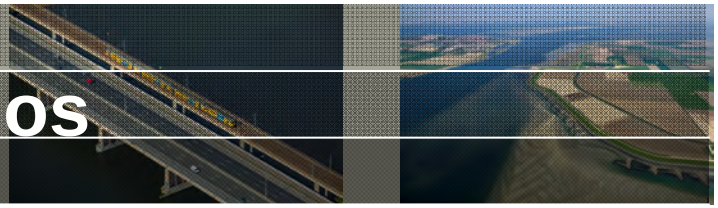
Future

- Basic set: plausible scenarios including:
  - Climate change and
  - Socio-economic development
  - Translated to water availability and water demand
  - Consistent relevant storylines will be defined based on perspective method
- "Small change, large impact" scenarios
  - Sensitivity analyses for extreme dry conditions
  - Events National Committee Watermanagement (LCW)



Now

Policy alternatives vs. scenarios



External context scenario

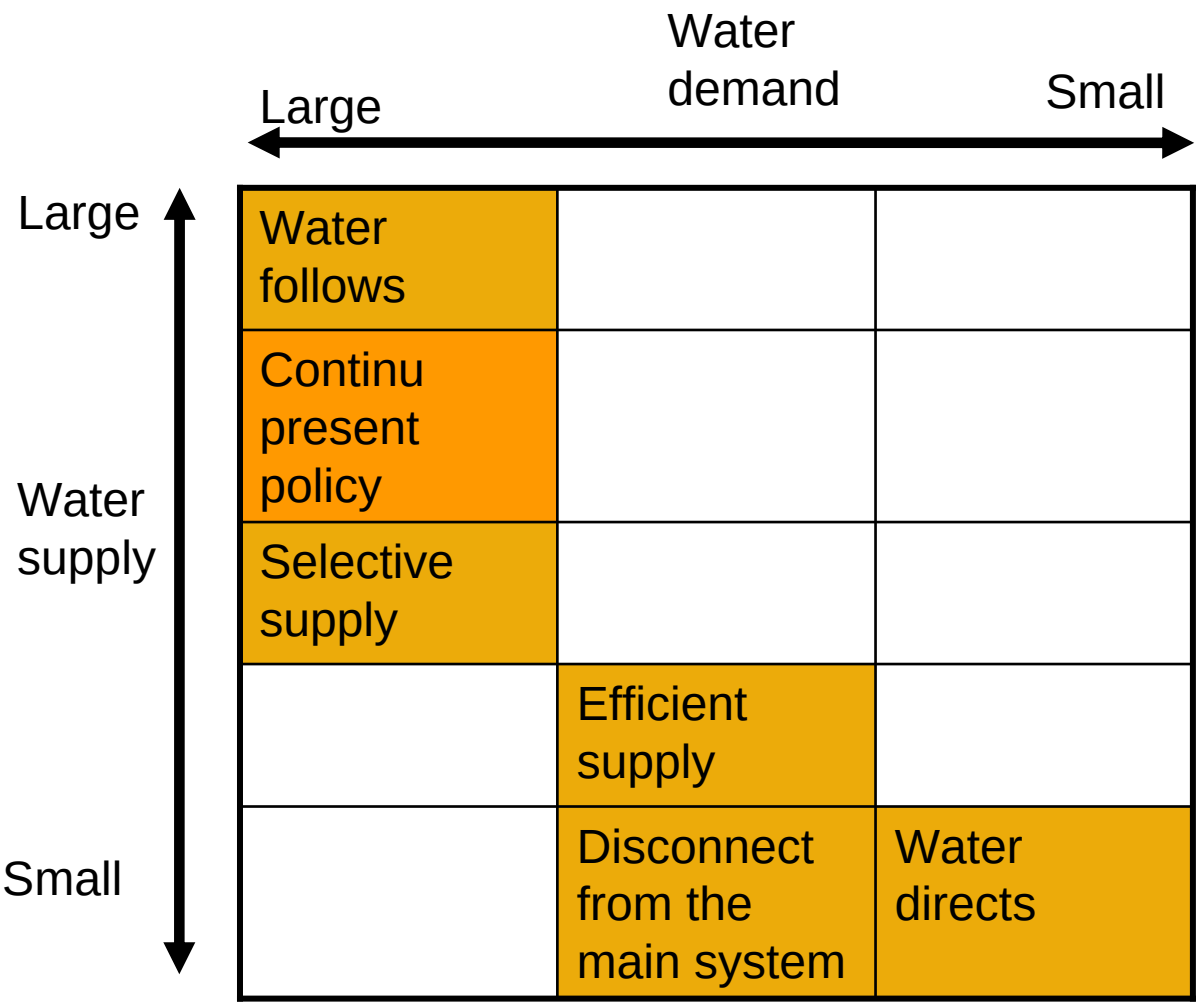
Policy alternative	A	B	C
More supply	+	-	-
Self reliance	+	+	+
Current policy	-	-	-

Policy alternatives to address plausible scenarios

Strategic policy alternatives

Policy alternative:
coherent consistent set of measures and policy instruments

Guiding principles
in order to explore (and be objective and unbiased as possible) the range of possible solutions



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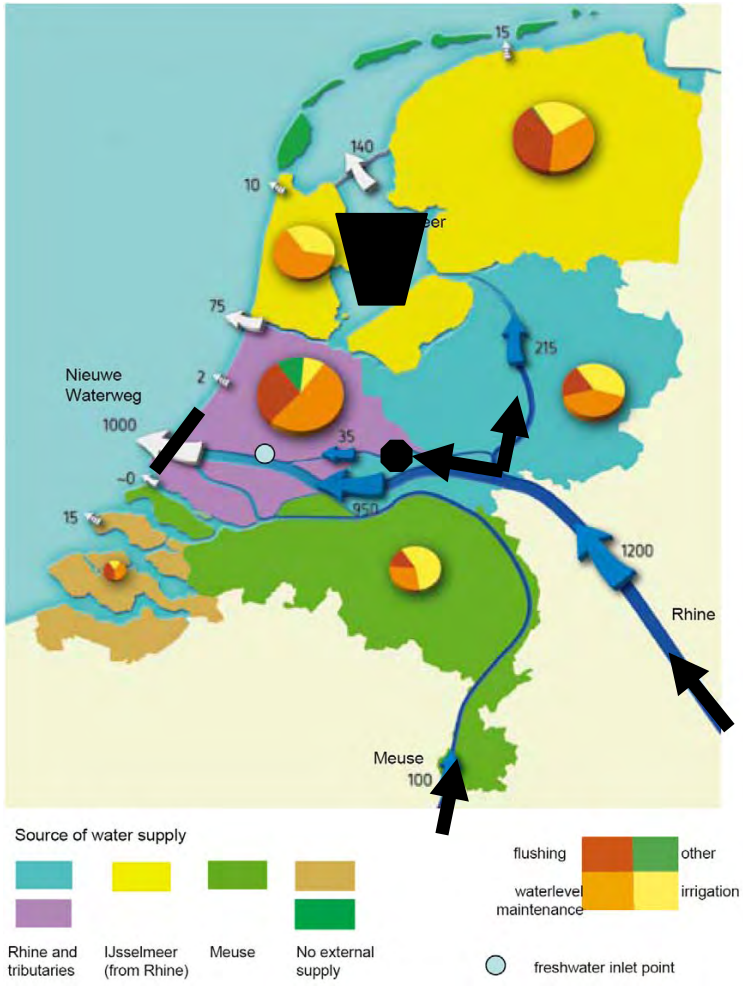
Fresh water supply in the future? > SUPPLY?



Optimization availability and distribution:

- Reduce saltwater intrusion via Nieuwe Waterweg
- Move fresh water inlets upstream
- Increase the water storage in IJsselmeer
- Change distribution between Rhine branches
- Coordinate water use with upstream countries

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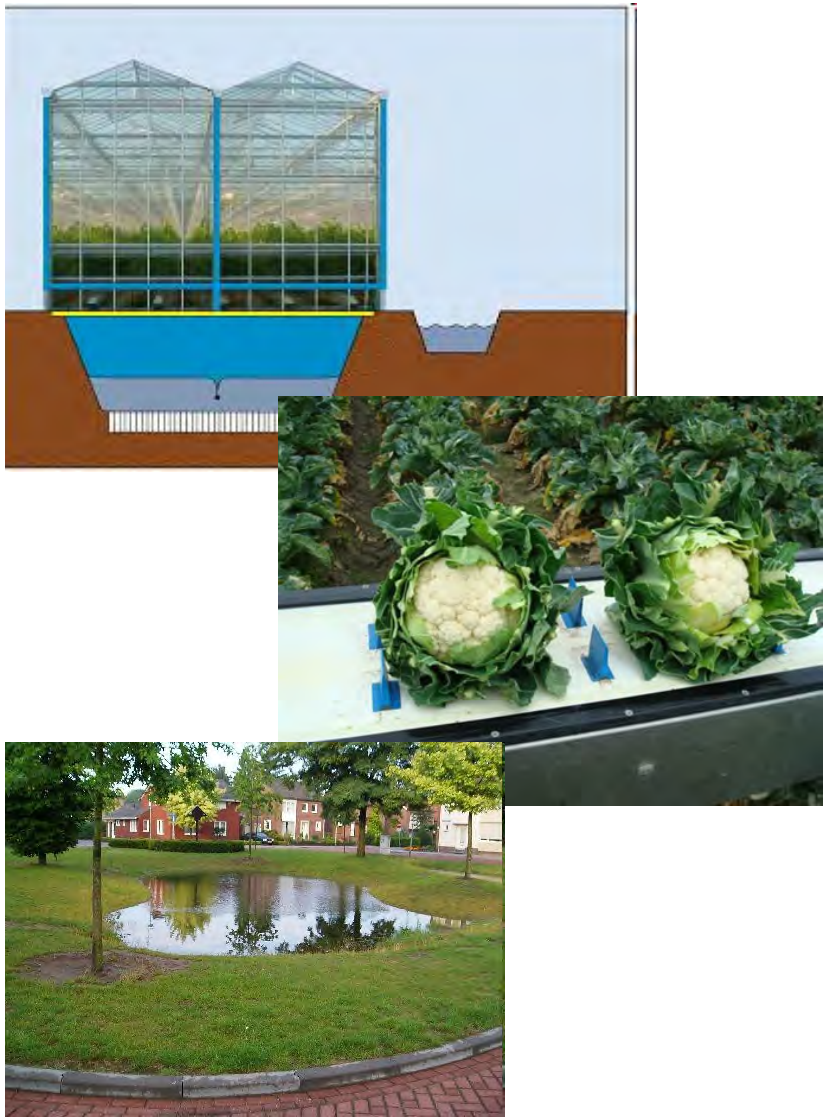
Fresh water supply in the future? < DEMAND?



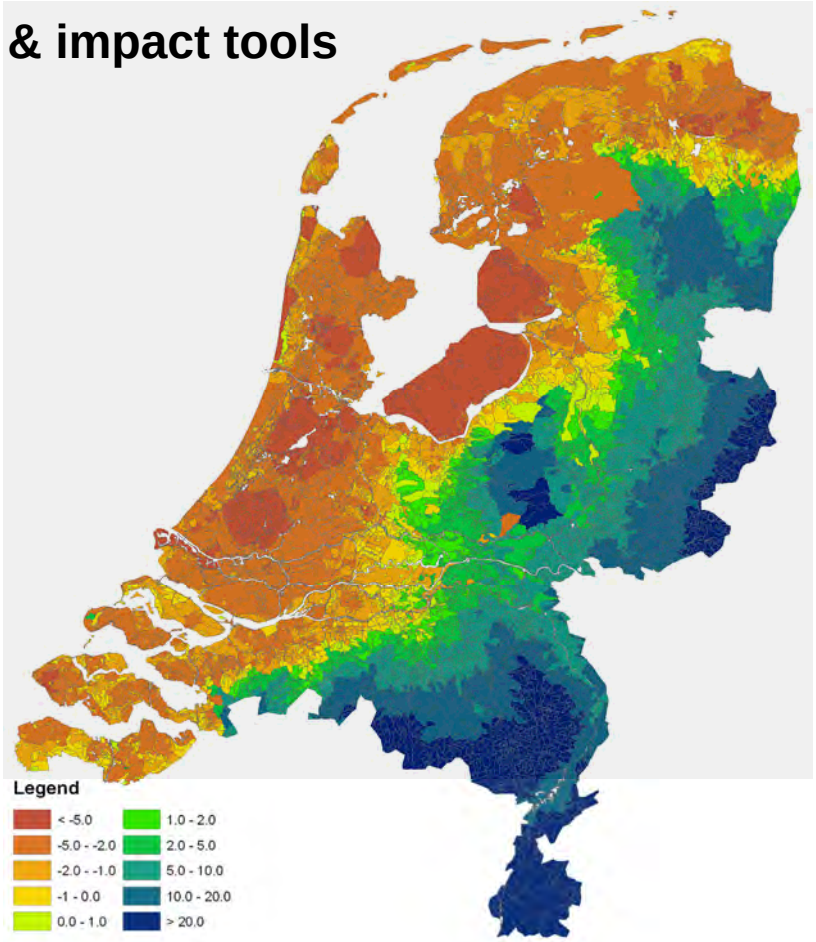
Increase self reliance regional systems:

- Accept water shortage
- More efficiency, re-use and storage in situ
- Changes in crops and crops management
- Stimulate functions on the right location
- Steps priority: 1. retention, 2. storage and 3. export
- Introduce price mechanisms

Modelling Framework

National Hydrological Instrument (NHI) & impact tools

- Complex model
- State-of-the-art coupling of SW and GW models
- Resolution of the groundwater model is 250 by 250 meters.
- 8500 districts
- Computed on daily or decade basis
- Impacts for water related services



See: http://www.nhi.nu

Rapid Assessment Tool

- Light version of NHI
- Tailor made for policy making
- Long time series simulation
- Explore many options to generate a better understanding of the potential of different water supply strategies

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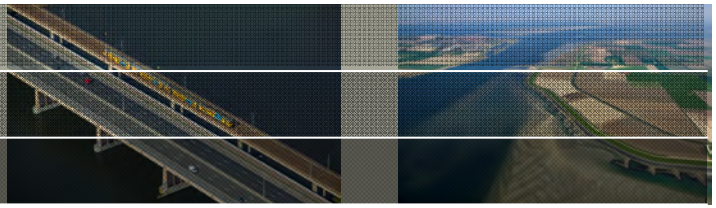
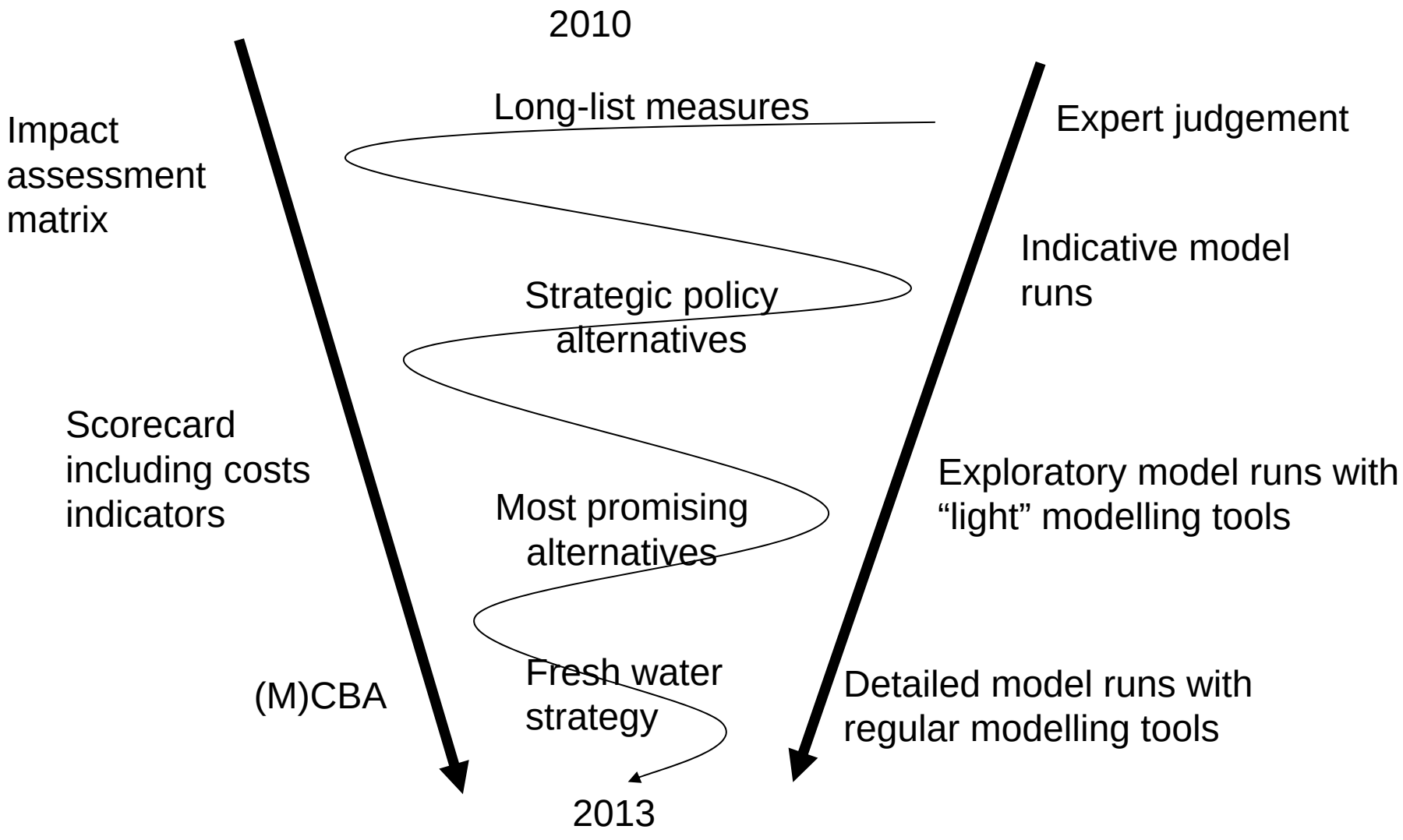
Evaluate policy alternatives (and adjust)

				Scenario (Climate, socio-economic, etc.)		
				Strat.bel. alt. 1	Strat. bel. alt. 2	…
Category	**Theme**	**Criteria**	**Indicator**			
People	Safety, instandhouding, living environment, solidarity,..	Flood risk, reliability of drinking water supply, equity, no transfer to next generation, …	Exceedance flood risks standards, frequency failure drinkwater intake	+	-	+
Planet	Nature, landscape, culture	Main water ways, regional waterbodies, landscape outlook, …	Water level rise in IJssel Lake, biodiversity change,			
Profit	Agriculture, navigation, fishery, recreation, energy supply, etc.	Damage, profit, …	Frequency threshold waterdepth, number of days irrigation..	100	50	120
Dealing with uncertainties	Robustness, flexibility towards scenarios	No regret, resistance, resilience,…	Sensitivity towards scenarios, number of measures also effective within other strategies			
Policy makers	Integration, coherence, fin. resources,..	Financing, administrative boundaries, commitment, …	Costs, number of stakeholders involved, …			

Select fresh water strategy





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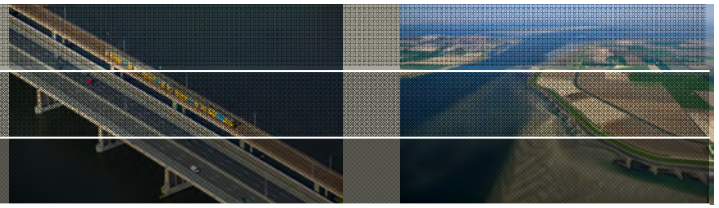
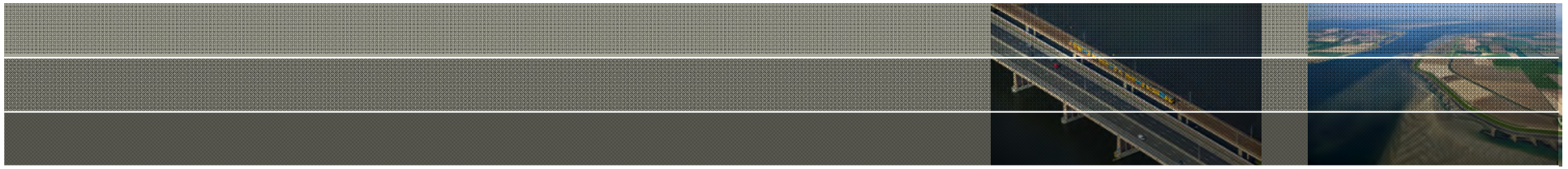
Summary



- To prepare for future droughts and scarcity we explore different futures in terms of climate change and socio-economic developments
- Strategies are developed in consultation with stakeholders.
- We search for a national optimum; guiding principles can differ per region to get the best mix.
- By analysing scenarios with complex hydrological and impact models we define the sustainability of strategies.
- Together with studies on flood management this will be incorporated in IWRM for the Netherlands.



Thank you for your attention

More information?

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Geo.Arnold@rws.nl for a comparative survey of policy arrangements for water scarcity in other countries, with the aim of distilling relevant lessons for the Dutch context