Climate change adaptation tools for the water sector

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Wageningen UR

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Our Approach

- An inventory of available methodologies, methods and tools for assessing climate change impacts, vulnerability and adaptation, including climate-proofing of plans;
- The selection of a framework for structuring and evaluating the methodologies, methods and tools;
- The assessment of opportunities for Dutch methods and tools to assist with adaptation and climate proofing abroad;
- The assessment of opportunities provided by methods, tools and methodologies available abroad for strengthening Dutch adaptation research and policy.

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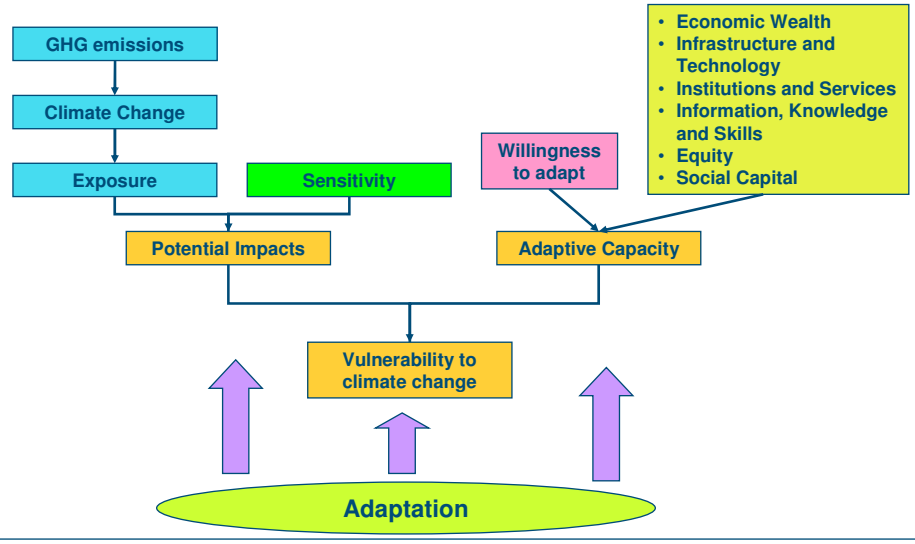
Adaptation framework



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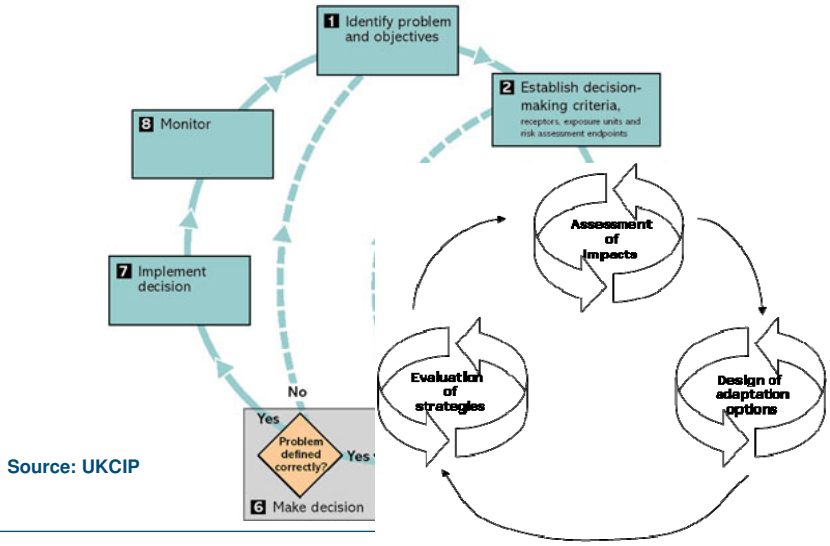
Adapted from EEA

Framework for adaptation



Source: UKCIP

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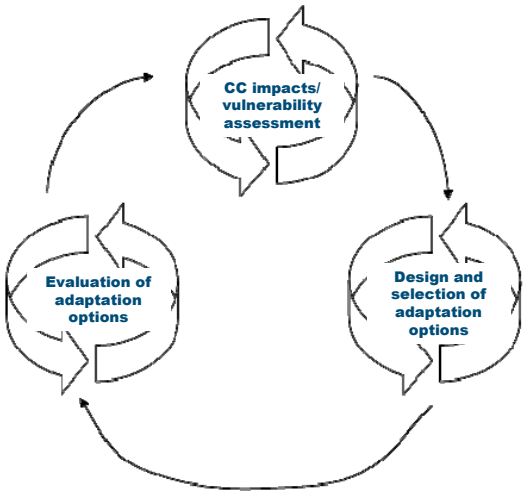
Source: Hasse Goosen/ Bouwstenen NAS

Tools and the adaptation cycle



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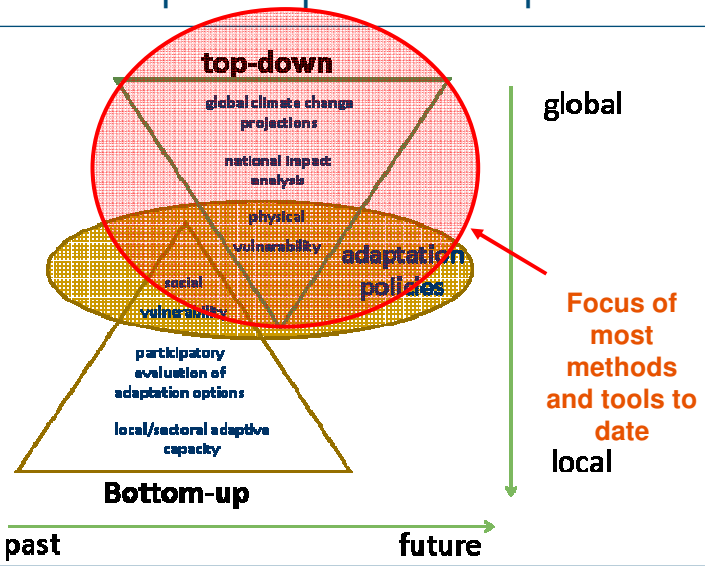
Bottom-up vs Top-down adaptation



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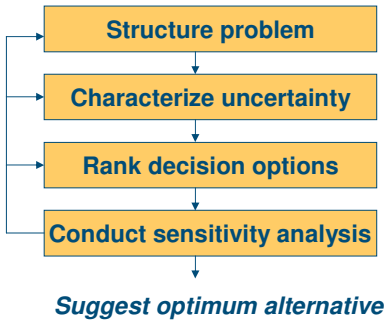
Source: Dessai and Hulme, 2003

How to deal with climate change – top down

- Common practice (inter)nationally - IPCC/EEA/KNMI
- Problem-oriented/climate scenario-oriented
- 'Predict-optimize-act'



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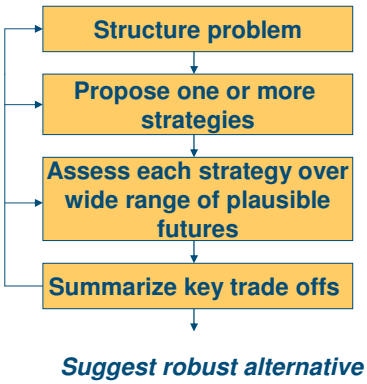
How to deal with climate change - bottom up

- Better connection to regional/local concerns
- Relative new in climate science
  - Thames 2100
  - Tipping points
  - Delta Committee
- Solution-oriented
- 'Assess-risk-of-policy'



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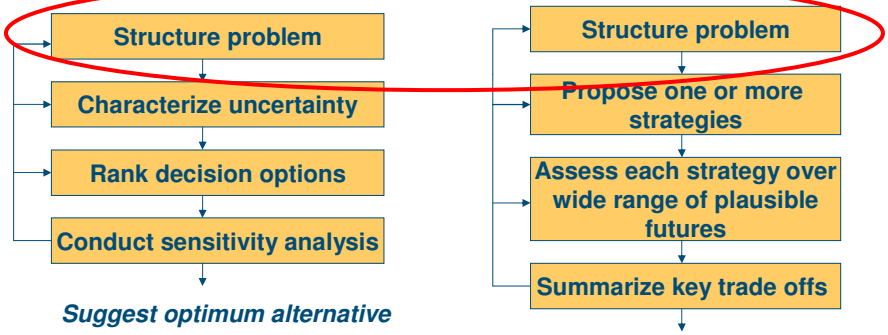
Top-down & bottom-up: complementary approaches

For both the bottom-up and top-down approach a proper impact analyses is very useful to know where and when adaptation is needed



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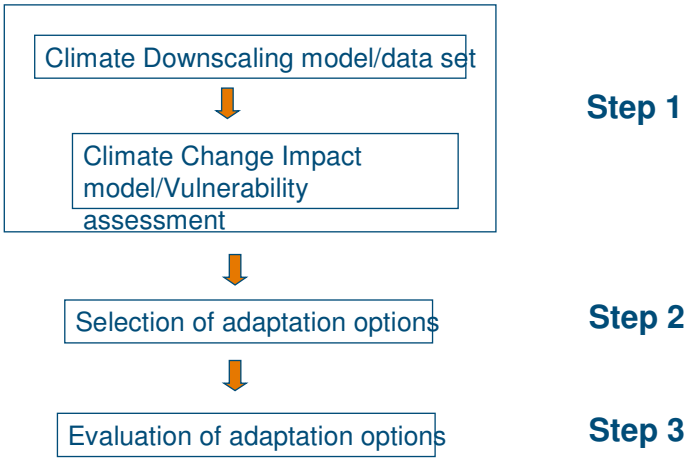
The two approaches may use similar tools, but with different perspectives and different goals

Application of tools in a top–down setting



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Examples of Tools

Climate Downscaling model/data set

Climate Change Impact model/Vulnerability assessment

Selection of adaptation options

Evaluation of adaptation options

Regional Climate Models
- REMO
- PRECIS
- RACMO

Data Sets
- WikiAdapt Climate Change Explorer
- Ensembles data set

Hydrological/Hydraulic models
- Sobek
- Lisflood
- VIC
- WEAP
- Mike

Agricultural Models
- Apsim

A combination of downscaling tool with impact model can be developed from many applications. To do this, considerable know how and funding is necessary – same tools can sometimes be used to evaluate technical adaptation

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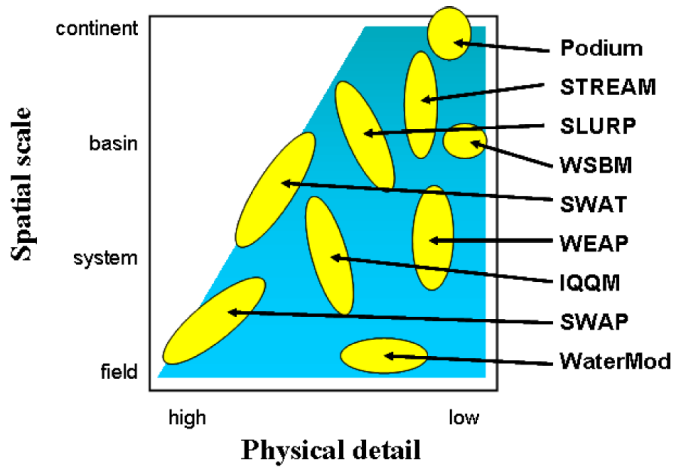
Different tools for different scales



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Source: Peter Droogers

Examples of Tools Step 1

Climate Downscaling model/data set

↓

Climate Change Impact model/Vulnerability assessment

↓

Selection of adaptation options

↓

Evaluation of adaptation options

→

Multisectoral / visualization / Integration tools
- Klimaatatlas
- SIMCLIM
- CIAM
- RegIS

These tools integrate climate and impact models. They are less flexible in term of scenario building. They tend to have good visualization tools which make them suitable to bridge the science-policy gap and use them in stakeholder interaction activities.

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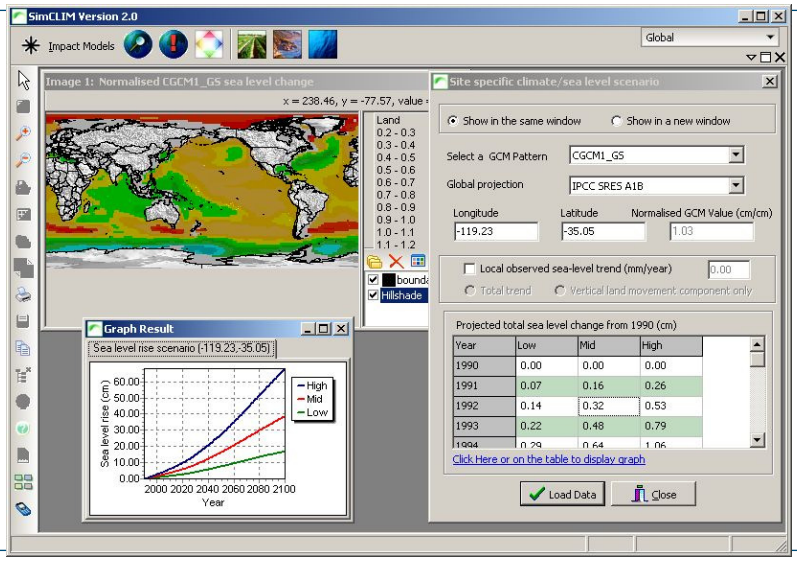
Example integrated tool: Sim Clim



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Examples of Tools Step 2

Climate Downscaling model/data set

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Climate Change Impact model/Vulnerability assessment

↓

Selection of adaptation options →

↓

Evaluation of adaptation options

Very few tools available for the selection of adaptation options. Only a few databases but little help on selecting which option when & where

Number of tools very limited

- ADAM Digital Compendium Adaptation Catalogue – option database
- The Adaptation Actions database demonstrates how organisations in the UK are adapting to climate change.
- ESPACE - A toolkit for delivering water management climate change adaptation through the planning system'
- Touchtable

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Examples of Tools: Step 3

Climate Downscaling model/data set

↓

Climate Change Impact model/Vulnerability assessment

↓

Selection of adaptation options

↓

Evaluation of adaptation options →

In most cases CBA are done to evaluate/compare the different adaptation options. At the individual business/farm level optimization models can be used. Some impact models can be used to evaluate the effectiveness of technical adaptation options – dikes/levees, drains, dams, some land use changes

Cost – Benefit Analyses

- ClimateCost
- Calvin

Optimization Models

- FARM-Adapt
- Berg River Spatial equilibrium model –

Water/Agricultural models

- WEAP
- VIC
- MIKE models
- APSIM

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Examples of Integrated Tools Steps 1-3

Climate Downscaling model/data set

↓

Climate Change Impact model/Vulnerability assessment

↓

Selection of adaptation options

↓

Evaluation of adaptation options

Adaptation guidelines

- UKCIP – Adaptation Wizard
- NordRegio, 'Climate Change Emergencies and European Municipalities: Guidelines for Adaptation and Response
- The Australian Government's Climate Change Impacts & Risk Management Guide for Business and Government
- Klimaatwijzer

These kind of guidelines are a useful as a first step and there might be an opportunity to develop these kind of guidelines for delta regions.

They can also be useful to introduce, provide a guidence for other tools (*e,g,* UKCIP)

However for the implementation of an effective adaptation strategy other tools will almost always be necessary.

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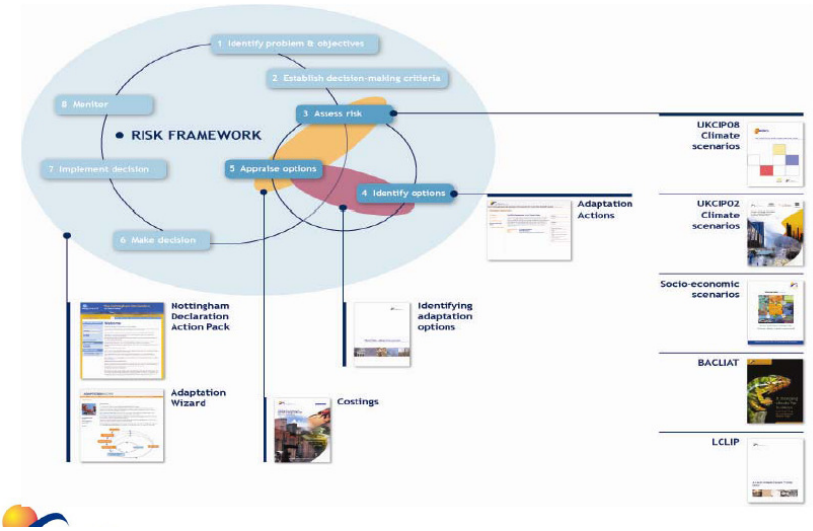
Tools in the UKCIP risk framework



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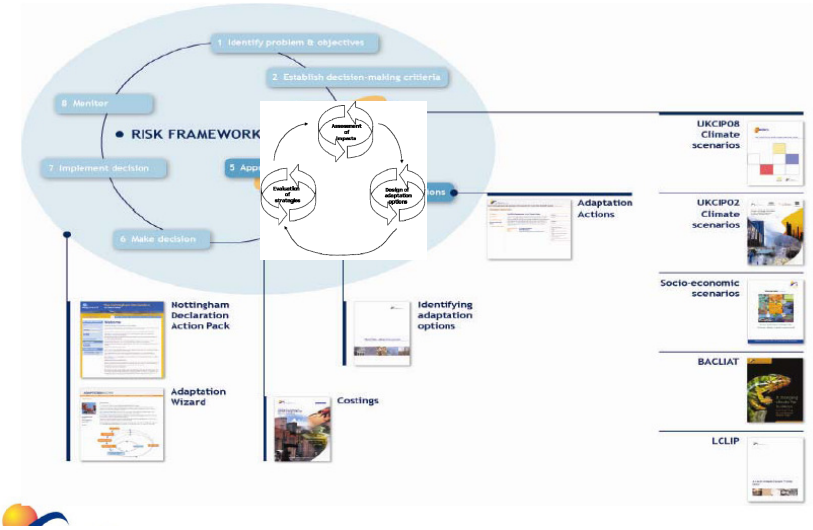
http://www.ukcip.org.uk/index.php?option=com_content&task=view&id=406&Itemid=448

Tools in the UKCIP risk framework



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http://www.ukcip.org.uk/index.php?option=com_content&task=view&id=406&Itemid=448

Key findings

- Demand is high: many processes urgently need practical tools (SEA, UNFCCC/NAPAs, Water Mondiaal, EU Adaptation Strategy, OECD etc.)
- Many tools are available, but few are satisfactory for effective climate adaptation policy support by knowledge institutions and the private sector
  - Tools address early stages of policy cycle - impact analysis, not adaptation policy support
  - Tools have been developed for non-climate purposes, e.g. water management
  - Tools have been developed for specific research purposes, not easily transferable for other real-world applications

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Recommendations in relation to developing guidance for “mainstreaming” adaptation

- *Good* climate change scenarios and climate change impact analyses are necessary for both the bottom up and top down approach
  - An initial impact analyses is often a good start for stakeholder interaction (think about climate atlas etc.)
- You need different tools/approaches for different stages in the adaptation/policy cycle – “there is no one size fits all adaptation tool”
- Use the top-down regional/global information to feed in to the bottom decision making process.
- Don’t forget about the opportunities in climate change adaptation – climate change is more than “floods, droughts and disasters”

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