Deltares

Enabling Delta Life

Sustainable Delta

a serious game about
water management under uncertainty

http://deltagame.deltares.nl

Acknowledgements

Deltares
Enabling Delta Life

Sustainable Delta was originally developed by a team from Deltares, University Utrecht, Maastricht University-ICIS, Carthago Consultancy, Pantopicon, KNMI, and University of Twente.

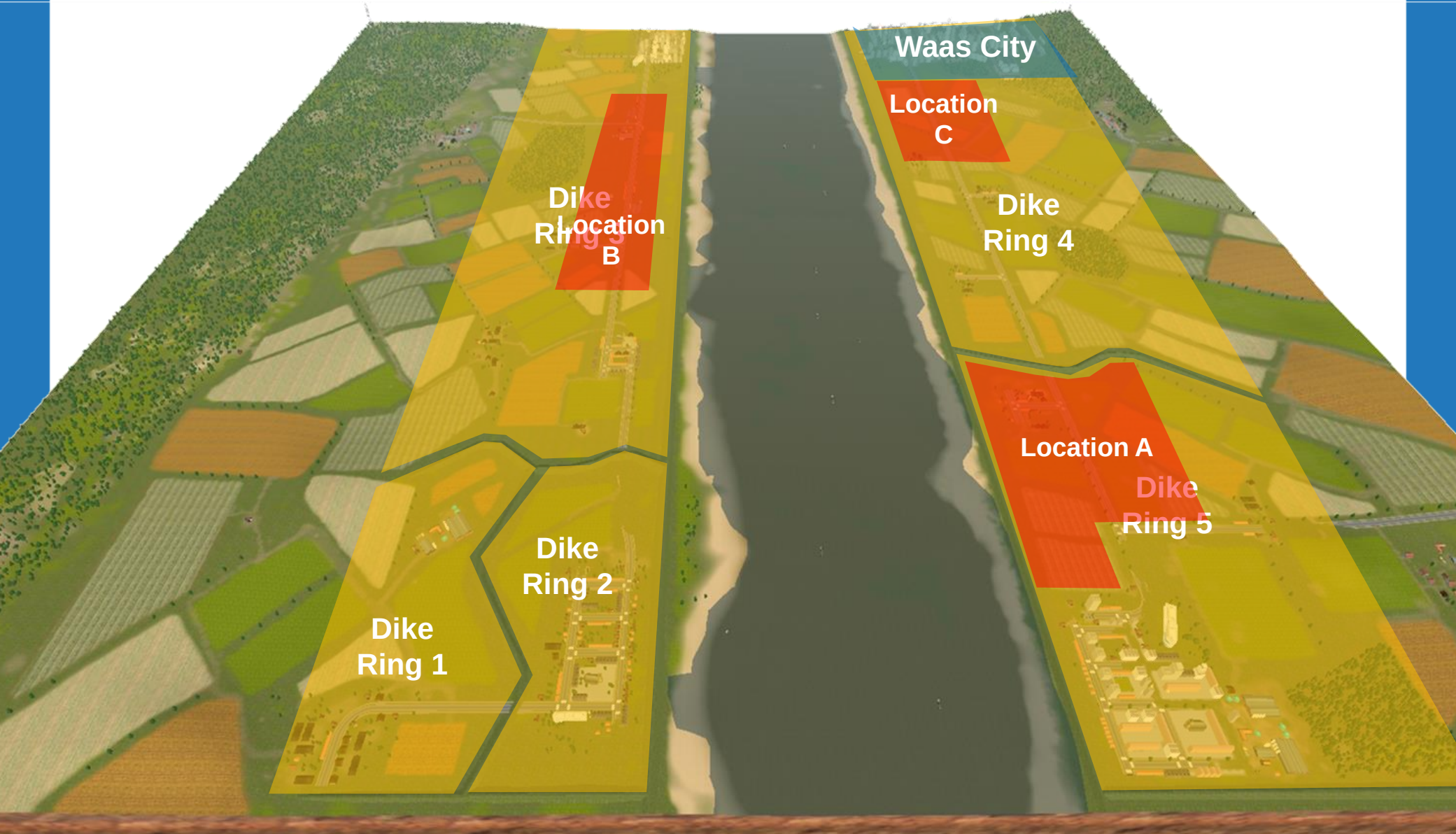
It has been further developed by Deltares, Carthago Consultancy, and the New Zealand Climate Change Research Institute, Victoria University of Wellington.

It has been played over 60 times with water managers, spatial planners, and students during workshops and international conferences all over the world.

Why play the game?

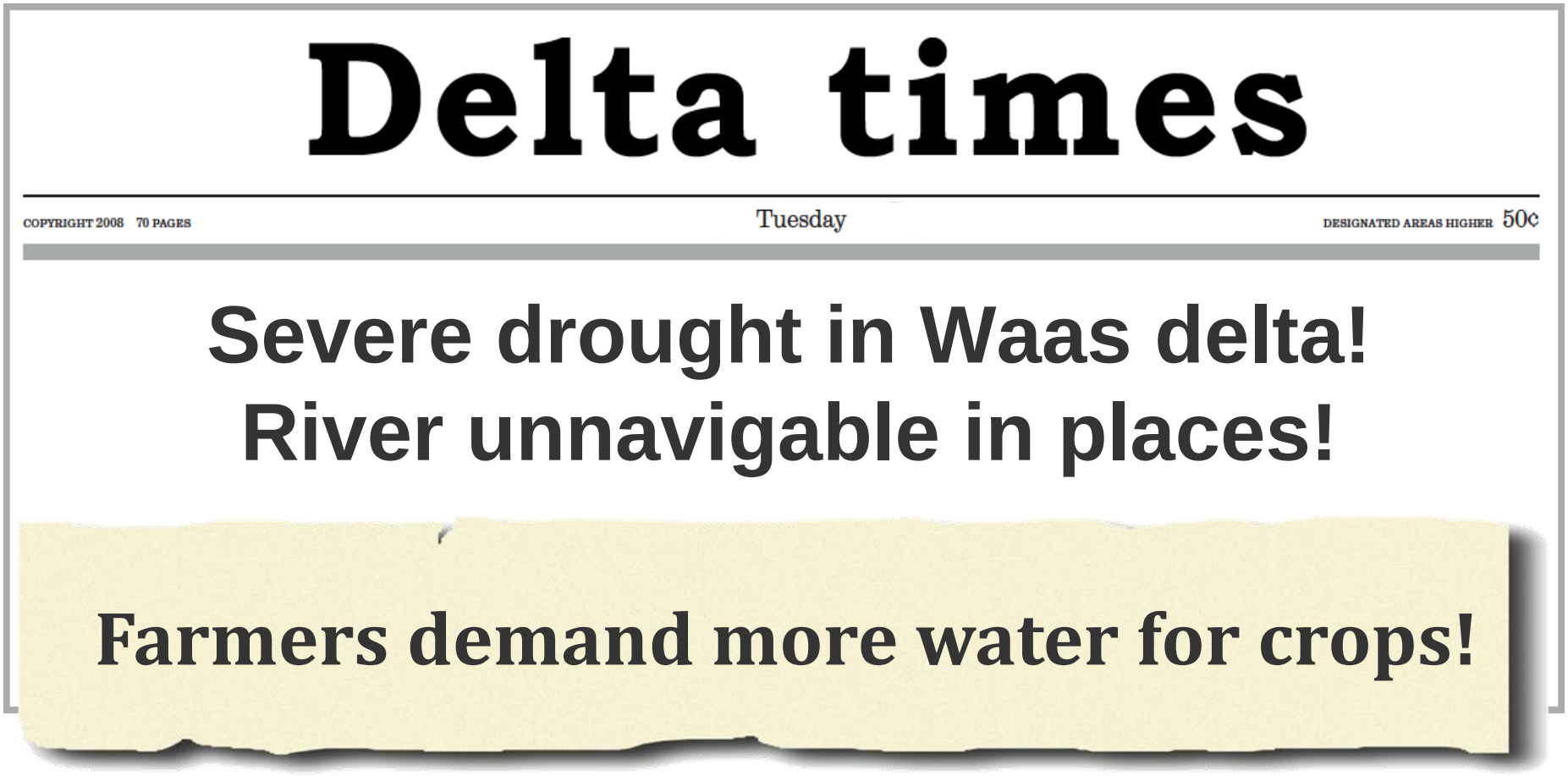
- Experience the future and its uncertainties
- Awareness about adaptive water management
- Awareness of the role of negotiation and collaboration
- Reflect on policy decisions
- Discuss robust and flexible policy actions

Waas River


Waas City
Location C
Dike Ring 4
Dike Ring 3
Location B
Location A
Dike Ring 5
Dike Ring 2
Dike Ring 1

Waas River

15 years ago...



Delta times

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Severe drought in Waas delta!
River unnavigable in places!

Farmers demand more water for crops!

4 years ago…

Delta times

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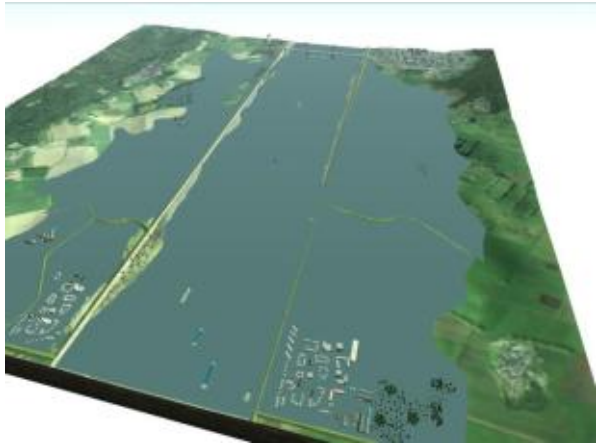
Another flood hits the delta!

Despite all the recent studies and measures, the Waas delta has flooded a second time in 3 years.

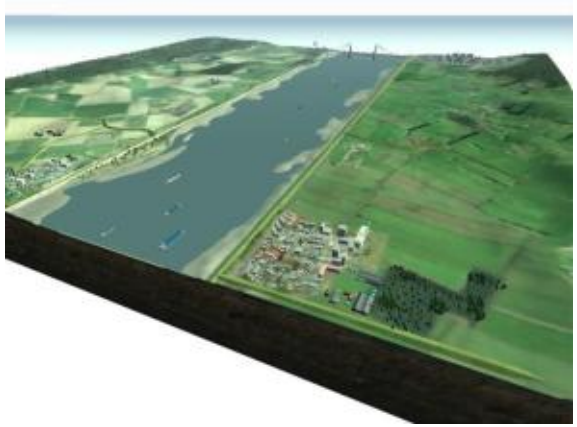
Mayor: This may never happen again!

History

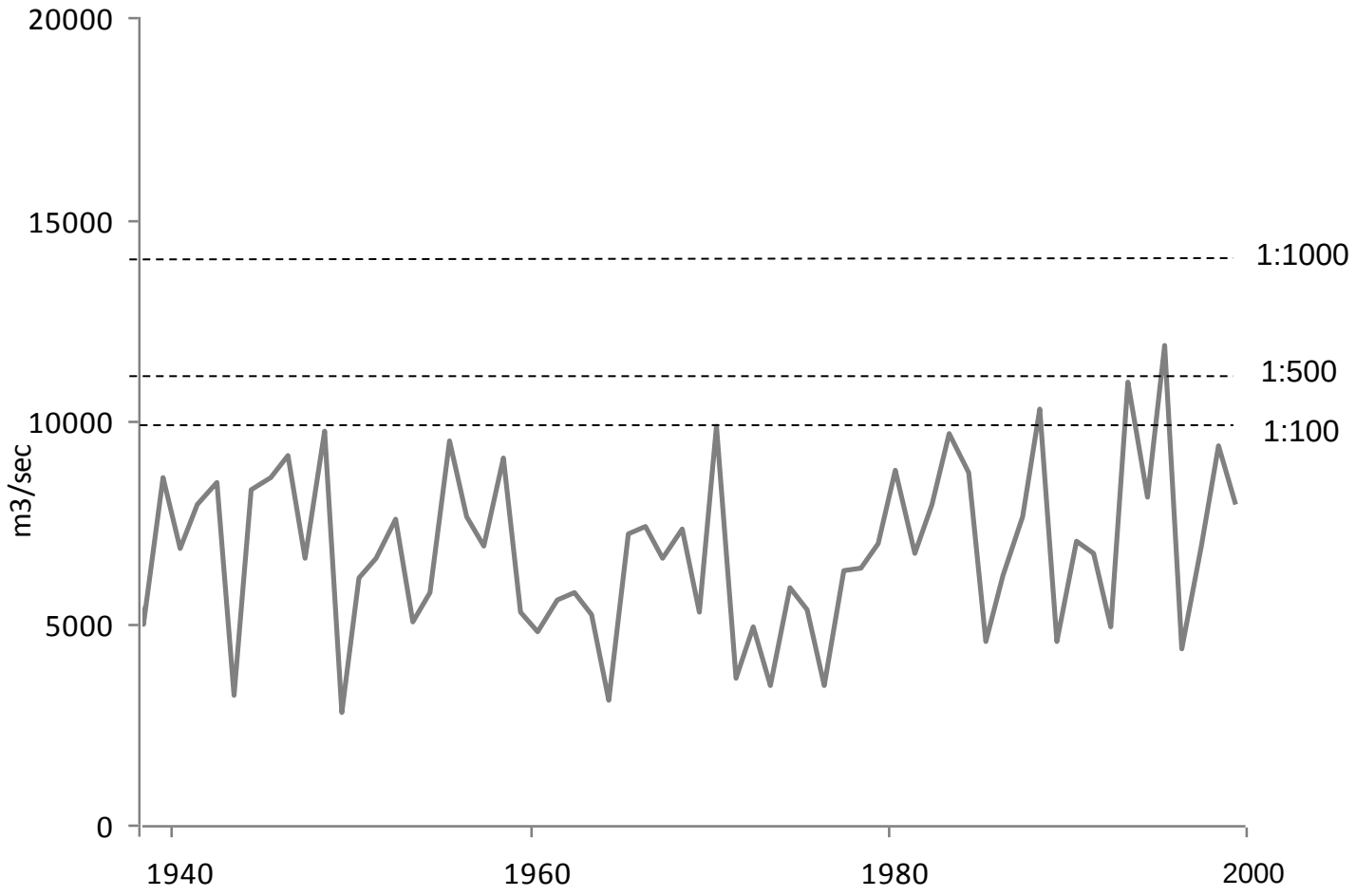
Floods



Droughts



Historical Peak Discharges



In the future…

Climate change?

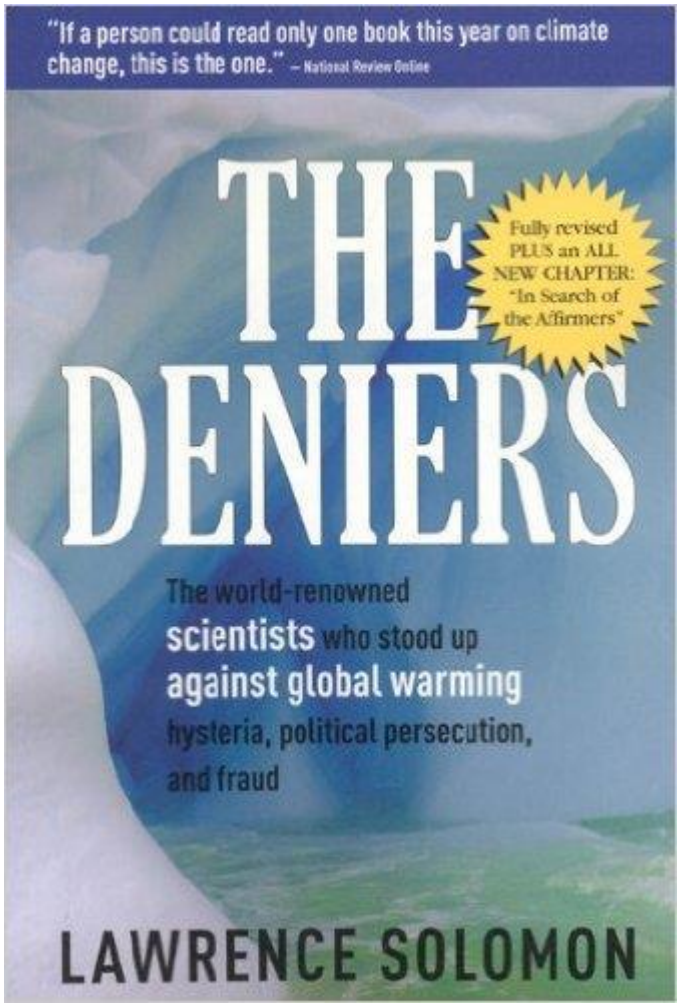
Socio-economic growth?

Climate Change

Bigger peak flows?

Lower summer flows?

Climate Change?



Socio-Economic Change?

Population growth?

Economic growth?

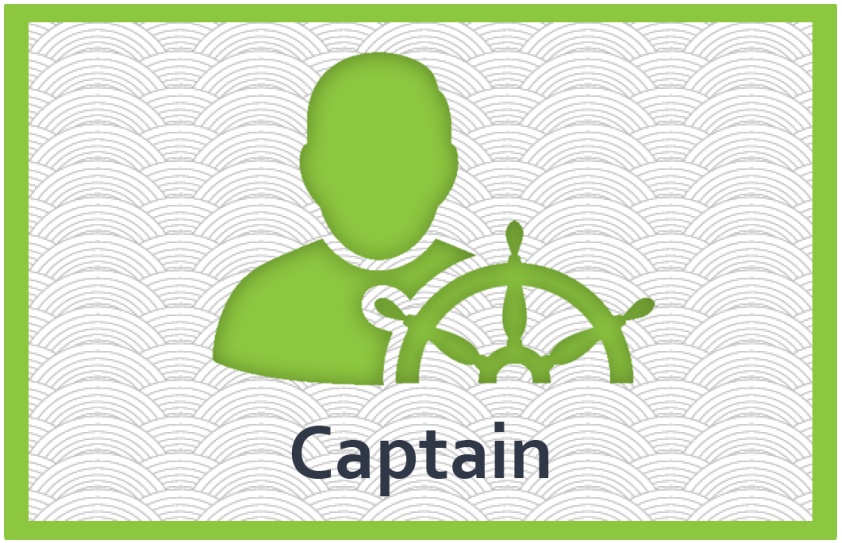
Your role

To develop a sustainable management plan for the Waas area for the next 100 years in the context of an uncertain and changing environment.

- Mitigate flood risks
- Pay attention to navigability
- Pay attention to nature
- Pay attention to community attitudes
- Acknowledge uncertainties

Rules

Two Teams



Game Round

1. Determine team's point of view and strategy
2. Take int
   (Local c
3. Each team chooses maximum two actions
4. Negotiate preferred actions
5. 'Overrule society'

Rapid assessment tool

Implement and simulate

1. Determine team name, point of view and strategy

Team name:

We have chosen
the following measures:

The most important reasons therefore are:

2. Take into account society's point of view

River Times

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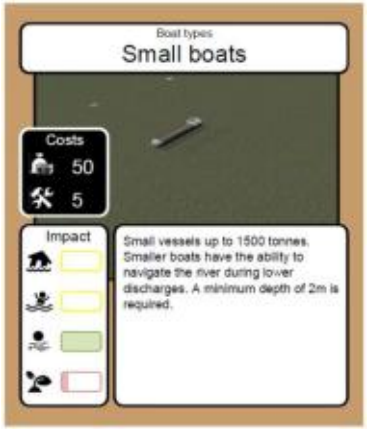
Nature conservation demands land purchase to promote water quality and outdoor recreation

3. Discuss and select <u>two</u> actions only



Card legend

Impact

Flood damage

Casualties

Drought (Navigation)

Nature

Cost

Initial costs

Recurrent costs

No effect

Very small positive effect

Very small negative effect

Small positive effect

Small negative effect

Moderate positive effect

Moderate negative effect

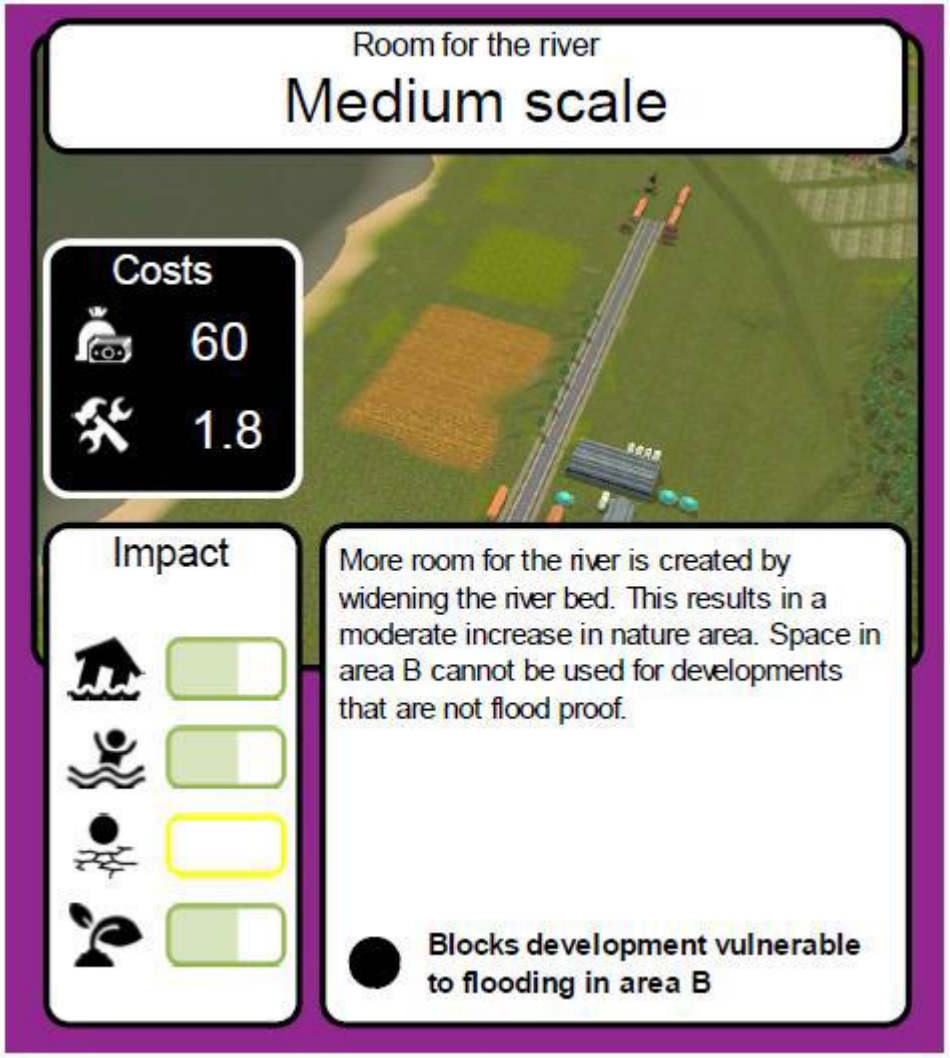
Strong positive effect

Strong negative effect

Very strong positive effect

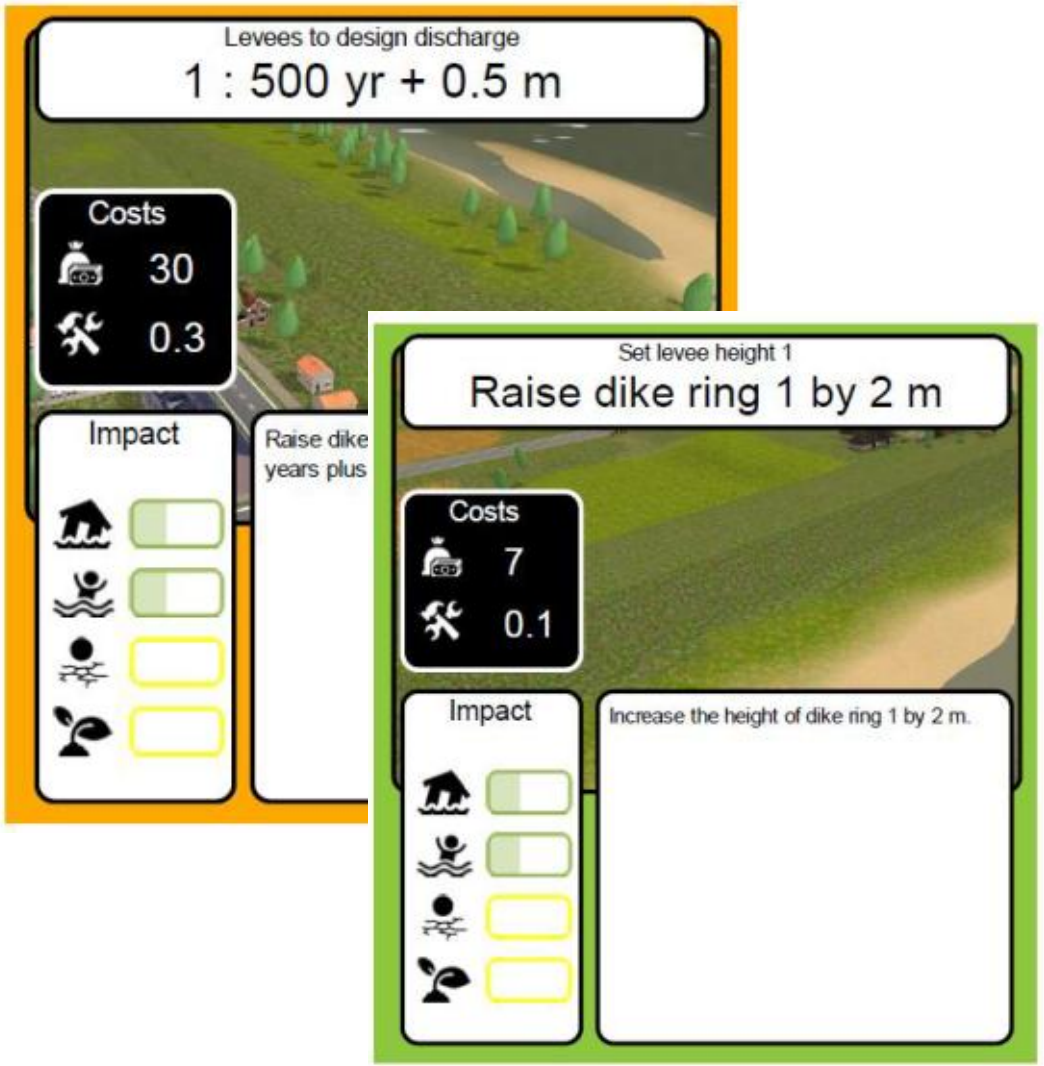
Very strong negative effect

Policy Actions



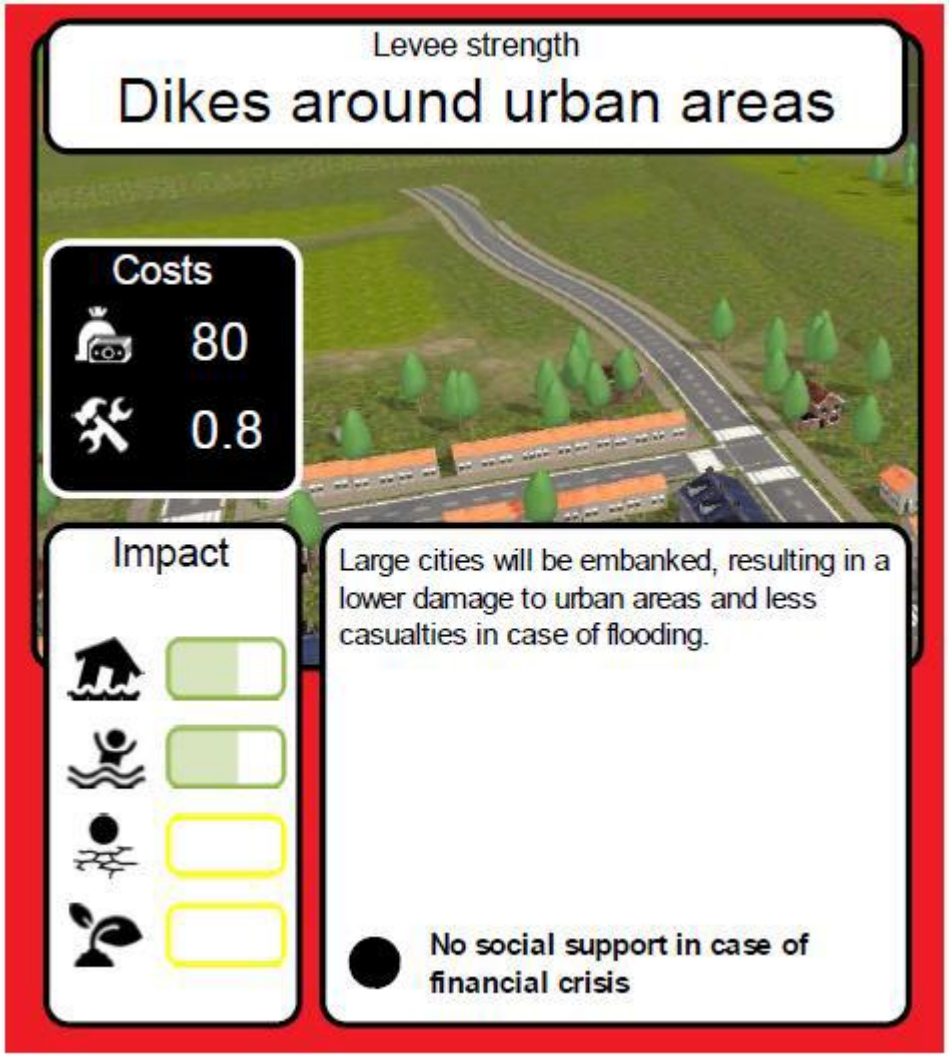
Room for the river

Policy Actions



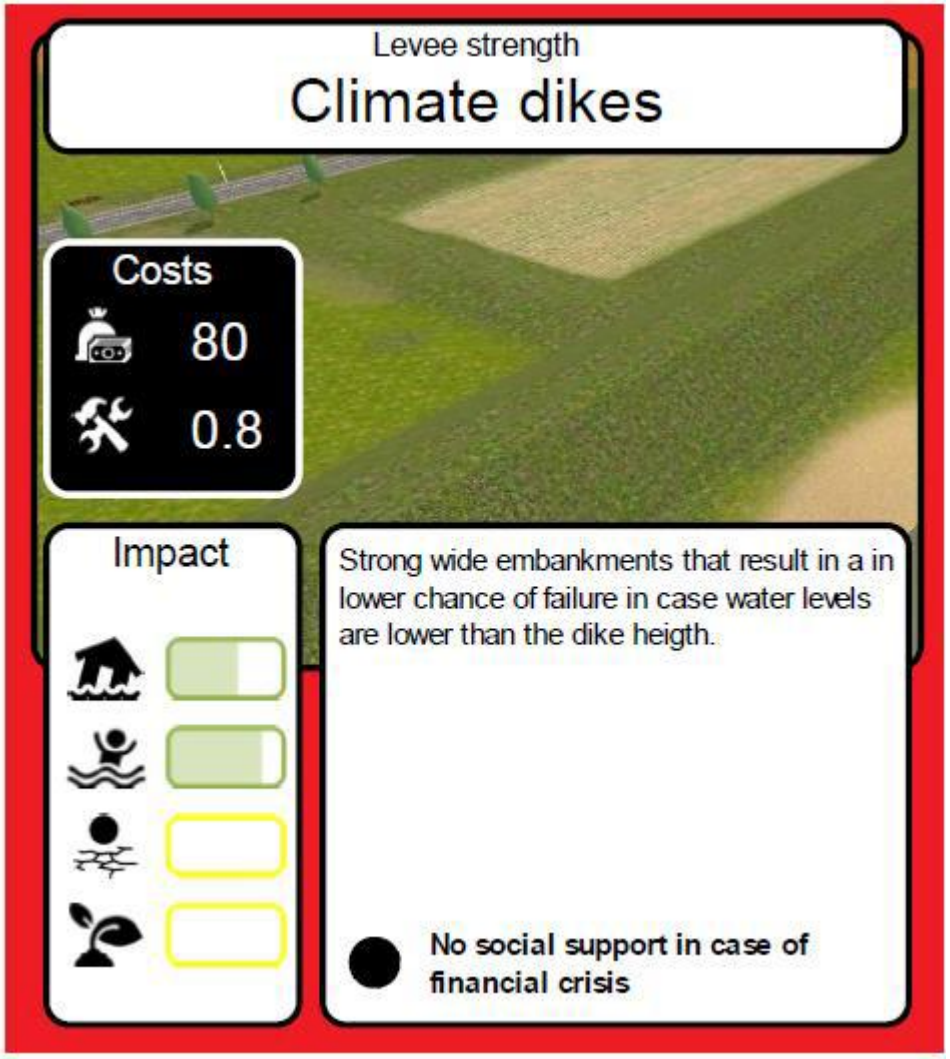
Raise dike levels

Policy Actions



Dikes around urban areas

Policy Actions

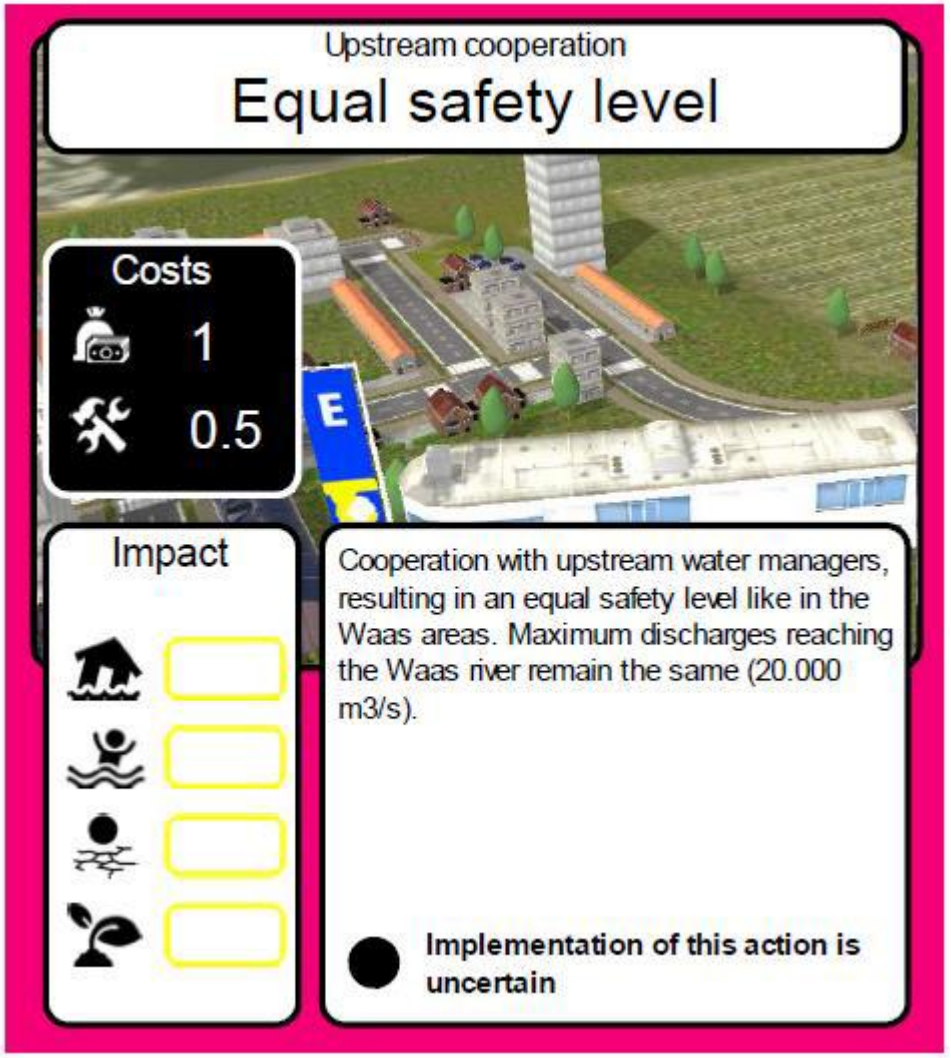


Climate dikes

Policy Actions

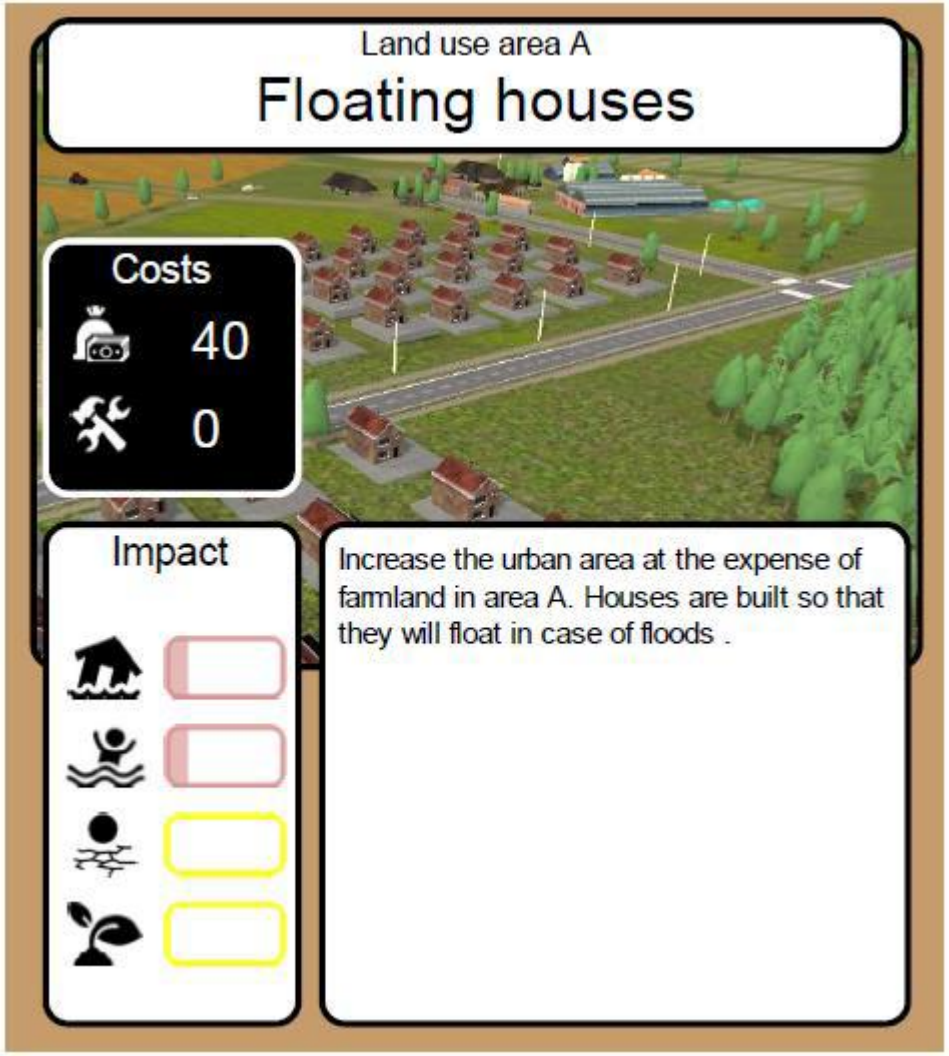
Evacuation training

Policy Actions

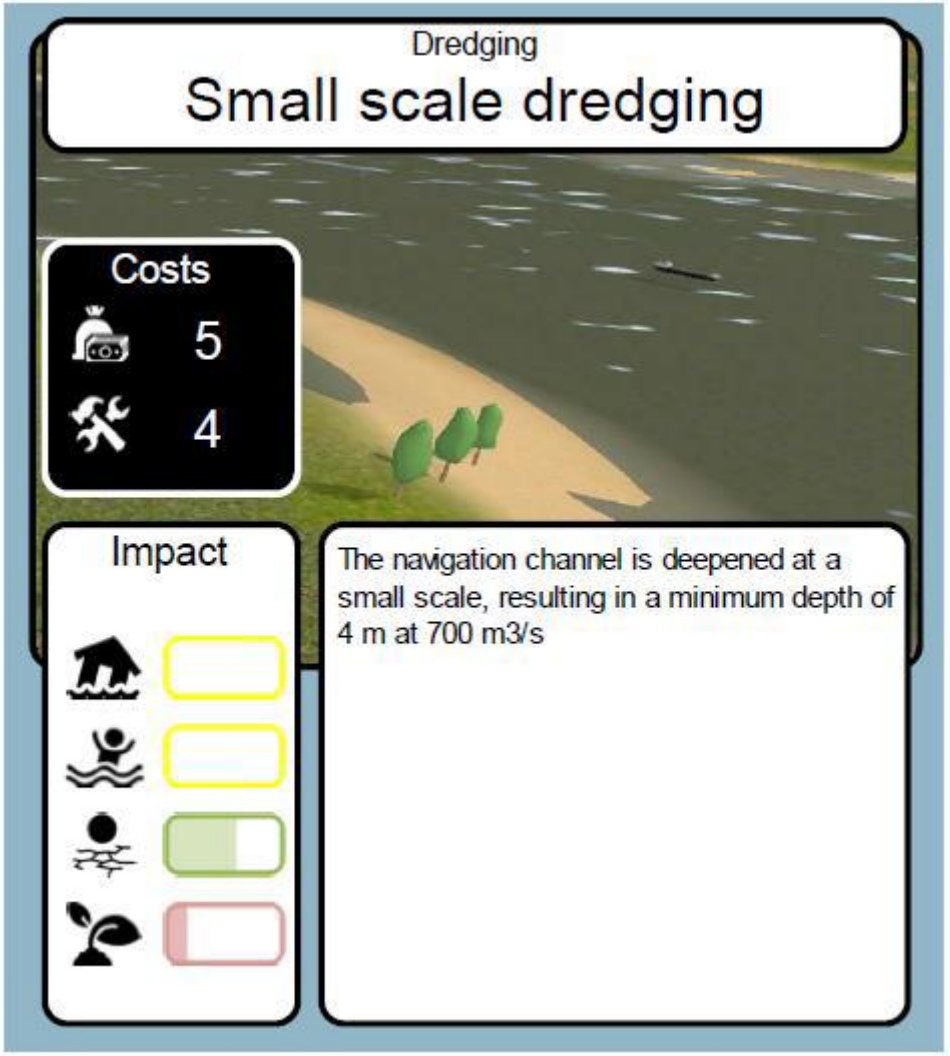


Cooperation with upstream communities

Policy Actions

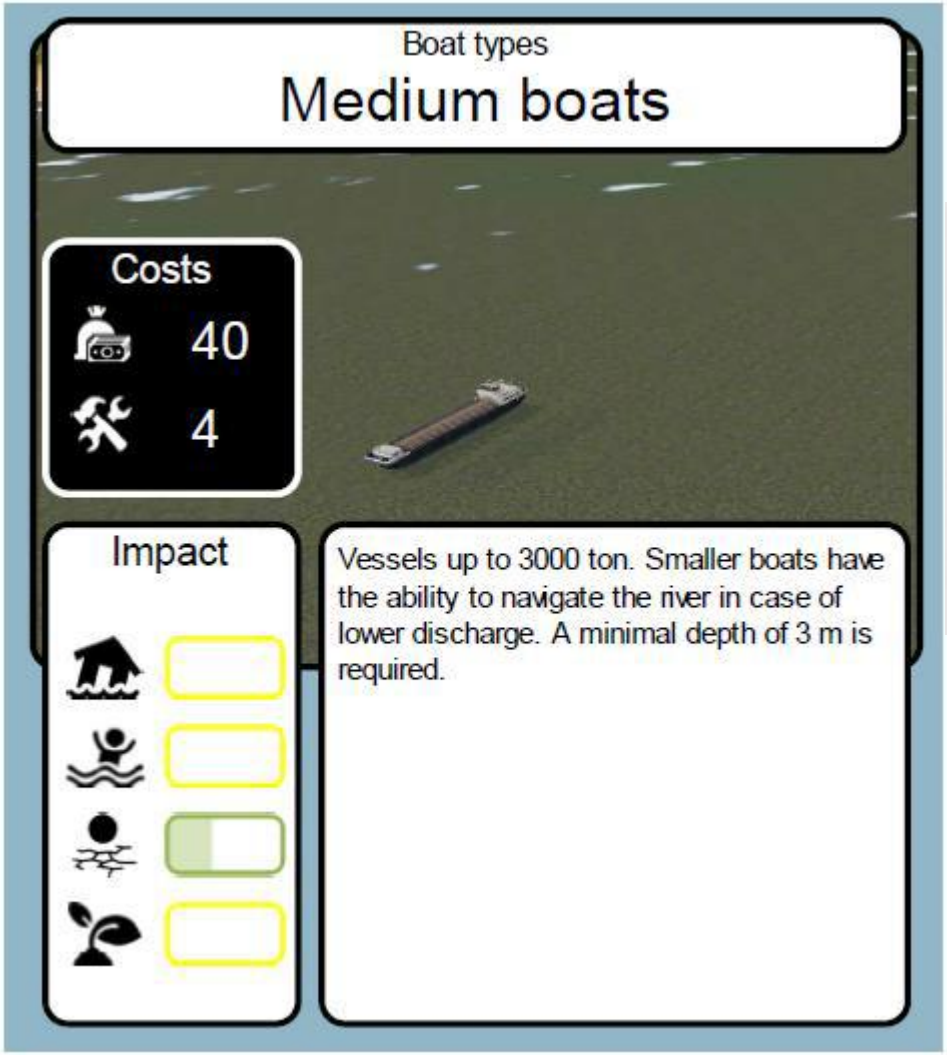


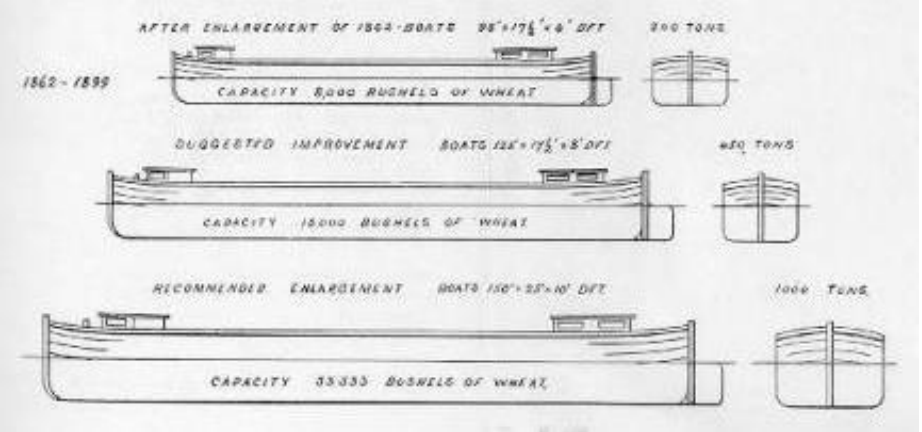
Policy Actions



Dredging

Policy Actions





Boat size

Limits on Actions

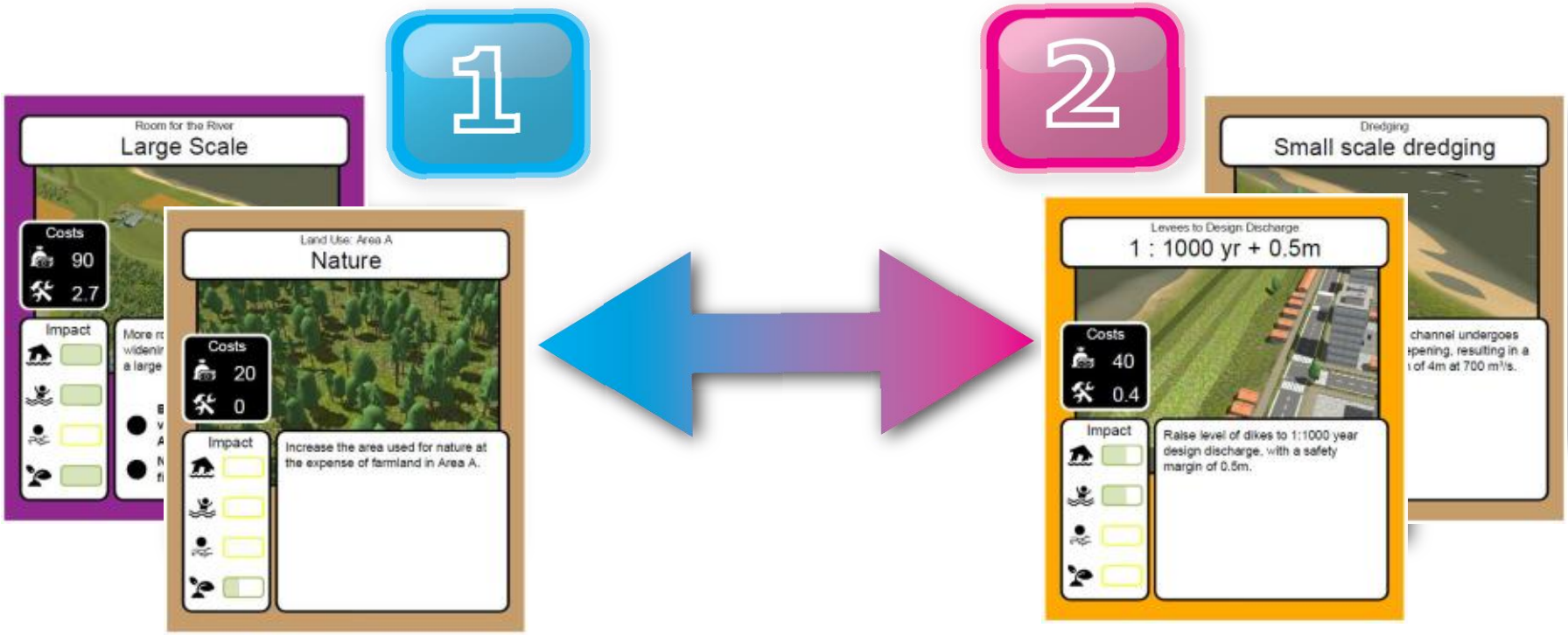
Choose preferred two team actions and provide rationale

Team name:

We have chosen
the following measures:

The most important reasons therefore are:

4. Negotiate


1
2
Room for the River
Large Scale
Costs
90
2.7
Impact
Land Use: Area A
Nature
Costs
20
0
Impact
Increase the area used for nature at the expense of farmland in Area A.
Dredging
Small scale dredging
channel undergoes
pening, resulting in a
of 4m at 700 m³/s.
Levees to Design Discharge
1 : 1000 yr + 0.5m
Costs
40
0.4
Impact
Raise level of dikes to 1:1000 year design discharge, with a safety margin of 0.5m.

5. Overrule society (if needed to implement negotiated actions)

6. Simulate to assess impacts

Flood Damage

Casualties

Nature

Drought (Navigation)

Let’s Play!

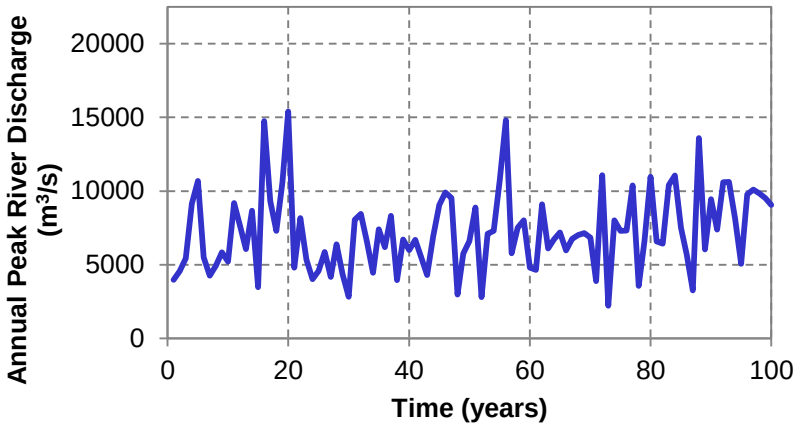
Debriefing

Evaluation after simulating 100 years

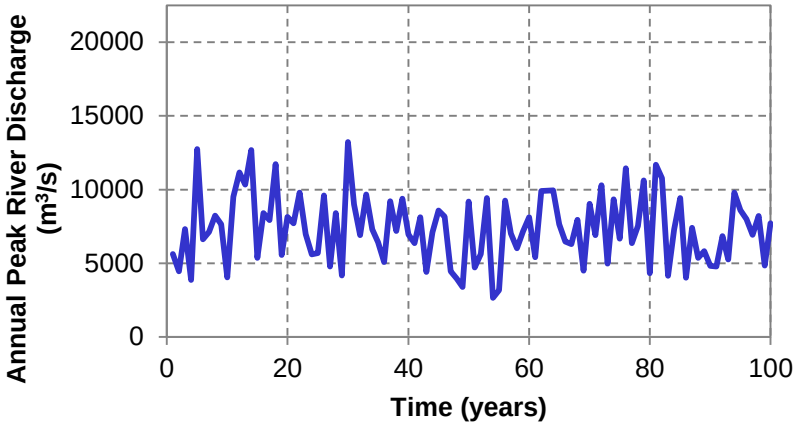
- Were there actions that were more effective than others?
- Did you notice any changes in your decision-making behaviour?
- (When) did you experience change in strategy or vision?
- What arguments did you use to change?
- Which uncertainties did you experience?
- What was the role of negotiation?
- In hindsight, would you have played the game differently?

Alternative Scenarios

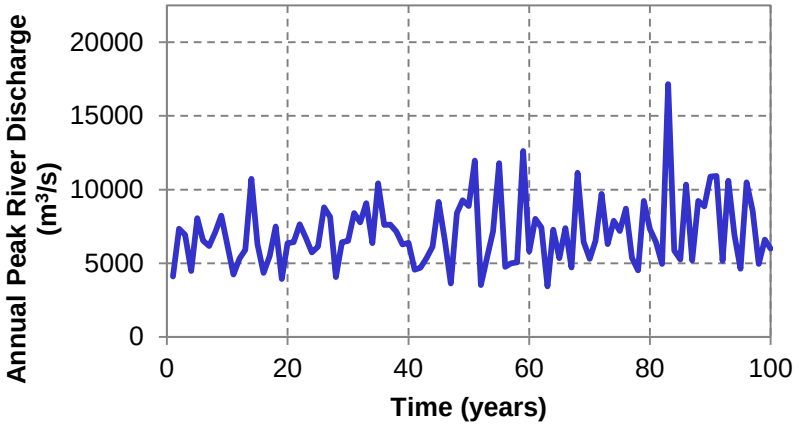
Scenario 18: G



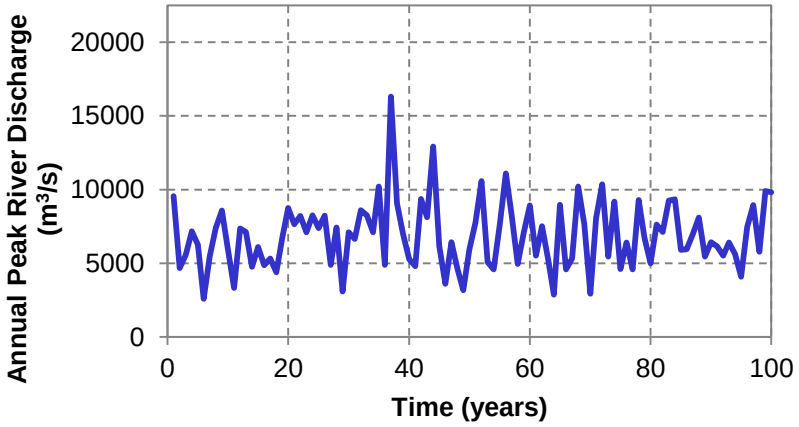
Scenario 14: G



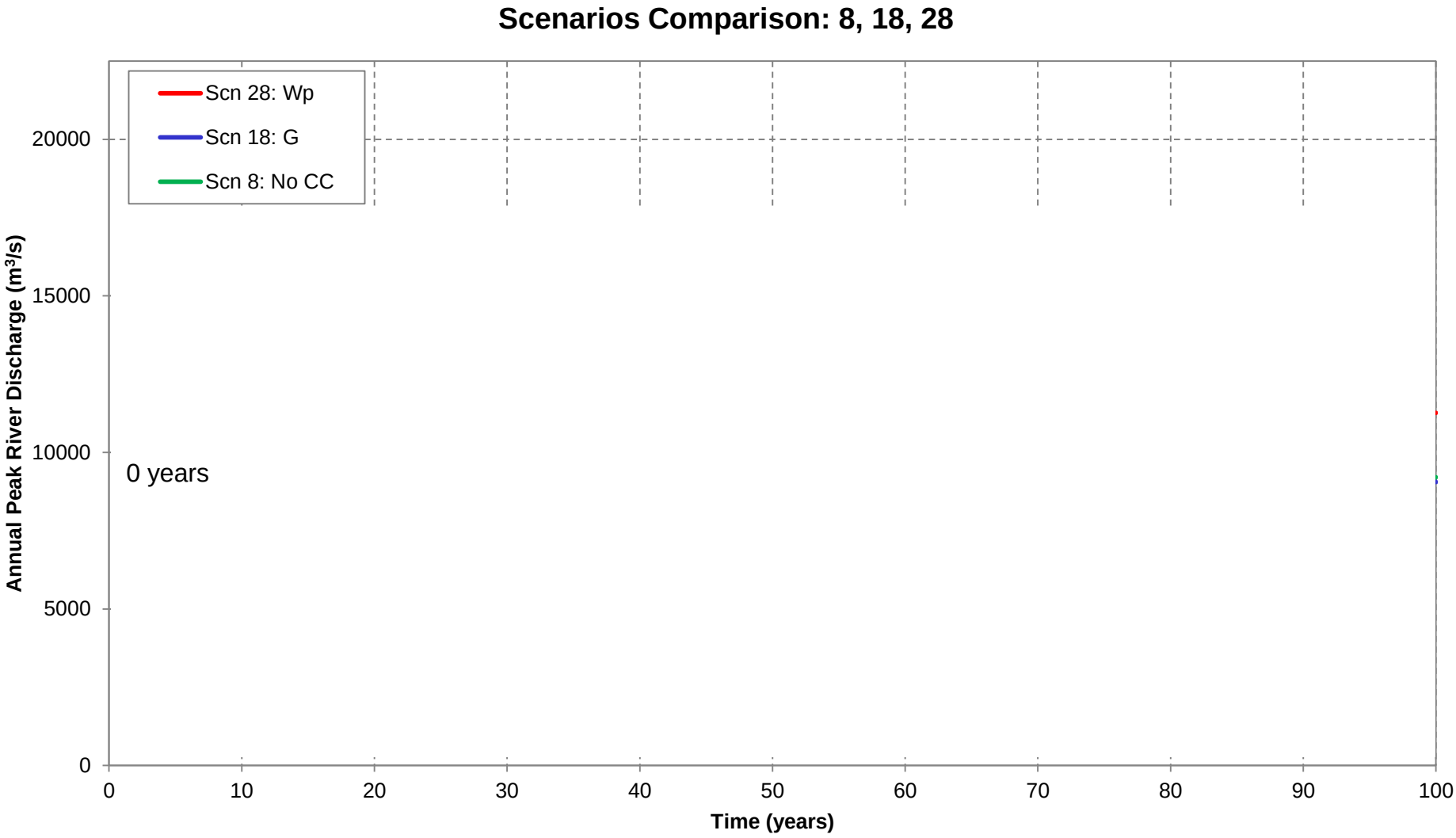
Scenario 20: G



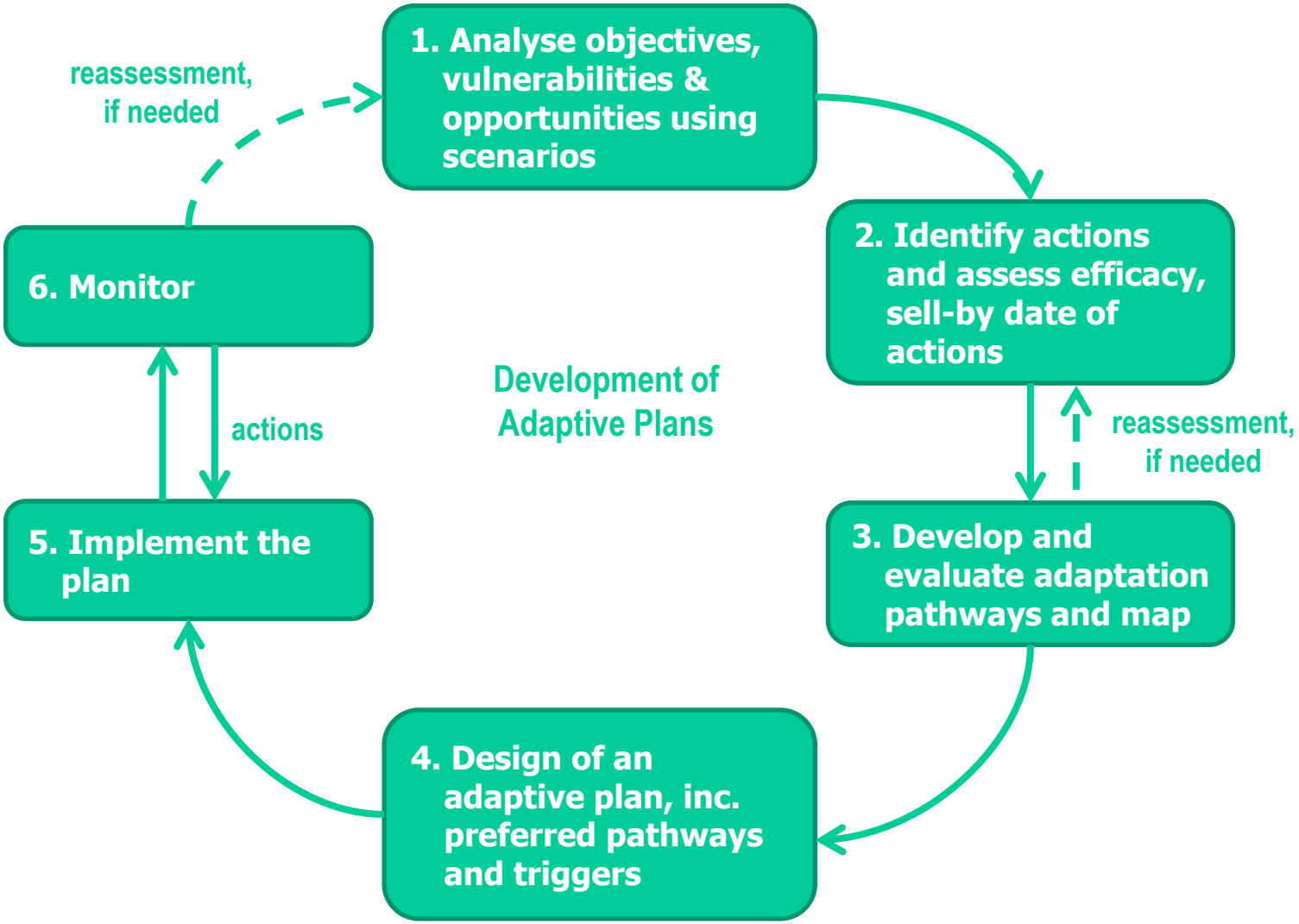
Scenario 11: G



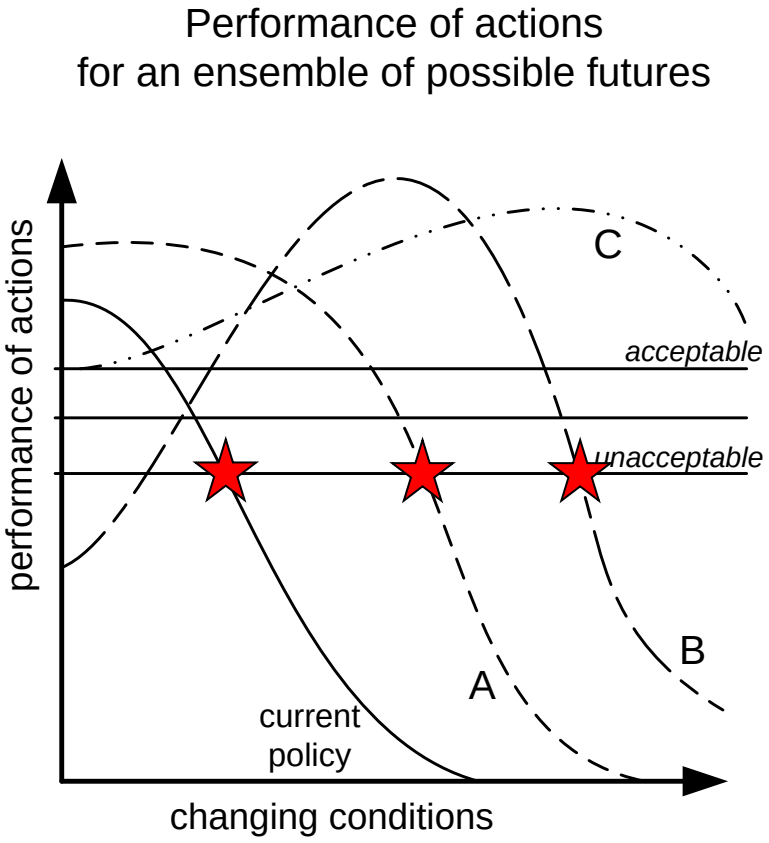
Alternative Scenarios



DAPP approach



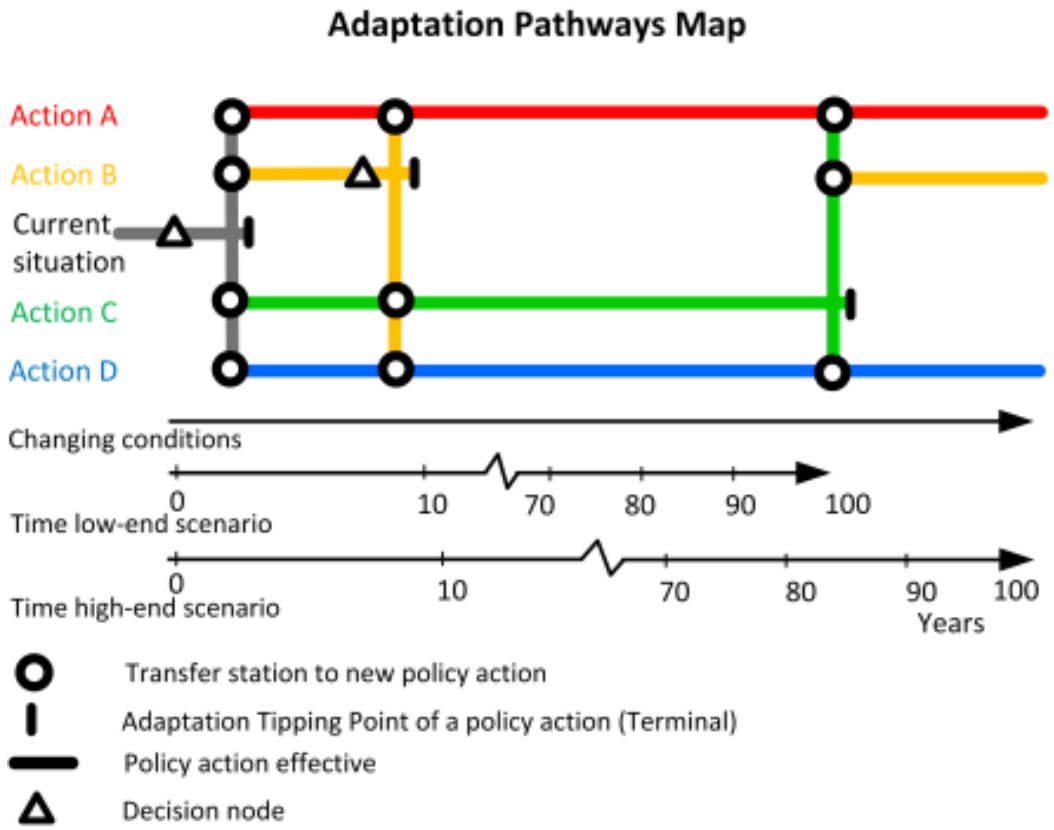
Adaptation Tipping Points

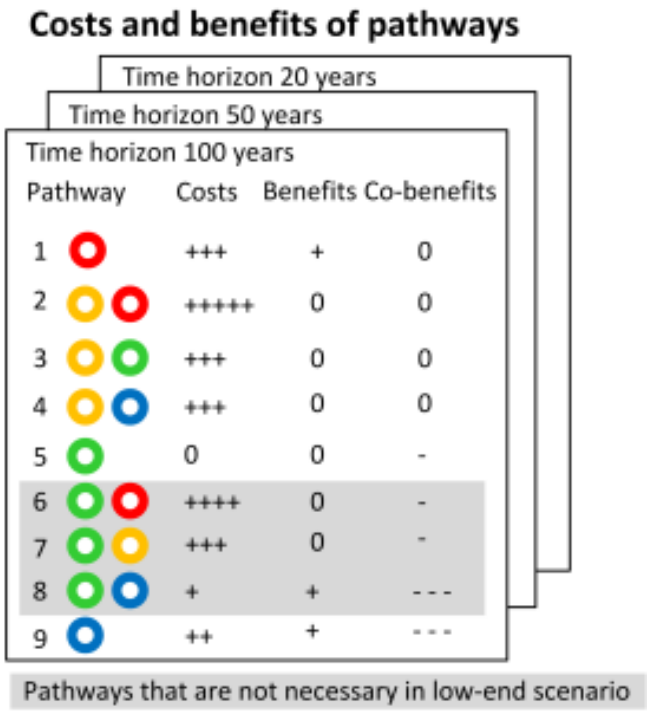


Conditions at which a policy begins to perform unacceptably

Haasnoot et al. (2012).
DOI: 10.1007/s10584-012-0444-2

Adaptation Pathways





A sequence of policy actions

Haasnoot et al. (2013). 10.1016/j.gloenvcha.2012.12.006

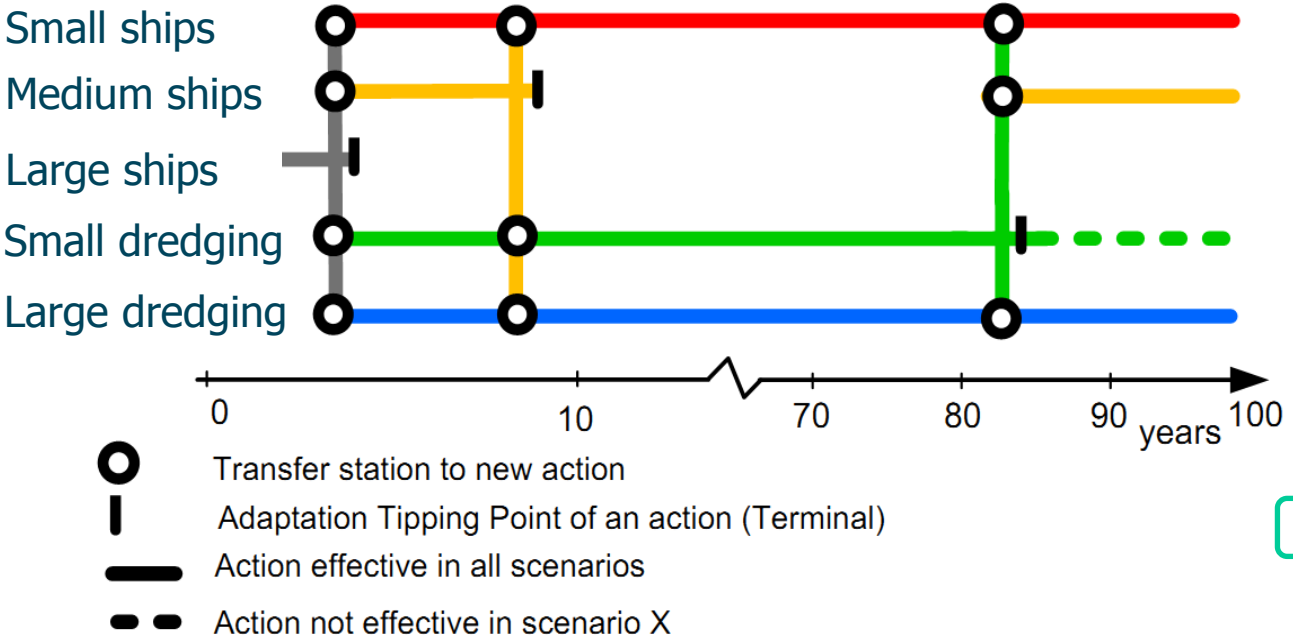
Adaptation Pathways

- Adaptation pathways can support robust decision-making (options, lock-ins)
- Water managers tend to respond to events and near events. Climate variability is important.
- Win-win may result in loss-loss (negotiation)

In practice...

- What are the vulnerabilities and opportunities?
- What could be (un)acceptable impacts and thresholds (adaptation tipping points) to implement adaptation actions?
- Are there specific drivers that cause these vulnerabilities?
- What adaptation actions can be taken? What could make these fail? What is their path-dependency?
- What adaptations are robust or flexible options?

In practice…



Adaptation Pathways Map

Path actions	Relative Costs	Target effects	Side effects
1	+++	+	0
2	+++++	0	0
3	+++	0	0
4	+++	0	0
5	0	0	-
6	++++	0	-
7	+++	0	-
8	+	+	- - -
9	++	+	- - -

Scorecard pathways

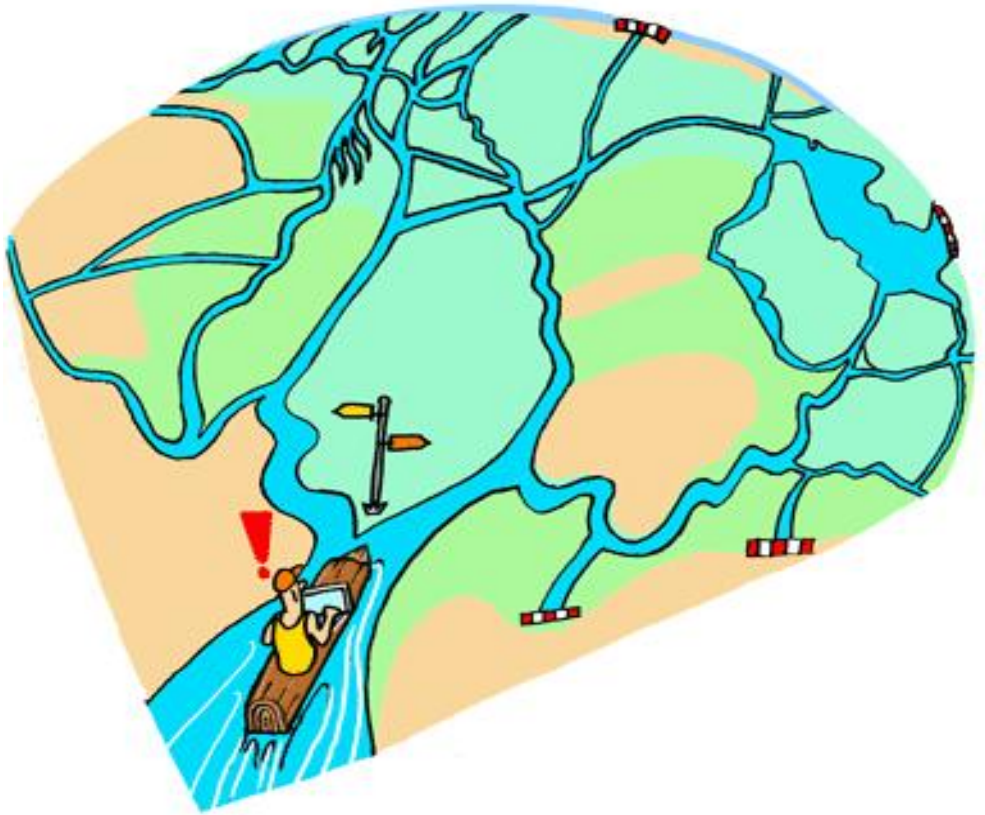
An Adaptive Plan could be:

- Small dredging and switch to large scale dredging, if necessary.
- Implement corrective actions to mitigate negative side effects.
- Monitor river discharges and transport developments.

Flexible action= small scale dredging

Robust action= small ships

Questions?



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