Faculty of Technology, Policy and Management

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MSc Programme **Engineering and Policy Analysis**

Adaptive delta management

Exploring pathways for sustainable water management

Model-based Decision-making under Deep Uncertainty

Problem definition

The Afsluitdijk, the Delta Works, Room for the River – all of these flood defense projects have been reactive in nature, responding to specific threats. The Netherlands would like to be one step ahead of disasters, implementing measures in a timely fashion. This requires an adaptive delta management plan that embraces uncertainty and lets The Netherlands prepare itself for climate change in the lead up to the year 2100.

Method

To design an adaptive delta management plan the uncertainty space is explored using scenario discovery. This method identifies a cause of uncertainty that has the largest impact on the system based on specified criteria, in this case the number of casualties that are expected to emerge. The system is represented by a model of the felicitous river 'The Waas' developed by Deltares.

Multi objective decision making is used to find a set of Pareto optimal solutions that should be evaluated in future decision making. The robustness of these solutions in different climate scenarios can be visualized.

Results

Scenario discovery showed that climate change forms the most important uncertainty for the performance of The Waas river system. Figure 1 illustrates the combined performance of water management policy in different climate scenarios. A policy with multiple dots at one scenario performs well on multiple criteria. The policy options in the higher end of figure perform well on multiple criteria in multiple scenarios, these scenarios are robust.

Conclusion

Based on these results, it is advised to highten dikes. According to which climate change scenarios becomes reality the height of the dike rise should be adapted.

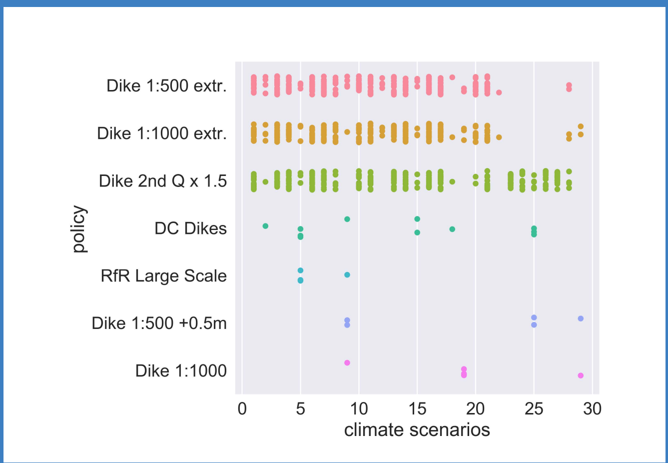

Figure 1: Performance of water management policy in 30 climate scenarios.

Policy	Costs (*10^6 €)	Casualties (lives lost)	Flood Damage (*10^6 €)
Dike 1:500 extr.	174,72	6	57,98
Dike 1:1000 extr.	252,84	6	56,33
Dike 2nd Q x 1.5	221,41	5	53,71
DC Dikes	600,00	31	4931,82
RfR Large Scale	269,00	63	1631,50
Dike 1:500 +0.5m	164,15	44	3716,80
Dike 1:1000	184,68	17	2600,80

Figure 2: Scores of water management policy.

Advised solutions:

Dike: 1:500 extr.	Dike height rise to cope with a 1:500 discharge
Dike: 1:1000 extr.	Dike height rise to cope with a 1:100 discharge
Dike: 2nd Q x 1.5	Dike height rise: adapting to 1.5 times the second highest discharge ever measured

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