Levee model
Hybridisation

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1 The problem tree

Overall, the problem tree is given as follows:

- Policy core problems:
  1. Investment priority
  2. Safety
- Secondary problems:
  1. Standard levee safety
  2. Old levee safety
  3. Standard levee length
  4. Old levee length

2 The policy packages

The exogenous parameters are given the following names, they are used in the four main policy packages:

1. Ageing time (AT)
2. Obsolescence time (OT)

3. Design time (DT)
4. Flood perception time (FPT)
5. Effects on renovation and construction (ERC)
6. Renovation time (RT)
7. Adjustment time (AdT)
8. Planning horizon (PH)
9. Renovation standard (RT)
10. Construction time (CT)

The policy packages within the policy tree are implemented using incremental increases and decreases in the following exogenous parameters.

1. Expertise
    - Adjustment time
    - Obsolescence time
    - Design time
2. Public perception
    - Flood perception time [-0.06/0.06]
    - Effects on renovation and construction [0.06/-0.06]
3. Resource allocation
    - Adjustment time [0.06/-0.06]
    - Obsolescence time [0.06/-0.06]
    - Design time [-0.06/0.06]
    - Renovation time [-0.06/0.06]
    - Adjustment time [-0.06/0.06]
4. Investment level
    - Planning horizon [0.06/-0.06]
    - Renovation standard [0.06/-0.06]
    - Construction time [-0.06/0.06]

Policy p.	AT	OT	DT	FPT	ERC	RT	AdT	PH	RT	CT
Exp. 1	+0.06	+0.06	-0.06							
Exp. 2	-0.06	-0.06	+0.06							
P.P. 1				-0.06	+0.06					
P.P. 2				+0.06	-0.06					
R.A. 1	+0.06	+0.06	-0.06			-0.06	-0.06			
R.A. 2	-0.06	-0.06	+0.06			+0.06	+0.06			
I.L. 1								+0.06	+0.06	-0.06
I.L. 2								-0.06	-0.06	+0.06

Table 1: Policy package changes in the exogenous parameters

3 The steps for model integration

Not up to date.

This section presents the steps that are needed to connect a policy context model, in this case the predation model, to the policy process model.

1. Before any coding, define what the belief tree and the policy instruments will be for the predation model.
2. Copy the policy emergence model files into the same folder.
3. In `runbatch.py`, replace the policy context items by the predation model.
4. In `runbatch.py`, make sure to initialise the predation model appropriately.
5. Change the `input goalProfiles` files to have the appropriate belief tree structure of the predation model.
6. In `model module interface.py`, construct the belief tree and the policy instrument array.
7. Make sure that the step function in the `model predation.py` returns the KPIs that will fit in the belief system in the order DC, PC and S. If no DC is considered, then include one value of 0 at least. All KPIs need to be normalised.

8. Modify the step function of the `model predation.py` to include a policy implemented.

9. Introduce the changes that a policy implemented would have on the model in `model predation.py`.

4 The steps for model simulation

Not up to date.

This section presents the steps that are needed to connect a policy context model, in this case the predation model, to the policy process model.

1. For the policy process:

   (a) Define a set of hypotheses to be tested

   (b) Define scenarios that will be needed to assess the hypotheses

   (c) Choose the agent distribution based on the scenarios constructed

   (d) Set the preferred states for the active agents and the electorate along with the causal beliefs to be used. This should all be based on the scenarios that have been constructed.

2. For the predation model:

   (a) Define the initial values for the main parameters

   (b) Define the parameters that will be recorded

3. Save the right data from the model.

5 Model hypotheses

One hypothesis is made for testing the policy process model. They are given as follows:

- H1: A difference in the policy core goals will lead to a difference in the policy instruments selected.

6 Model scenarios

Six scenario are considered. All but one focus on a change in the preferred states of the agents or their causal beliefs. For each of the scenario, the preferred states of the agents are shown in Table 2 and their causal relations are provided in Table 3.

	PC1 IP	PC2 Safety	S1 SLS	S2 OLS	S3 SLL	S4 OLL
Scenario 0						
Policy makers	12	0.85	60 000	60 000	10 560	10 560
	0.80	0.85	0.75	0.75	0.88	0.88
Scenario 1						
Policy makers	6	0.95	60 000	10 000	12 000	500
	0.40	0.95	0.75	0.13	1.00	0.04

Table 2: Preferred states for the policy makers on a the interval [0,1].

Scenario 0/1		
	PC1	PC2
-S1	0.00	0.50
-S2	0.00	0.50
-S3	0.75	0.00
-S4	-0.75	0.00

Table 3: Causal beliefs for the policy makers. These causal relations can be read as: an increase of 1 in S2 will lead to a decrease of 0.75 in PC3. They are all given on the interval [-1,1].

- Scenario 0 - Investment prone agents

  Scenario 0 is a scenario where the policy makers care more about the investment priority than safety. It is a simulation of the levee model with the policy emergence model. The preferred states for the agents are provided in Table 2. The causal beliefs used as given in Table 3.

- Scenario 1 - Safety prone agents

  Scenario 1 is a scenario where the policy makers care more about the safety than investment priority. It is a simulation of the levee model with the policy emergence model. The preferred states for the agents are provided in Table 2. The causal beliefs used as given in Table 3.

7 Initialisation of the levee model

The parameters that need to be initialised for the levee model are given by:

1. Ageing time (AT): 20
2. Obsolescence time (OT): 25
3. Design time (DT): 2.5
4. Flood perception time (FPT): 0.5
5. Effects on renovation and construction (ERC): lookup
6. Renovation time (RT): 3.5
7. Adjustment time (AdT): 30
8. Planning horizon (PH): 55
9. Renovation standard (RT): 0.2
10. Construction time (CT): 5

8 Results

The results section is divided up into the different hypotheses that were brought up previously.