Flood Risk Management for the IJssel River

Advice for the Province of Overijssel to manage uncertainties related to flood risk of the IJssel river using exploratory modelling.

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Part 2: Political Reflection

The role of analysts at the science-policy interface is widely misunderstood. Analysts are expected to generate a scientifically rigorous model and optimal solutions to a problem (even when embedded within a broader context), which in an ideal world, would be acceptable to all actors and mandated for action by politicians. Achieving the correct balance between a technical and political discussion is key. Reality is somewhat muddier, as was illustrated through the process of modelling and the actor debate. In this reflection, the challenges of implementing our policy advice is explored and we present some directions to mitigate the risks associated with these challenges:

Taking a macro view

In the real world, as seen in this study, analysis and outputs of static models were often challenged by value differences from actors, since most actors (especially the smaller ones who do not contribute financially) tend to focus on their own gains. Hence, multiple problem framings for a common goal were essential

Despite the presence of a mandate for actors for a project with the goal of minimizing losses due to flood risks, the separation of reality and preferred outcome is not very clear. This makes problem framing important (Hisschemöller & Hoppe, 1995). The case study of the Ijssel river has a common goal (safety of citizens) which does not make it unstructured at the start. However, the pathways to reach the goal differs, impacting some actors in an unfavourable manner. The issue is the lack of a broader worldview in which the problem is situated. Smaller actors such as provinces do not necessarily concern themselves with issues of national safety (such as the Delta Programme and Room for the River). They not only will not contribute to it financially and do not want to suffer socio-economic consequences either (land submergence, displacement of people, etc). Moreover, profit-oriented actors such as the Transport Company with a single aim of not disrupting their business may not even align with the common goal of the project (Warner, Van Buuren, 2011).

Analysts have a role here to illustrate not just the optimal solutions but also the negative or worst-case scenarios that may occur if certain measures are not implemented. Rival framings of the same problem catering to each actor would be the key to enable a macro-view of the issue enabling a strong ground for consensus.

Arriving at a middle ground

This requires broadening the scope of the problem to arrive at a consensus regarding shared and conflicting values on risk distribution, financial trade-offs and immeasurable variables such as design quality.

In order to find an optimal solution, the ontological description of a problem determines which variables, or KPIs, are of importance (Driessen et al., 2010). Furthermore, a wide set of assumptions, boundaries and unquantifiable variables give ample opportunity to politicize an analysis (Van Enst, W.I., et al., 2014). Each actor may have their own truth proven using a model. Hence, debating for what is correct is an exercise in argumentative ammunition.

During the debate, stakeholder dynamics are determined by tensions emerging from a fair risk-distribution and fair cost-benefit distribution (although 'cost' was not explicitly a mandate for any actor). Delta Commission and Rijkswaterstaat had the common goal of identifying a long-term strategy for flood-risk management for the Ijssel river. They are also the financiers of this project and the Rijkswaterstaat had the power to overrule any policy, even if all or no actor is satisfied, though they are open to other actors contributing.

The provinces and their respective dike rings shared the objective of protecting their people and assets from damages. This could be achieved by: (a) Building higher dikes (this displaces people, shields connection to the river); or (b) Adopt Room for the River projects (expensive, reduces the depth of water, provinces will have to give up land). Each alternative impacts provinces differently.

The Transport company, true to their mandate, strongly supported the heightening of dikes to make sure water levels do not reduce, whereas, the Environmental Interest Group only supported Room for the River initiatives. This was a recurring tension in the debate. In addition to a fair distribution of risks and costs, the ethical trade-off of money and human lives must also be negotiated. No policy can claim to have completely mitigated a risk to human life. Though the Rijkswaterstaat works with a probability of 1 in 100000 people dying in a flood, quantifying this against not adopting a measure is plagued with ethical arguments.

Narrow role of the analysts

The role of the analyst was viewed as the truth finder by other non-analyst actors, which simplified the notion of the analyst. In this perception there is an *apriori* of an expectation of an optimum which might be the case for a sole actor, but is rarely the case for the multi-actor systems

As analysts of the Delta Commission (DC), our mandate was to cater to the requirements of the Commission. The problem itself is a case of deep uncertainty and working remotely in a multi-stakeholder environment also made it a 'wicked' problem where the boundaries between problem formulation and solutions are intertwined with each other (Kwakkel, J.H., et al 2016). Our challenge was to provide effective decisions under unavoidable uncertainty (Lempert et al. 2003). At the onset, our objective as analysts was also to go beyond the assigned tasks to broaden the scope of the problem and understand how to aid a forward-looking decision-making process.

Delta Commission (DC) is one of the prime actors in this developing the high-level strategy and holds veto powers to approve or scrap strategies irrespective of the viewpoint of other actors. As their analysts, we were assigned multiple tasks over the timeline of the project including:

- Organising meetings with other Actors to gather their concerns.
- Collecting and verifying data for their objectives and from other actors..
- Running analytical models.
- Substantiating research
- Verifying claims made by other actors. (For e.g. the claim by the transport company stating boats are better for the environment than trucks).

The experience working for the Delta Commission (DC) can be described as an example of what is not ideal in practice as a working relationship between a client and an analyst. The analysts did not

have any tasks set out for them which made them unsure of their roles in the project. The larger goals of DC were unclear and it was only very close to the debate that the DC began to involve the analyst team in meetings. The DC, in the absence of Rijkswaterstaat, wants to act as an Actor that wants to build consensus amongst all actors, without strong mandates for itself. What followed after that was multiple tasks on gathering data, analyzing it and verifying claims which had to be executed rapidly. The running of the model, which is a substantial part, was allotted very late in the process. This slowed down the optimization process which was complicated further because there were no clear goals. Political consensus building tool centerstage. This disagreement between different modelling practices and consequently different truth claims proved to be a hurdle during the debate. The amount and depth of information forthcoming from other actors also varied widely on policy levers. So we incremented each other policy randomly to get an overview of what the solution might entail. This practice, most of the time, prevented a certain alignment on the technical level before the debates.

The DC wanted the duration of the model to be set to 2100. So, we ran the model twice: once with a run time of eighty years and once with a normal run time of 200 years., so we could actually assess the outcomes for DC, but also for the other groups. So, the recommendation would be to have a technical meeting to agree on model practices and variables. (Van Enst, W.I., et al., 2014).

Debate Proceedings

The ambiguity of values of lives, costs, risk distribution, tradition and environmental stewardship are clashing and are not seen as commensurable. Not all such conflicts can be resolved using standard financial compensation packages. Such clashes are typical in the political arena. For example, in the presidential elections of Bush vs Al Gore, the result outcomes were so close that there was no technically accepted result based on the number of votes. In such a situation, the decision was made by democratic institutions agreeing within an established and accepted judicial framework (Sarewitz, D. 2004).

Focused coping strategies must be devised based on what arguments are expected in the political arena. (For e.g.,Overijssel offered to compensate for some costs, which was not sufficient as per Gelderland) (Stewart, 2006; Thacher & Rein, 2004). Six major coping strategies summarized by Graaf et al, (2016) are FireWalls, Bias. Casuistry, Cycling, Hybridization and Incrementalism.

In our case, the Hybridization strategy and Bias strategies would have helped to structure the value inputs for the analysts. The Bias strategy enables agreement of values that can be neglected in return for compensation. Implicitly this was done to preserve traditional agricultural land by supporting dike heightening. However, since its value was not quantifiably, it was not part of the used formula. The hybridization strategy aims at establishing consent over values and is especially developed for multi-sectoral public–private partnerships. In essence the case debate is a form of this, but the debate focused on more technical and CBA aspects and less on the convergence and defining values involved. By making the implicit values explicit beforehand the chance of anonymity and hostility emerging might decrease. Analysts can help determine if scenario and policy discovery show that certain values are not threatened. An analytical framework can then be established incorporating these values, and agreeing on good practices.

In conclusion, analysts should be clear about the uncertainties, so politicians can make informed choices (Stirling, 2010) and political decision-makers can be held responsible and accountable. (Turner, 2005). Transparency is critical and any technocratic decision made without transparency undermines the values and motives of the government/ organisation. Such distrusting perceptions have already emerged towards large inter and intra-national institutions such as WHO, WTO, U.N., IMF, World Bank and E.U. (Johnson, 2011; Armingeon & Ceka, 2014; Kramer, 1999).

Acknowledging this value framework in the democratic decision-making process under uncertainties will determine the success of this process.

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Appendix 1: Average uncertainty mean table

Policy	Total Damage	Total Deaths	Total Investment	Total RfR	Total Evacuation
0	608425386.7	0.511685295	158847680.6	0	0
1	621711142.9	0.521825381	153331806.6	0	0
2	595643721.1	0.499624695	162147239.9	0	0
3	625424094.4	0.522590968	152210479.1	0	0
4	651587885.8	0.537063365	141852808.4	0	0
5	638034435.9	0.526409418	147368682.4	0	0
6	646636068.2	0.538725118	148173608.7	0	0
7	664366556.2	0.556556462	145281932.2	0	0
8	612086619.2	0.512372151	157726353.2	0	0
9	668963033.2	0.557967654	144160604.7	0	0
10	592932845.2	0.059814596	163389027.6	0	12121.15541
11	605827155.2	0.510640332	160089468.3	0	0
12	770199958.9	0.680761737	134608667.8	0	0
13	773451510.4	0.680284666	133597387.9	0	0
14	1262221624	1.425753586	43576003.55	0	0
15	971620292.1	0.909807375	59423021.44	0	0

16	782092792.5	0.668189967	93322051.71	30700000	0
17	1264452364	1.424250989	37255203.24	0	0
18	786694566.2	0.667405642	87001251.4	30700000	0
19	1223744025	1.075179745	54862719.29	0	0
20	1693244531	0.220607167	20299287.63	0	34446.24387
21	1857354654	1.756669715	6320800.31	0	0
22	1264452364	0.512730356	37255203.24	0	23455.43159
23	1074576075	1.093188444	57554490.86	0	0
24	971620292.1	0.327530655	59423021.44	0	16830.3156
25	1321987528	1.24795714	52994188.72	0	0
26	970544012.2	0.913463377	65743821.75	0	0
27	1074576075	0.39354784	57554490.86	0	19067.10892
28	1654221310	0.212468804	0	30700000	33157.76116
29	778632567.1	0.66842039	94333331.62	30700000	0
30	1859122658	1.755789843	0	0	0
31	1601180378	1.308672176	22167818.2	0	0
32	1223744025	0.387064708	54862719.29	0	17625.34818

33	1499410341	1.553535106	32694901.09	0	0
34	1693244531	1.470714444	20299287.63	0	0
35	1859122658	0.263368476	0	0	40783.68911
36	1264452364	0.213637648	37255203.24	0	38939.68135
37	1499410341	0.559272638	32694901.09	0	23861.74237
38	1859122658	0.632084343	0	0	24566.17509
39	1321987528	0.187193571	52994188.72	0	32824.1987
40	1693244531	0.5294572	20299287.63	0	20748.79631
41	1262221624	0.213863038	43576003.55	0	38705.79337
42	1499410341	0.233030266	32694901.09	0	39614.22074
43	1321987528	0.44926457	52994188.72	0	19771.75263
44	1601180378	0.196300826	22167818.2	0	31089.38219
45	970544012.2	0.328846816	65743821.75	0	16718.00074
46	1262221624	0.513271291	43576003.55	0	23314.54848
47	1601180378	0.471121983	22167818.2	0	18726.7808
48	1599717905	1.31065703	28488618.51	0	0
49	1654221310	1.416458692	0	30700000	0

50	1599717905	0.196598554	28488618.51	0	30924.65139
51	1857354654	0.263500457	6320800.31	0	40617.72134
52	1857354654	0.632401098	6320800.31	0	24466.20391
53	1599717905	0.471836531	28488618.51	0	18627.55472
54	1654221310	0.509925129	0	30700000	19972.67496
55	845432465.6	0.28175199	92464801.05	30700000	12997.21104
56	845432465.6	0.782644417	92464801.05	30700000	0

Appendix 2: Worst case uncertainty mean table

policy	Total Damage	Total Deaths	Total Investment	Total RfR	Total Evacuation
0	1701361045	0.524287477	20299287.63	0	20984.70644
1	1701361045	1.456354104	20299287.63	0	0
2	1816190341	1.694514267	0	0	0
3	1630831773	1.324787008	22167818.2	0	0
4	1595752137	1.292733522	47205032.2	0	0
5	1816660025	1.698026863	6320800	0	0
6	1816190341	0.610025136	0	0	24014.82397
7	1595392411	1.296200869	53525832.2	0	0

8	1549062935	1.23040087	45336501.63	30700000	0
9	1633575947	1.330724817	28488618.2	0	0
10	1667117712	1.425051197	45336501.63	0	0
11	1816660025	0.611289671	6320800	0	23983.60937
12	1551102003	1.236120241	51657301.63	30700000	0
13	1482886636	1.199278437	98885262.2	0	0
14	1515894760	1.225739169	94311968.2	0	0
15	1508252698	1.218801271	90023447.2	0	0
16	1476605415	1.196814263	99896542.2	0	0
17	1457081334	0.141337145	102669839.2	0	27996.02994
18	1463440744	1.180345449	101658559.2	0	0