DELFT UNIVERSITY OF TECHNOLOGY

EPA1361 - MODEL-BASED DECISION MAKING

Robust Decision Making for Multi-Actor Governance: Policy Advice for Flood Risk Mitigation in the Municipality of Gorssel - Political Reflection

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1 Political Reflection

1.1 Introduction

Decision-making concerning large scale infrastructure projects such as RfR benefit immensely from exploratory modelling approaches. It allows us to deepen insight of systems in question, explore behaviours under a wide range of uncertainties and scenarios, and, using this understanding, formulate robust and effective policies to address these uncertainties, which would otherwise be left to chance (Bankes, 1993). As analysts, we are responsible for ensuring that the use of models and the information derived from them is correctly understood and utilised appropriately to aid in real-life decision-making (Pielke, 2007; Van Enst et al., 2014).

Through analysing this case and the simulated debate-style policy negotiation, several tensions and challenges arose that might affect the successful adoption of proposed policies. Here, we reflect on three of these challenges and describe how our analysis attempts to address these, and additional actions that an analyst could still take. Finally, we reflect on the risks of adopting these strategies and how our client, Gorssel, might adapt their approach in light of these risks.

1.2 Tensions and Challenges

We will discuss three fundamental tensions and challenges identified in the analysis process in the following subsections.

1.2.1 Information Asymmetry (IA)

Unequal levels of information and technological expertise of the different actors involved can mean that the chosen policy does not align with a perceived understanding of modelling or goes against the interests of less informed actors. It represents an “ethical threat” (Albertus, 2019), that stems from inadequate information sharing between “information-rich" and "information-poor" parties (vertical IA) or information that is distributed and incomplete among parties (horizontal IA) (Clarkson et al., 2007). This phenomenon was visible during the debate preparation and negotiation process, where high-level actors such as the Rijkswaterstaat and transport company had teams of analysts to support them, resulting in vertical IA. These actors may not act in good faith or hide relevant information from other actors creating more uncertainty for our modelling purposes. Moreover, they could use their expertise and reputation to legitimise their claims. We were provided with a mandate that was, in general, less technically focused than those of other actors. This made participation in policy debates and requests from other stakeholders to quantify our position a more challenging prospect, with more uncertainties to account for.

1.2.2 Intangibility of Costs and Benefits

Models which are designed based on achieving consensus between actors may fail to adequately capture or quantify intangible/ephemeral costs, benefits, and objectives, which may influence the behaviour of certain actors. Over the past decades, the urban-rural divide has caused a divergence in attitudes and political discourse between these factions. The rural discourse emphasises social, cultural, ecological, scenic and other ’normative’ values of the countryside (Andersson et al., 2009; Frouws, 1998). This is reflected in Gorssel’s policy mandate, highlighting their pride in organic and sustainable farming practices. More importantly, there was an expectation of ’fairness’ in the treatment of Gorssel relative to urban municipalities (mainly Deventer), a factor that is not formally part of the model. Furthermore, model outputs cannot account for actions that actors may take in relationship management. Given they are both administered by Overijssel’s provincial government, in reality, Deventer and Gorssel may make concessions to one another in the interests of maintaining good working relationships for the long term. These concessions are not simple to quantify in a model.

1.2.3 Fixed Goals

Goal definition is needed during decision-making processes to provide direction for any given project. Goals are the result of the first step of any decision-making process: problem scoping and formulation (Enserink et al., 2010). However, cognitive bias often leads actors to fixate on these predefined goals, even when the problem understanding changes through exploratory modelling analysis. This severely limits opportunities for the actor to engage with more expanded multi-issue agendas in the latter stages of policy analysis that modellers present. This fixation may also be a strategic choice for smaller actors to make a solid stance to obtain more significant concessions from a high-level actor (e.g. the Rijkswaterstaat) than letting goals be dictated by analysts, who can have biases or agendas of their own (Hans de Bruijn, Mark de Bruijne, Ernst ten Heuvelhof, 2015).

1.3 Effects on the Modelling Approach

The three challenges were essential drivers of our modelling approach. Each challenge impacted our approach in the following ways:

1.3.1 Information Asymmetry

IA is inherent to any political decision-making problem. Yet starting actors out with the same model already provided a first mean to combat information asymmetry. For this exercise, all actors/analysts were equipped with equivalent training in modelling approaches. This ensured a predefined consensus on deep uncertainties and that all actors acknowledge that something must be done by cooperating. By employing a collectively accepted model, even actors with less technological capabilities can engage with the analytical approach.

We tried our best to account for IA in our exploratory modelling approach and to conceive standpoints or problem formulations for actors, mainly within the Overijssel region, using actor analysis (Enserink et al., 2010). Specific to our modelling, the objectives of each actor were then scoped to only a small number of objectives per iteration (e.g. minimise deaths, damages, and costs) to not only reduce computational requirements but it also ensures that the most critical trade-offs modelled are well communicated to a non-technical stakeholder/decision-maker.

1.3.2 Intangibility of Costs and Benefits

Expanding the model to include additional model parameters to try and capture these "intangible" factors" was not seen as a solution to address this challenge. This is because the usefulness of the model is a balance between enough parameters to capture system behaviour, but also few enough to keep uncertainties manageable (Saltelli et al., 2020). Moreover, a model cannot and need not fully capture the actual system, as some models may lead to alterations in system behaviour (e.g. as is the case for RfR models being used to alter river flow) and thus become self-invalidating.

We opted instead to introduce an information reporter to Gorssel's problem formulation, which calculates the differences in expected annual damages and expected number of deaths between Gorssel and Deventer, as a proxy for the more intangible feature of 'perception of fair treatment. We then used this reporter in the final analysis of robustness and sensitivity for Gorssel, whereby the factors were used to inform both satisficing and regret-based robustness objectives (McPhail et al., 2018). In this way, our advice would address critical contextual factors for our client stakeholder that do not directly concern flood risk management.

1.3.3 Fixed Goals

To avoid rigid goals that reduce the potential policy space, we used an RDM approach. RDM is inherently iterative and should, from the outset, encourage actors to adjust their scope/objectives in light of unexpected outcomes through multiple iterations of the RDM process (Lempert et al., 2006).

For this assignment, following the policy debate, the problem formulations were updated and reframed due to new information brought up by other actors. For instance, after learning that Deventer wished to impose a hard constraint to prevent the dike heightening in their city, we updated the problem formulation to avoid policies that involve dike heightening in Deventer.

1.4 Solutions for Real World Situations

For real-world situations, a much more comprehensive range can address these tensions and challenges that were not available to us during this project report. Below we present four promising ways/ideas that can guide modeller behaviour in future decision-making processes like RfR.

1.4.1 Use of Serious Gaming to Build Consensus

Using interactive methods such as serious gaming can help to further consolidate consensus in an environment where not all stakeholders have the same level of knowledge or technological capacity. It can also serve as a means to build empathy between actors by asking them to take on the role of a different actor in the same problem domain. This could then lower the barrier to entry, such that a broader range of lower-power stakeholders can be genuinely involved in the decision-making process (for example, farmers and/or citizens in the municipality of Gorssel) (Savic et al., 2016).

A serious gaming approach would require the development and use of a "blokkendoos" or "planning kit", in essence, a simplified model designed to aid various stakeholders rapidly assess spatial measures for inclusion within

adaptive flood protection management strategies, without needed formal modelling experience (Warren, 2015). This approach would reduce expertise asymmetry, meaning there is less incentive for less technical actors to oppose model outputs or attack the model as a whole. The empathy-building and social value of serious gaming approaches may also help to reveal intangible costs and benefits.

1.4.2 Support the Creation of a Multi-Issue Agenda

A fixed goal that opposes another actor's goal will lead to serious conflicts within the political arena. Conflicts are inevitable, but the introduction of new 'issues' to the agenda widens negotiation space, allowing for opportunities to find trade-offs, agreements and compromises, as well as opportunities to broaden the scope beyond the model analysis to help prevent actors from becoming too attached to specific goals or problem formulations throughout the policy process (Hans de Bruijn, Mark de Bruijne, Ernst ten Heuvelhof, 2015). Specifically, in our case, the RfR could be tied with other developmental projects in the region, such as making transport networks more efficient or making the region more attractive for certain companies, e.g. in the tourism industry. Creating a multi-issue agenda encourages cooperation when specific objective goals cause actors to behave in a non-cooperative manner, which in turn can also help reduce information asymmetry (Coehoorn & Jennings, 2004).

1.4.3 Reconceptualise Modelling with Dynamics Adaptive Policy Pathways

Acknowledging deep uncertainties, such as climate change, population growth, new technologies, economic developments, societal perspectives, preferences and stakeholders' interests, modelling can no longer be viewed as a predictive planning tool. Instead, a new planning paradigm has emerged: dynamic adaptive policy pathways (DAPP), which involves designing alternative policy options that are dynamically adapted depending on circumstantial factors. Central to the approach is the monitoring of a meaningful metric or "signposts" that can trigger the change from one policy option to another (Haasnoot et al., 2013).

Our recommended policy indicates that the use of dikes seems the most favoured solution for Gorssel and Overijssel as a whole. However, dike failure remains highly uncertain, and therefore somehow monitoring dike strength could serve as an adaptation tipping point and alter to a more appropriate policy. Since the MSMORDM approach results in a collection of favourable policies, Gorssel can combine these into a DAPP framework, whereby the most appropriate policy is implemented at appropriate time steps (Kwakkel et al., 2015).

This provides all actors to carefully adjust goals and analysts with more time to exchange information and re-evaluate if certain assumptions still hold.

1.4.4 Constructive Decision-Making & Quantitative Storytelling

Another critical idea concerns not necessarily the modelling approach but the general communicative approach itself. To analyse a complex system, the modeller must take the secondary role of being an "honest broker". The "honest broker" one engages in a constructive style of decision-aiding, which involves the analyst facilitating joint sense-making with the client (in this case, Gorssel), and with relevant stakeholders (Tsoukiàs, 2008). Even the finest model is useless if its insights are not communicated and comprehensive in a way that impacts decision-maker behaviour. The human mind is not built to comprehend large sets of data, but more so images and stories. It is natural then that in general, "numbers don't stick, stories do", meaning that more often than not, policy debates/decisions are determined by a leading narrative or anecdotes as opposed to empirical data (Kettl, 2016), see Table 1.

Given that a narrative is more effective in informing/guiding evidence-based policy debates than numerical data, policy analysts and modellers must find ways to work with this human limitation by tying data analysis to an overarching narrative. Gorssel can support this narrative historical accounts of flood from 1993 & 1995, including damage cost estimations would emphasise the need and incentive for actors to implement measures, despite being costly (Rijke et al., 2012). This is known as quantitative storytelling, which has manifested itself in the use of composite indicators, which are numerical metrics built to 'tell a story. For example, a simple composite actor is GDP and common narrative ties to progress and development (Kuc-Czarnecka et al., 2020). Gorssel can also use such metrics for flood risk to guide project implementation and address information asymmetry since QS is more intuitive and inclusive for actors to follow. However, like GDP, such composite indicators are criticised and come with considerable risks, discussed in the following paragraph (Kuc-Czarnecka et al., 2020)).

1.5 Reflection on Proposed Strategies

In the final section, we reflect on the potential risks which analysts may face and how Gorssel can adapt the proposed solutions, see Table 1.

Table 1: Risks of Strategies and their Responses

Risk of Strategy	Potential Response
RDM strategies still require a decision and investment to be made, which (in the context of wicked problems) will likely be irreversible	Revisit the modelling using a DAPP approach to find if there are opportunities for generating more flexible
The requirement to iterate over RDM strategies may never resolve to a favoured solution by all actors.	Ensure there is a 'stopping point' for the iteration over the problem scoping. The analyst could base this on a deadline date at which the client must decide or a certain number of iterations.
Changes in leadership or government of involved actors result in changing priorities or disagreement with the consensus model.	Ensure that each step of the process is well documented, including all decisions and assumptions and past iterations of the scoping and their outcomes, such that the new or changed actor can become up to date on the process.
Participating actors have 'pet solutions', and they may influence the serious gaming or constructive modelling approaches to favour their solution.	Pot et al. propose several strategies to compensate for these behaviours, including the use of visions and scenarios.
Robust decisions can still be subject to other complications in their implementation as the model does not take into account limitations and uncertainties in implementation (for instance, delays in the actual building of flood mitigation measures)	Engage in expectation management with the clients and stakeholders around the limitations of the model. The model is just an abstraction of reality built to help inform decision making; scenarios are not forecasting. Saltelli et al., 2020 recommend that modellers be aware of hubris, ensuring they do not confer too much certainty in the modelling process.
The 'policy window' may not be open for the solutions to be implemented. Rijke et al., 2012 highlighted the importance of a sense of urgency that guided involvement in policy-making.	Being aware of the socio-political environment and long-term planning will allow rapid implementation when opportunities present themselves.
Even when all stakeholders use the same model, different problem formulations can result in significant differences in the nature of the policy advice.	The Serious Gaming approach can enable stakeholders to see how different conceptualisations can generate different results in the same model.
Quantitative storytelling using composite indicators may oversimplify multidimensional problems, resulting in simplistic or misleading policy messages if poorly constructed or misinterpreted	Acting as an "honest broker" ensures joint sense-making between client and analyst so that the analyst can address potential misconceptions.

Even when the analyst is aware of these risks, and their potential responses, the very nature of the wicked, highly contested problem spaces in which this analysis is occurring is such that uncertainties in the process itself could derail any one of these strategies, while also rendering the potential responses redundant. As analysts, we must practice what we preach; to be highly adaptable to the dynamic and uncertain political environment we are faced with.

The key is to uphold the trust and integrity of the modelling process. Managing expectations and the ability for a solution to be robust to different futures is essential to being an honest and transparent participant in the policy-making process. However, modellers must strike a balance between building stakeholder trust in their model and managing these expectations by using the many tools and methods at their disposal. Expectation management can backfire if it results in scepticism towards the outputs of the model. However, keeping all this in mind and utilising the proposed potential responses, we can find a favourable outcome for Gorssel and other clients in the future.

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