

When stakeholders cannot be involved in a modelling process: Integrating participatory modelling and consultative approaches

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Abstract

Diverse authors defend the idea that stakeholders' involvement is of crucial importance in most decision-making processes. Adequate selection and involvement of the actors of a given social system is a key issue to increase understanding of the problem, and even to ensure organisations' viability. This paper is based on a group model-building project conducted with the Netherlands' Environmental Assessment Agency, to understand how the main actors of the Dutch real estate market affect the dynamics of the mid-range price segment. We illustrate the approach we followed to model stakeholders' decision-making without including them in the participatory process. The aim of this paper is to analyse the limitations of the chosen approach, but also the extent to which its application is valid to inform public decision-makers. We argue that, modelling stakeholders' decision-making without them in the room can be a useful approach if the process follows a well designed and executed structure including a consultative and a participatory phase. For the case study, the consultative phase consisted of interviews with the stakeholders, and the participatory one with the GMB intervention. We further emphasise the importance of stakeholder analysis to guarantee that the system boundaries represent the actual policy-making domain of the decision-maker.

Keywords: Group model building, stakeholder involvement, stakeholder analysis, decision-making, systems mapping

Introduction and motivation

The involvement of stakeholders in the decision-making process is considered a crucial aspect of problem solving, as it allows getting a deeper understanding of the problem situation, and to ensure the viability of organisations in the long term (Nutt 1990, Bryson 2004). In fact, using a single perspective for problem framing, autocratic behaviour, and the failure to consider stakeholders' values and ethics, have been identified as some of the main causes of bad decisions (Nutt, 1990).

Mitchell et al. (1997) propose a dynamic theory of stakeholder identification and salience based on three attributes: power, legitimacy, and urgency. For each stakeholder, these attributes can change over time, making them more or less relevant for decision-makers. The stakeholder selection and their involvement will then focus on the highly salient ones, which are those who possess at least two attributes. Although Mitchell et al. (1997) address the need for a normative theory of stakeholder identification, they also recognise that there is not an objective definition of the attributes, but rather that these are social constructs. As Bryson (2004) explains, stakeholder selection is an inherently political process that involves judgement and has ethical consequences, since it defines who and what counts.

The arguments presented above portrait the importance of selecting and involving stakeholders. But although normative stakeholder theory pursues a broad and inclusive approach, this cannot always be translated to practice. By presenting a case study, we want to illustrate the approach we followed to model stakeholders' decision-making processes and values without including them directly in the process. The aim of this paper is to analyse the limitations of the chosen approach, but also the extent to which its application allowed to overcome this practical limitation to stakeholder involvement in modelling.

The paper is based on a Group Model Building (GMB) project carried out by the researchers with the Netherlands' Environmental Assessment Agency (PBL), with the aim to map the decision-making processes of some of the key actors of the Dutch housing market. Our argument is that a well-designed participatory process can foster the understanding of stakeholders' decision-making processes, even when the stakeholders are not directly involved in the GMB sessions. We suggest that in the presented case study, one of the success factors was that the process was led by a public decision-maker, as its aim is directed to create public value beyond satisfying particular stakeholders (Bryson 2004). In addition, the public organisation had obtained first-hand information on the stakeholders' decision rules through a consultative process involving qualitative data collection tools. For the case study, semi-structured interviews were carried out by the PBL team before the GMB project started.

We argue that, despite its limitations, modelling stakeholders' decision-making processes and values without them in the room can be a useful approach if the process follows a carefully designed and executed structure including a consultative and a participatory phase. We further emphasise the importance of carefully selecting the stakeholders, in order to guarantee that the system boundaries represent the actual policy-making domain of the decision-maker. In a second step, we thus apply Ulrich's (2003) approach of critical system thinking and argue that stakeholders analysis and selection can be an even more sensitive step in the process of considering all legitimate stakeholders than their involvement itself; a process which in this case study turned out to not be satisfactory.

The paper is structured as follows: In the next section we explain why GMB and systems mapping are suited approaches for the analysis of stakeholders' decision-making rules. In the third section we describe the process carried out with PBL and in the fourth section the methodology chosen to analyse the process. The fifth section presents the process results and discuss their validity, success and limitations in terms of the GMB process itself, the quality of the stakeholders' involvement and the quality of the stakeholder analysis. The paper closes with a conclusion and some recommendations for further research.

Group model building as a means to tackle complexity

Group model building (GMB) as a participatory modelling method has a high potential to foster the understanding of the complexity that characterises many organisational problems. This complexity is mainly due to the existence of contradictory interests and power differences amongst the different stakeholders, uncertainty about the outcomes of the project, and also to inter-personal dynamics that characterise group life (Phillips and Phillips, 1993).

The positive effects of this method have been well documented. For instance, Rouwette, Vennix and Van Mullekom (2002) conclude that GMB has the potential to make the group process smoother and to improve crucial elements such as effective communication, the quality of the insights gained, and the level of consensus and commitment. Vennix (1990) states that a participatory approach increases the commitment of the participants to the decision and likewise the chances of its successful implementation. He further points out that in order to produce satisfying results, the process needs to be adjusted to the characteristics of each specific case.

GMB sessions, which are managed by an unbiased and neutral facilitator, tend to create an environment in which participants feel comfortable to expose their ideas and perceptions, so that these can be discussed in the group and serve as a basis of analysis. This openness and spirit of collaboration help to foster an endogenous view of the problem and to focus on causal interrelations (Andersen and Richardson, 1997). It also fosters a holistic thinking. Coyle (2000) points out that by restructuring the participants' worldview and consolidating it with the one of the other participants, new insights are generated. Coyle further mentions the usefulness of qualitative modelling as a tool to structure complexity. The flexibility of this modelling approach allows integrating the ideas of the participants in a systemic framework which helps to identify factors and forces that affect the decision-making processes.

The concept of process consultation proposed by Schein (1999) is strongly related to GMB. Process consultation postulates that the client should be involved in the problem analysis, thus permitting them to learn about and understand their own organisational issues, in order to develop a more critical view and to lead the group efforts towards better decisions that should result in implementable policies. To ensure a smooth management of the process, it is of a great advantage if the facilitator also has knowledge in system dynamics -in addition to skills such as reflective listening and conflict handling- since system dynamics is the methodology used in GMB sessions. Reflective listening means that the facilitator is able to summarise the participants' contributions, in order to portray them in a model representing the problem. Finally, conflict handling is maybe one of the most important skills that a facilitator must have, since group interactions are usually accompanied by distinct types of conflicts which have the potential to defocus the efforts and discussions towards aspects without relevance for the problem at hand (Vennix, 1990; Campbell, 2001; Wolstenholme, 1982; Winch, 1993).

By combining divergent group tasks, such as the elicitation of key variables, with convergent tasks, such as the mapping of the interrelations between the variables in a causal loop diagram (CLD), it is possible to foster group learning and understanding. The role of the facilitator is essential to achieve this. Phillips & Phillips (1993) mention

that the facilitator, as the person who manages the process, must be aware of his or her own behaviour in order to manage the group dynamics. This is one of the main reasons why the facilitator should avoid participating in content discussions, since this might endanger the facilitator's objectivity, which is likely to distort the work of the group (Rouwette and Vennix, 2006). Likewise, the facilitator must attempt to ensure procedural and organizational justice in the modelling process, which means ensuring that the participants feel that their inputs are valued and taken into account, despite possible power differences (Cropanzano, Bowen and Gilliland, 2007). Such processes usually tend to foster a constructive discussion in an open environment (Vennix, 1996).

To sum up, GMB as a participatory modelling and facilitation method is a powerful tool compared to business as usual meetings as it allows to generate a holistic and inclusive view of complex decision problems, and to foster enduring understanding of complexity among participants by developing mental model alignment and refinement (Scott, Cavana and Cameron, 2013).

The project: To understand the decision rules of the key actors of the Dutch housing market

The aim of the GMB project with PBL was twofold: i) to build a qualitative model which provides insight into how the key stakeholders in the Dutch real estate market - commercial investors, housing associations, and municipalities - make decisions considering the on-going reform of the housing market aiming at liberalising the market and fostering its mid-range price segment; and ii) to consolidate the views of and establish consensus between the participants from PBL regarding their understanding on how stakeholders make decisions.

The current challenge for the Dutch government regarding the housing market is to assure that despite the desired contraction of the subsidised housing segment, consumers will be able to find affordable housing. To strengthen the mid-range price segment is seen as the most promising solution. But to understand how this could be achieved, it is important to understand the decision rules of the key actors in the housing market. The establishment of consensus among PBL team members was of importance since the team as a whole is supposed to formulate and advise public decision-makers regarding future policies aiming at the Dutch housing market. Therefore, alignment within the group of experts is important to give a consistent recommendation.

Three team members with different backgrounds represented PBL: a social researcher, a housing market lawyer, and a housing expert. PBL was responsible of the overall project to inform the Dutch government on the evolution of the mid-range price segment of the housing market. They had previously identified the three key stakeholder groups, and in order to better understand their decision-making rules, they applied a qualitative data collection method by conducting semi-structured interviews with some of their representatives. In the course of the project, the information that each PBL team member had regarding the stakeholders was consolidated in a qualitative model through a participatory modelling process. The process aim was to synthesise the wealth of information and to bring to light and clarify differences of understanding or perception between the three representatives of PBL, in order to generate a common understanding on how the stakeholders make decisions, and which could then be used to inform the decision-makers within the Dutch government.

The process for PBL consisted of two phases: A first one, which can be classified as consultative, and during which the members of PBL obtained qualitative data on the stakeholders' decision rules; and a second phase which can be classified as participatory, and during which we assisted the members of PBL to condense the collected information into a qualitative model.

During the first phase, which lasted about one month, PBL team members conducted semi-structured interviews with the stakeholders. They conducted the interviews in pairs, recorded them, and wrote down their key insights instantly after the interviews, before they started with the transcription of the interviews. Based on their notes and the transcriptions, they then went on to code the interviews.

The second phase, which consisted of our intervention, began with a kick-off meeting between the modelling team and the representatives of PBL. In the meeting, the key question and the problem domain were communicated to the modelling team, the data collection and modelling method were explained and the consecutive workshops and workbooks were planned. A total of three workshops and a final session to present results were conducted. In addition, two workbooks were sent to the three participants to cover divergent tasks such as the elicitation of relevant variables and the description of the impacts of the current and expected housing market reforms. We asked the participants to name both key variables and the likely impact of the reforms as perceived by each of the three key stakeholders. Their comments on the implications of the reforms were condensed in a cognitive map to facilitate the communication of the collected information back to the participants. By the end of the process we were able to deliver to PBL three individual CLDs - one for each key stakeholder - and a consolidated map showing how the decisions of the three stakeholders interact with each other.

The PBL team appeared to be satisfied with the process, as will be explained in the next sections. Since the question was of importance to them, they were highly motivated to participate in the sessions and to complete the workbooks. Discussions during the workshops were animated, and we felt that there was a lot of goodwill coming from the participants to make the process work.

Methods of analysis

To analyse whether the project conducted with PBL allowed for better understanding the policy-making context of the Dutch housing market as set by its key stakeholders, we analyse in a first step the quality of the process, and in a second step the inclusivity of the stakeholder analysis.

As explained in the preceding section, the project consisted of two phases: A first consultative phase, in which PBL gathered qualitative data through interviews with the stakeholders, and a second participatory phase, in which the insights gained from the interviews were consolidated into causal-loop diagrams in a participatory process with PBL. The modelling team was thus only involved in the second phase of the project.

Whilst it might be generally preferable to directly include the stakeholders in the modelling process, this is not always possible, due to time and resource constraints, as it was the case in the present case study. Our aim is thus to understand whether the chosen process is adequate to deal with this limitation. In the next section, we proceed to analysing the validity of the chosen process as well as of the conducted stakeholder analysis.

It has been repeatedly suggested to judge the quality of any modelling exercise based on how well it fits its purpose (e.g. Barlas & Carpenter, 1990). We will thus evaluate the chosen modelling approach based on its aptitude to fulfil the project goals set by the client at the beginning of the exercise. We base this analysis on literature on GMB processes and their evaluation criteria, as well as on the feedback received by the participants at the end of the process through the distribution of standardised questionnaires.

To analyse the quality of the consultative phase of the project, we will examine the process chosen by the client in view of literature on qualitative data collection methods, and on how such processes can be conducted in a way that minimises possible biases. Nonetheless, we are unfortunately not in a position to reach any conclusions with regard to how well the chosen process allowed us to represent the information collected from the stakeholders, since we did not have the opportunity to get feedback from them.

In a last step, we will look at the quality of the stakeholder analysis. According to Ulrich (2003), the stakeholder selection at the same time defines the policy domain, which shows the importance of this step. To evaluate how well the present case study is suited to understand the likely implications of the ongoing housing market reform, it is thus important to make sure that the system was defined in a way that allows to reach conclusions in this regard. For this, we apply Mitchell et al.'s framework on stakeholder salience (2007) based on power, urgency and legitimacy.

Results and discussion of the process

To establish whether the process chosen in the present case study is appropriate for the modelling of stakeholders' decision rules without including them directly in the process, it first needs to be established whether the process in itself can be deemed successful.

Quality of the GMB process

Since the project was designed as a group model building exercise, we will first evaluate if the project met the criteria of this methodology. In the course of this analysis, we will look at whether the process was appropriate both with regard to the chosen modelling method and the execution of the participatory modelling exercise.

As previously mentioned, the aim of the project was to consolidate and organise the participants' knowledge of the decision rules and characteristics of the key actors of the Dutch housing market, in order to better understand the likely impact of the reforms aiming at strengthening the mid-range price segment. According to Coyle (2000), CLDs are a very apt tool to simplify a complex problem and to find explanations for a system's behaviour, although, due to the lack of actual simulation, no behaviour can be inferred from the model. Nonetheless, in the present case, we deem that the use of a CLD, rather than of a simulation model, was justified, since the primordial object of the project was to organise, consolidate and clarify information. The use of a very intuitive and easy to understand modelling technique, which results in models that can be read by lay people, thus seems appropriate, given that it is generally recommended to use the simplest model that still serves the purpose (Walker, 2000; Barlas & Carpenter, 1990).

In order to judge the validity of the resulting models, we refer to Barlas and Carpenter (1990), who state that for a model to be deemed valid, it must be useful and requisite given its purpose. Not only does this define system dynamics modelling as a

problem-based approach, it also makes model validation an inherently social process. In our case, the model's purpose was to gather and consolidate information that can then be used to inform policy-makers on the design of appropriate reforms.

Campbell (2001) recommends to make sure that all participants' views are adequately represented, to ensure that the group understands the model as a novel representation of their own knowledge, and to foster model ownership by the client. Coyle (2000) further insists on the necessity that all variables have their real-world equivalence, and Nutt (1990) highlights the importance of avoiding black box models and of being transparent about the methodology and its limitations. We implemented these recommendations by following the instructions given by Vennix (1996) and Andersen and Richardson (1997), who describe the ideal structure of a participatory modelling process.

The use of a first workbook before the start of the actual modelling exercise gave us first insights about how the different participants perceived the problem, and where they put their emphasis, which made the facilitation during the workshops easier, since we were aware of potentially different interpretations, and also of positions which were not necessarily made explicit during the discussions. The careful and structured facilitation of the workshops ensured that all participants were able to voice their opinion, and that all inputs were discussed with the aim of building consensus and integrating them into the models. Some of the information gained from the workbooks was further translated into a cognitive map, which was also presented to the participants. Since some of the participants were new to modelling in general and participatory modelling in particular, we also spent a considerable amount of time both during the kick-off meeting and the first workshop on explaining to the participants the basics of CLD modelling as well as of participatory modelling, and the purpose of its reliance on neutral facilitation, where all content information comes from the client, whilst the modelling team is solely in charge of managing the process.

The participants' feedback on both the process and the resulting models and insights showed us that we had succeeded in assisting them to see clear in the plethora of information they had collected in the first phase of the project, and to give them a powerful communication tool. They not only agreed on the way the models represented their information and fostered its understanding, but they also derived some new insights from the models, which they were previously unaware of. This newly found consensus and joint understanding should make the participants' further research on the topic, and notably a quantitative analysis, much more easy and efficient (Hanssen, Rouwette, and Katwijk, 2009), and should help them to convey their insights to their colleagues within PBL.

We are however convinced that not only the carefully structured process, but also the good working atmosphere contributed to the success of the project. We were with regard to this in an advantaged position, since the participants were already a team before the start of the workshops and used to working together, which made the facilitation easier in some regards. The group was already conscious of its internal working and emotional life; a fact which not only made these elements more visible to the facilitator, but also enabled the group to support the facilitator in her intention to make the group process as effective as possible (Phillips & Phillips, 1993). Some authors have also mentioned dangers inherent to working with well-established groups that have low disagreements of content and outcome of tasks, such as premature consensus and groupthink, due to a higher need and desire for harmony in the group (De

Wit, Greer and Jehn 2012). In our case, we tried to mitigate this risk by distributing a first workbook before the first session, with the expectation that this would help us to be sensitive to possibly diverging opinions that might end up not being voiced in the workshops. These precautions were however unnecessary, as the group members never hesitated to express conflicting views and opinions, and were often animatedly debating. They even repeatedly asked us whether we had the impression that their opinions were aligned or very diverging, and showed a great interest in their peers' perspectives.

Quality of the stakeholder consultation

Thus having established that the process can be judged to have satisfied the exigencies of the participants, and to have produced the results they were expecting, we now need to analyse the quality of the consultative phase that PBL conducted with the stakeholders. As previously mentioned, the stakeholders were only involved in the process through an initial consultation, during which they could contribute information, but were excluded from the discussion of this information. The fact that the final models were not presented to the stakeholders, and that we didn't have any other chance of receiving feedback from them, means that we can only conduct this analysis based on the characteristics of the process, but that we cannot reach any conclusions with regard to how well the process actually resulted in models reflecting the stakeholders' views.

Nutt (1990) points out that key preconditions for good decisions are the inclusion of a wide variety of viewpoints, the avoidance of autocratic behaviour, as well as the avoidance of an overreliance on intuitive judgement. Since PBL based this project on extensive interviews with representatives of the housing associations, the commercial investors and the municipalities, it can safely be said that they were aware of their limited knowledge and the importance of understanding the key stakeholders' views. By committing a lot of time and effort to understand and map the stakeholders' perspective, PBL recognised the importance of taking their inputs into consideration in order to increase the effectiveness of the planned reforms (Nutt, 1990). However, no final validation stage was conducted with the stakeholders.

By conducting semi-structured interviews with different representatives of the selected stakeholders, and by dividing this work between them, the participants not only ensured that for each selected stakeholder, different representatives were heard, but also that the collection and interpretation of the information was not done by one single person, thus also allowing for a variety of viewpoints in the summarising and interpretation process. Nonetheless, the selected stakeholders were not actually present in the modelling workshops, mainly due to practical reasons. Their number was too large, and the required organisational effort had been deemed exaggerated.

Their absence from the modelling process most likely means that, if confronted with the models, they would struggle to see them as a representation of their own mental model, meaning that model ownership by the stakeholders would be endangered (Vennix, 1996, Campbell, 2001). However, since the purpose of the model was to help PBL to better understand their policy-making domain, and was to be used exclusively by PBL, we believe that in this case, the absence of the stakeholders in the modelling process might be less of a problem than it is usually assumed. As such, the most important prerequisite is that the model ownership of the participants is guaranteed, and that it contains information on the likely reaction of the stakeholders to reforms of the system. The model ownership of the participants was achieved through the participatory

modelling exercise, and the information on the stakeholders was to be gained in the first consultative phase. It has however to be kept in mind that the models don't exactly portray the stakeholders' perspective, but the participants' interpretation of the stakeholders' perspective.

Since the model is thus to be used as a source of information for governmental decision-making, it is all the more important that the information it contains is of high quality. The use of semi-structured interviews to gather information from the stakeholders has been distinguished as a valid technique to inform the conceptualisation stage of a modelling process (Luna-Reyes & Andersen, 2003). That the participants of PBL usually conducted and coded the interviews in pairs further mitigated possible biases, since, as Turner et al. (2013) mention, the data collector and coder is also the context setter. By sharing this work, thus introducing a control stage, PBL tried to avoid relying on the judgement of one single person, thus eliminating a too high degree of subjectivity. The interviews and the coding process also familiarised the participants with the language used by the respective stakeholders, and enabled them to use the same terminology during the modelling process. This should further contribute to the model being close to the representations given by the stakeholders (Repenning, 2003).

Another important factor to consider is that whilst in many participatory projects, the aim is to consolidate the conflicting interests and perceptions of the stakeholders, this was not the case here. The interests of the individual stakeholders do indeed differ and conflict, but it was not the aim of this project to change this. This project's goal was to consolidate PBL's perception of the stakeholders, and to produce a map of their policy-making domain. PBL, as a governmental agency, has the aim to create public value while satisfying all key stakeholders' claims, according to what the stakeholders define as being valuable. To pay attention to the stakeholders' claims is their way of finding out what is politically feasible (Bryson, 2004). This puts PBL in a neutral position, which it maintained during the modelling process, so that all stakeholders' claims entered the models on equal grounds. The resulting models thus have the aim to show where the interests of the individual stakeholders counteract each other, and to portray the key interests and ideals of each stakeholder.

A critical analysis of the stakeholder selection

To understand how well the models produced in the course of this process represent the system within which PBL has to implement policies, it is important to analyse how well the system boundaries have been drawn. Bryson (2004) states that the definition of the stakeholders is of crucial importance, since it defines the perspectives and viewpoints that are to be considered, and which are to be part not only of the problem definition, but also its solution. According to him, a stakeholder is any person or party affected by or affecting an organisation's activities. Stakeholders are thus not just those with the power to affect an organisation's goals. Ethical criteria, as well as considerations of social justice also have to be taken into account. This corresponds to Mitchell et al.'s (1997) consideration of three variables defining stakeholders: power, legitimacy and urgency.

Ulrich (2003) further highlights the importance of challenging and critically examining one's stakeholder selection and their role in the process. He joins Bryson (2004) in his view by stating that the selected stakeholders and viewpoints define the reference system of facts and norms to be considered. However, by emphasising the

inherent selectivity of all stakeholder analyses, he goes one step further than Bryson and Mitchell et al., by making a thorough analysis of one's boundary judgements one of the key goals of any project, in order to increase its normative content (Ulrich, 2003).

The question thus has to be asked whether the stakeholder selection of PBL meets these criteria. All three of the selected stakeholders -the housing associations, the commercial investors and the municipalities- have a high influencing power on the Dutch housing market, but are also affected by the government's policies aiming at its regulation or liberalisation. As such, they correspond to Bryson's (2004) definition of a stakeholder. If looked at from Mitchell et al.'s (1997) viewpoint, we can say that they have power and legitimacy -since they are sanctioned market players of which two are partly affiliated with the government- and most likely also urgency. This also puts them in the category of stakeholders that are absolutely to be included. That these stakeholders were selected by PBL thus seems valid. Another question is however whether the selection is exhaustive.

If we look at the selected stakeholders more thoroughly, we notice that the three of them together represent the key power sources governing the Dutch housing market -at the exception of the actual government. However, when thinking about housing, and particularly about strengthening the mid-range price segment, another important, yet at least individually powerless stakeholder comes to mind: The occupants of the houses, meaning the households. We thus have to admit that only stakeholders having the attribute of power were included in the process, whilst other potential stakeholders, who are lacking this attribute, were excluded. That it is of vital importance for the quality of the decision to include the stakeholders with power has often been mentioned (e.g. Snabe & Grössler, 2006; Grössler, 2007; Mitchell et al., 1997). However, it has also been pointed out that to limit the focus of the stakeholder selection to the stakeholders with power means only taking into account self-interest and the success of the organisation's goals as selection criteria (Mitchell et al., 1997), and that it is further likely to reinforce existing patterns of unequal power distribution, thus making the emancipation of potential stakeholders with less or no power increasingly difficult (Ulrich, 2003).

Whilst, as explained in the previous section, the process of the involvement of the stakeholders appeared to be methodologically sound, although we lack a final confirmation of how well the process represented the stakeholders' views, there are some serious concerns with regard to the selection of the stakeholders. If we follow Ulrich's (2003) ambition to increase the normative content of all systems exercises, and to not only strive for methodologically sound and successful projects, but also to incorporate ideological components as found in the normative stakeholder theory, the project remains unsatisfactory. The exclusion of potentially relevant stakeholders potentially biases the view of the system, which can complicate the implementation of any kind of policies, since there might be powerful interests or ethical claims that were not taken into account.

Conclusions

Although we recognise that stakeholder selection and involvement are critical for an effective decision-making process and for problem solving, it is often the case that their involvement is infeasible for practical reasons. The present case study has allowed us to test an approach to model stakeholders' decision-making and values without their

involvement in the GMB process, by relying on a consultative process involving qualitative data collection tools. It also allowed us to critically assess the case study in terms of the stakeholder analysis, under the assumption that stakeholder analysis is at least as significant as the involvement of stakeholders' itself.

We believe that this approach to model stakeholders' decision-making processes and values without them in the room notably resulted to be promising due to the following elements:

- *The process was led by and involves a public decision maker.*
A public decision maker has both the power and a high interest to solve the problem at hand. Furthermore, the aim of public organisations goes beyond satisfying a certain group of stakeholders; but rather to create public value and to satisfy all stakeholders' claims. Therefore, when the participants of a modelling project are from a public agency, they can be expected to be more likely to be concerned about generating an outcome that is considered useful by a large number of stakeholders, in order to fulfil their purpose as a public organisation.

- *The decision-maker had first-hand knowledge about the stakeholders' decision rules.*

The team members from the public agency that are participating in the modelling project have a good knowledge and understanding of the stakeholders' attitude and behaviour. A consultative process including qualitative data collection methods, such as interviews, appears to be appropriate. The validity of the inputs collected for the case study could only be partly assessed by a consideration of in how far the methods corresponded to the best practices of qualitative information collection and modelling. However, the validity of the inputs collected for the modelling exercise can only be assessed by going back to the stakeholders to evaluate whether their inputs have been considered adequately, which was not done in the present case.

- *There was a well-structured and facilitated modelling process which made the participants' perceptions of the problem explicit and consolidated them in a visual, easy to understand model.*

The intervention methodology is key to achieve successful results. GMB combines an effective modelling method, which uses causal loop diagrams, with the assistance of an unbiased facilitator handling group dynamics and managing the modelling process by encouraging participants to make their knowledge and assumptions regarding the content explicit.

On the other hand, one of the biggest limitations of this approach to model stakeholders' decision-making is related to the validity of the resulting model as perceived by the stakeholders. We address this limitation by considering Barlas' (1996) suggestion of judging the validity of a model by judging its appropriateness for its purpose. In this case, the model is not meant to be used as a tool to inform stakeholders or to foster their commitment, but rather to inform the decision-making process of the organisation. Nonetheless, the model can only provide useful insights for the decision-making process if the public decision-maker, who is providing the inputs for the modelling process, is well informed about the decision rules of the stakeholders. This means that even if they are not part of the actual modelling exercise, the stakeholders have to be considered in a consultative phase, in which the information that they hold is being extracted.

In the presented case study, the aim of the project was to model stakeholder's decision making without their direct involvement. This is thus a deviation from the typical goal of participatory modelling, and which is to consolidate the conflicting interests and perceptions of the stakeholders and foster consensus and commitment among them - in which case their involvement is a requisite. However, in this case, the project's goal was to consolidate PBL's perception of the stakeholders, and to produce a map of their policy-making domain, hence, the conflicting views and interest of the individual stakeholders did not need to be consolidated.

Lastly, for a modelling project like the one carried out with PBL to fulfil its purpose, and to inform the decision-making process, it has to take into consideration all relevant stakeholders. This highlights the importance of including a carefully conducted stakeholder analysis as part of the problem solving process. If the selection is not made based on attributes beyond influence or power, the modelling results will most likely be limited or biased. In this sense, we believe that in order to ensure that the project is inclusive and represents the policy-making domain adequately, the careful selection of the stakeholders can be even more relevant than their direct involvement in the process.

Limitations of the analysis and opportunities for further research

As previously mentioned, we did not have the opportunity to discuss the final models with the stakeholders whose views and perceptions they were supposed to represent. We could therefore only base our analysis on the quality of the process and on in how far it corresponded to the best practices of qualitative information collection and modelling. This is an important limitation, since we do not know if the stakeholders share our opinion that their inputs have been considered adequately.

We therefore think it would be highly advisable to conduct further projects in a similar setting, but where the final models, or at least the conclusions gained from them, are also presented to the stakeholders, in order to determine to which degree they feel that their inputs have been taken into consideration. The aim of such an undertaking would not be to ensure model ownership by the stakeholders, but to examine whether they agree with the selection and interpretation of their inputs. The stakeholders would thus still be involved only through a consultative process, but the researchers would most likely find it easier to evaluate the quality of their models and to define their limitations.

Another factor to keep in mind is that in the present project, all participants of the modelling exercise were from the same governmental agency, and additionally also were a team outside the GMB project. It can thus be assumed that their viewpoints were already to a certain degree aligned, which might have contributed to making the process as smooth as we had perceived it. Nonetheless, many governmental projects, due to their interdisciplinary nature, involve participants from different agencies. It would be interesting to know whether in such a case, it is still possible to conduct such an analysis, or whether the likely need for placing more emphasis on aligning the participants' mental models would mean that less time and effort could be invested in carefully analysing and discussing the stakeholders' contributions.

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