

Modelling for Policy Without Policy Modelling

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Abstract. This paper reflects on the efforts of the ABM community to model for policy from our perspective as policy developer. Our goal is to enrich the understanding the community of this perspective on the policy processes and draw attention to more opportunities for modelling in the policy process. We make this explicit by introducing the problem cycle as part of the policy process. The problem cycle can be understood as an iterative process that precedes the policy cycle and has its own goals and results. By modelling in the problem cycle modellers can add valuable contributions to the policy process without modelling a policy. We provide three initial tools to modellers to advance their thinking on how to do this. One: a mapping showing the usefulness of the various model(ling) goals for each policy phase. Two: a classification of different types of governments and what they value. Three: an introduction to actionable perspectives as an effective way to present results to policy. We conclude by stressing that it is always important to have conversations with policy people on equal footing to identify how to usefully model for policy without modelling a policy.

Keywords: Agent-Based Modelling, Modelling for Policy, Goals of Models, Model Purposes, Policy Development, Policy Problem, Policy Process, Policy modelling, Policy Cycle, Problem Cycle, Types of Government, Handelingsperspectief, Actionable Perspective

1 Introduction

In this paper we reflect on our experiences as policy developer on the efforts of the Agent-Based Modelling (ABM) community, including ourselves, to model for policy. Our goal is to enrich the insight and language of the community in policy processes and draw attention to more opportunities to use modelling in a policy process. We will do this by discussing reflections and overviews from the community on this topic, the theoretical policy cycle in relationship to the policy process practice in the Netherlands, map modelling goals to policy phases, discuss different types of government styles and introduce the concept of actionable perspectives.

With our reflection we aim to extend other discussions and reflections on modelling for policy. These reflections stem from the feeling in the community

that our work can be more useful to policy development than it currently is. For example Edmonds and ní Aodha [1] neatly illustrated things that can go wrong when we trust models too much for policy development, identify relevant pitfalls and suggest mitigation measures. Gilbert et al. [2] provides a broader reflection by discussing various use-cases and drawing general lessons from them to improve modelling for policy. From the complexity science perspective, one of our neighbouring communities, Nel and Taeihagh [3] add an extensive literature review on non-technical challenges that hinder the adoption of modelling in policy processes. They also make various suggestions to improve the situation.

All these papers are a good read for anyone who wants to gain more understanding of the issues we face. Yet from a policy developer perspective all of these papers leave us with questions that can be summarized as “what do you mean with *modelling for policy*?”. It seems that most of the authors (often implicitly) answer this question with “the goal of modelling for policy is to model a policy”. We think that the ABM community is selling itself short with this answer; a policy is only one of many results a policy process can have. That this aspect is overlooked is not very surprising; the process is called the *policy* process, the process model is a *policy* cycle, the people involved have roles named *policy* analyst, *policy* maker, *policy* developer and *policy* advisor and the most visible result to the outside world is indeed a *policy*. So what else than a *policy* would the result, and thus useful modelling work, be?

In our attempt to answer this question we will first discuss the policy cycle in Section 2 to put most of the community’s efforts in broader perspective and illustrate where opportunities can be found. In Section 3 we will then provide a number of tools that can help to make use of these opportunities. We will add some more general reflections and conclude in Section 4.

2 Policy Cycle and Problem Cycle

To answer the question “what else than a policy?” we can start with a further look at the policy cycle. Figure 1 illustrates a theoretical policy cycle. The phases are sometimes called differently or merged together, but generally it depicts an iterative Plan, Do, Check, Act (PDCA) type of process. The representation of the process with such a cycle also implies that the policy process is neatly structured and abides the rules of the process model. In reality the policy process is often more hectic, chaotic and unpredictable as steps can be skipped, repeated or have a different order. Despite the difference between practice and theory the policy cycle is an useful model of the policy process for our discussion.

In the policy cycle in Figure 1 we have added a *problem cycle*. This problem cycle deals with the question “what is the right problem?”. From experience this part of the policy process is very important and often time consuming. In this cycle we try to figure out and decide how to describe a *policy problem* in such a way that it can be dealt with in a good way *if it is decided that governmental involvement is needed*. Agreeing on a problem definition, a shared language, understanding of concepts, responsibilities, relevant stakeholders and

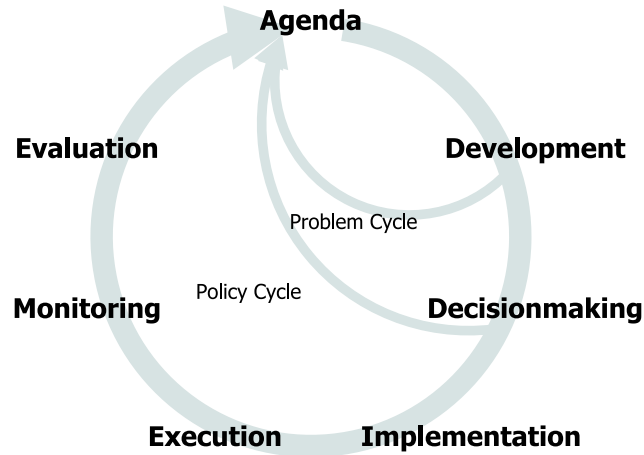


Fig. 1: A schematic representation of the policy cycle and problem cycle. The policy cycle includes all the steps, the problem cycle includes Agenda, Development and Decisionmaking.

ways to structure the related processes are all results that can be achieved in this cycle. One thing that we have learned in this process is that it's a process of small incremental steps. While we would like to directly plan to find the “correct” problem and/or solution, more often than not policy developers work towards intermediate products to get things moving in the right direction within organisations. Notice that we aren't modelling policies in the problem cycle, but that the outcomes do have impact on potential policies.

One of the final outputs of a problem cycle can be a policy problem. Usually this is the starting point of involvement of policy modelling. One example is the nice methodology of Nespeca et al. [4] to use ABM for policy support. The methodology aims to provide policy support “given a policy problem” (also without specifying what a policy problem is). It does have a Problem Formulation phase, but this phase looks at the modelling problem and not the policy problem:

“The problem formulation entails making decisions about (a) the modelling purpose and (b) the system's performance and change of interest to be captured respectively by criteria for assessment and other indicators designed to study possible changes in the configuration of the system. These choices are made based on the policy problem and the application of the conceptual framework as shown in the following.”

This illustrates a general pattern that we see in the work in our community: we assume that there is a clear policy problem and model policies based on that problem. With this approach we mostly ignore the problem cycle. But, depending on the policy context, the problem cycle can be the biggest part of a policy process. This difference is illustrated in Figure 2. The exact size, location

and shape of the areas are of course up for debate; it merely serves to indicate how much opportunities are still out there that we don't make use of.

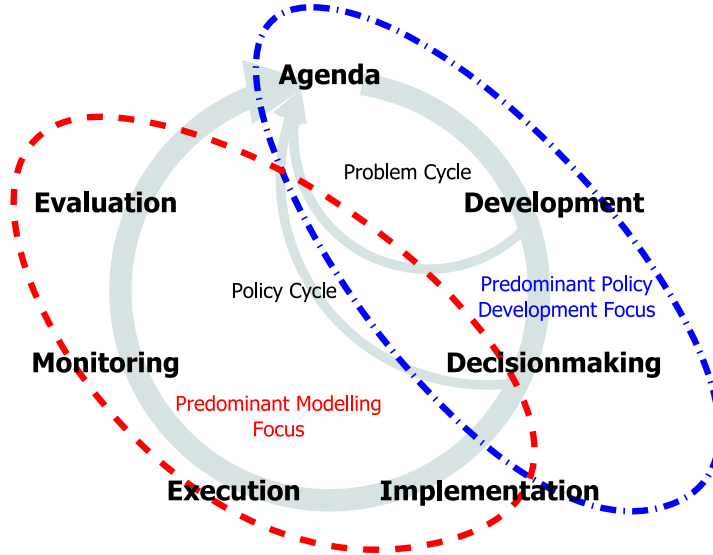


Fig. 2: The policy cycle and problem cycle with a red dashed circle depicting the predominant modelling focus and a blue dashed-dot circle depicting the main focus of the policy development process.

We do want to add one bit of nuance based on the work of Gilbert et al. [2]. In their work Gilbert et al. remark that the main benefit of policy modelling is that “it provides an understanding of the policy domain” and helps to “clarify understanding of the processes at work in some domain.”. These types of results are exactly what we want to find in the problem cycle. But by focusing on policy modelling these types of results only seem to be nice side benefits. By focusing on the problem cycle we can upgrade them to core results for, and contributions to, the policy process.

3 Tools to Contribute to the Problem Cycle

We’ve made explicit that modelling for policy can be more than modelling a policy. Yet we can imagine that it might be difficult to image how to model for other things than a policy as it is quite ingrained in our thinking and language. We will provide a number of tools to aid the thinking about the usefulness of modelling for the whole of the policy process.

3.1 Goals and Cycle Phases

Table 1 illustrates the usefulness of the goals of models by Epstein [5] and various goals of modelling that we have earlier presented in [6] for each policy phase. This table has been created using our own interpretation of the goals and how the different policy phases are experienced in our daily policy practices. Parts of these experiences are discussed in earlier work (Melchior et. al. [7]), which provides more context on our reasoning. The phases are both applicable to the policy and the problem cycle. So, for example, *explain* can be both read as *explain how the policy works* and *explain how the problem works*.

#	Model Goals	A	Dv	Dc	I	Ex	M	Ev
1	Explain	✓	✓	✓		~		✓
2	Guide Data Collection	~	✓	~			~	✓
3	Illuminate Core Dynamics	✓	✓	✓				✓
4	Dynamic Analogies	✓	✓	✓	~	✓		
5	Discover New Questions	✓	✓	~				✓
6	Scientific Habit of Mind	~	✓					✓
7	Bound Outcomes to Plausible Ranges							
8	Illuminate Uncertainties		✓	✓				✓
9	Crisis Options in near Real Time	~	✓	✓	✓			✓
10	Show Trade-offs		✓	✓				✓
11	Challenge Robustness		✓					✓
12	Show that Wisdom is Incompatible with Data		✓	~				✓
13	Train Practitioners				✓	✓		
14	Disciple Policy Dialogue			✓				
15	Educate General Public				✓	✓	~	
16	Reveal Simple/Complex to be Complex/Simple	✓	✓	✓	~			~
17	Predict				~			
#	Process Goals	A	Dv	Dc	I	Ex	M	Ev
P1	Understanding of Problem Complexity	✓	✓	✓				~
P2	Improve Alignment	✓	✓	✓	✓	~		~
P3	Suggest Next Steps	✓	✓					~

Table 1. Goals and applicability in various policy development phases. ✓ = useful, ~ = somewhat useful. Phases: A=Agenda, Dv=Development, Dc=Decisionmaking, I=Implementation, Ex=Execution, M=Monitoring, Ev=Evaluation

A brief discussion on the phases and how the goals help in these phases is in order. In the *agenda* phase the goal is to get something on the agenda in the right way with the right story. Modelling can help to understand *what* to put on the agenda (what is the right problem) and *how* to put it on agenda. For example, initially a problem might have looked like a technical issue, but during the modelling exercise it is learned that it has a big social and economic aspect as well. Or, maybe we have learned that the problem as a whole is too much to put on the agenda and slicing it up in smaller pieces will be more successful (this is known as the Salami slicing tactic). This provides the option to reformulate

the problem as a different problem, with a better story, while still addressing the fundamental issue.

In order to do good agenda setting the *Development* phase and *Decision-making* phase can provide us with better topics to put on the agenda. The development phase does this by improving the understanding of the problem, whereas the decision-making phase provides decisions about what is and what isn't important. One example of our own experience is a case-study on the uptake of electronic vehicles (EV's) by consumers [8]. In this case-study the goal was to identify useful indicators to monitor the transition to EV's, which in turn could indicate where additional policy might be needed. Through our modelling exercise we were able to identify various indicators and explain why they say something useful about the transition. This led back to the agenda phase with the question if the government should invest in measuring the suggested indicators or not.

Once a policy problem has been identified and a policy has been devised the *implementation* phase starts. Here the main question is not what we should do but how we should do it. The *execution* and *monitoring* phases ideally work in parallel: we want to monitor how things develop during the execution. No new things are developed or decided in these phases. The *evaluation* phase offers a moment to reflect if the goals the policy set out to achieve have been properly achieved. In our experience it's not rare that this phase is seen as a formality, which begs the question how useful it is to try to model for this phase despite the large number of goals that would be useful for evaluation.

3.2 Types of Government and The Effect on Modelling for Policy

Despite how sharp and clean Table 1 might look, the exact meaning of the words used and how goals are seen as useful is far from clear cut. The table is a generalization and lacks such details. But, to be able to usefully model for policy it is important that the modeller is able to specify how the concepts in Table 1 are interpreted and used.

One important dimension that affects the (perceived) usefulness of modelling with a certain goal in policy processes is the type of government one wants to model for or with. Depending on the type a governmental organisation different things are valued and seen as important and useful. To give the concept of different types of government more body and make it actionable we have translated and included Table 2 by Faber [9].

In [9] Faber discusses the emergence of "transitions" and "system approaches" in broader Dutch policy discussions and offers policy developers a way to structure their thinking about them. This can be seen as a change in Dutch policy culture which still has its roots in the Dutch Polder Model. This policy culture has a strong preference for consensus based policy development, something that is exemplified by the central positioning of stakeholders in the Dutch Policy Compass (Beleidskompas)[10]. The policy compass shows an ideal (Dutch) policy process and is illustrative for the things that are deemed important (and useful) in this policy process.

	Legitimate government	Performing government	Collaborating government	Responsive government
Actors				
Driving force	(Central) government	(Central) government	Interplay of actors, incl government	Private sector/civil society
Stakeholders	Autonomy/roles decided by principal(government)	Autonomy of the market	Equality	Self-organisation; community
Power base	Authority; democratic representation	Competition; scientific knowledge; contracts	Agreement; knowledge; trust	Leadership; involvement; social capital
Institutions				
Representation	Pluralistic	Pluralistic; corporate	Partnership	Partnership
Roles for interaction	Formal	Formal	Formal and informal	Informal; social norms
Mechanisms of interaction	Top-down; command & control; autonomy	Management; interaction	Interactive; collaboration; deliberation; negotiation	Bottom-up; collaboration; deliberation; learning; negotiation
Policy content				
Goals	Uniform; generic	Uniform; specific	Actor-specific; process-oriented	Process-oriented
Instruments	Legislation; norms; rules; standards	(Economic) incentives; performance- contracts	Covenants	Voluntary agreements; private contacts; labelling; reports
Type of knowledge	Disciplinary scientific expertise	Interdisciplinary scientific expertise; boundary work	Transdisciplinary scientific expertise; lay knowledge	Practice; specifics of (local) expertise
Policy integration	Sectoral	Sectoral; thematic	Integral	Local

Table 2. Perspectives on management and role of government. Translated from [9].

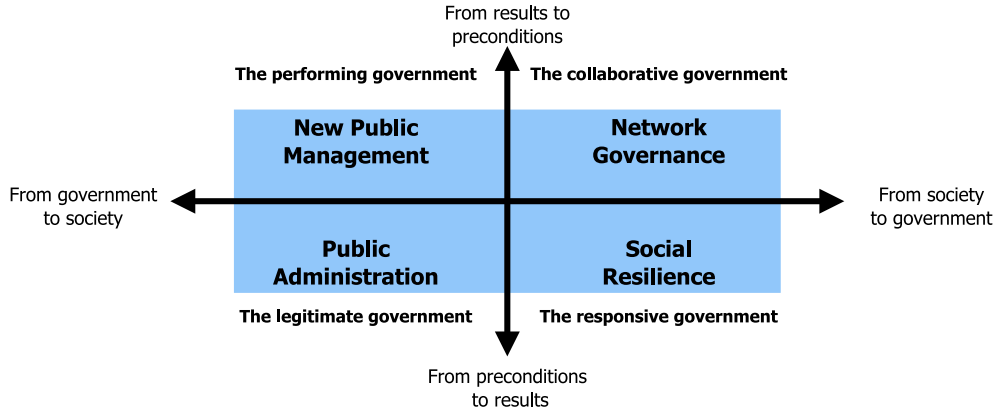


Fig. 3: Perspective on control (Dutch: sturing). Translated form [9].

Faber uses Figure 3 to illustrate that classifying a type of government is not a black or white choice. We can plot a governmental organization somewhere in the blue space of Figure 3 depending on how much it leans to a type of government. For example, most of the Dutch government has its focus in collaborative government (Polder Model) but also has strong parts of the legitimate government. When a modeller is able to identify the type of government they are modelling for or with, it becomes easier to suggest modelling goals and approaches that are deemed useful by this government and its policy developers. For example, if one works in the context of a responsive government a modelling exercises that focuses on disciplinary scientific expertise is less likely to be deemed useful than one with the focus on eliciting local expertise. In our own policy process practice we see that trust, social capital and collaboration are very important as starting point for discussions in policy processes. But if this fails, and you can show that you really tried, it is acceptable to switch to a more legitimate style of government and use other approaches. As such modelling approaches that are compatible with these aspects are more successful in our policy practice.

Table 2 can also help to identify which types of government a known methodology is useful for. To illustrate we can take a look at Companion Modelling [11] (ComMod). ComMod is a cross-disciplinary approach to address (local) environmental issues and to rely where possible on modelling methods for interaction between different disciplines and stakeholders. It is mainly used for local policy issues, drives on self-organisation of communities, tries to build on partnerships, interactions seem to be informal, bottom-up and collaborative and results in agreements, contracts and knowledge of the local phenomena. In a comparable context Johnson [12] experiments with using ABM as an “interested amateur” for policy discussions. This experience highlights the importance of understanding policy culture and the role of the facilitator to effectively use ABM to improve policy. As such ComMod fits responsive government well, collaborative govern-

ment somewhat and will most likely not succeed in legitimate and performing government.

3.3 Handelingsperspectief: an Actionable Perspective

As a policy advisor one of our main goals is to provide an *actionable perspective* (Dutch: *handelingsperspectief*) to decision makers within government, such as the most senior civil servants and ministers. An actionable perspective is a perspective on the (various) action(s) that a decision maker can decide to take to achieve a certain goal. The most known version of an actionable perspective is a set of different policy options to achieve a policy goal. The actionable perspective describes these choices as scenario's and what the expected outcomes will be, both negative and positive. The decision maker can then make the choice which, if any, scenario's to implement. For example, if we want to reduce the number of accidents with cars on a certain road we can present a number of scenario's which the decision maker can choose from.

Providing an actionable perspective is possible in more ways than just providing policy options. One way to do this is by using the problem cycle introduced in Section 3.1. In the problem cycle we can present options on how to describe, scope and frame an issue as an actionable perspective. The decision to adopt a certain framing, scoping or description affect the future options available with regards to the issue at hand. It locks you into a certain path towards certain potential policy options. To illustrate this in the ABM context we have formulated a number of examples of actionable perspectives that relate to a better understanding of the problem in a policy process:

1. This is an explanation of the (complex) system that causes issue X . These are the details, here are the main dynamics and this are the things that need to be addressed to reach goal Y . By adopting this explanation of issue X as framework a project can be started to investigate how¹ to address the identified dynamics in such a way that it contributes to reaching goal Y .
2. There are various issues, but it is unclear what the main issue is. We advise to start a process to further investigate issues X , Z , A as these are the most relevant to achieve Y .
3. There are various issues, but there is no agreement about their importance between stakeholders. We advise to start a process to decide on the main issue or find a framing that satisfies most stakeholders based on our proposed structure, guidelines and scope.
4. The issue is bigger than we anticipated, we are unable to provide sensible advise to realize goal β now. We advise to choose one of two actions to enable us to provide sensible advise:
 - We can zoom out to get a broader perspective on the issue, starting with domain γ and δ and focus on aspects 1 and 2.
 - We can put ϵ and ζ out of scope and zoom in on the remaining elements to find a way forward.

¹ To develop a *how* is usually the role of a policy developer.

To provide more inspiration for actionable perspectives, next to Table 1, we have included Figure 4 by Boonstra et. al. [13] by translating the Dutch version to English. It lists various interventions in different categories that can be used to formulate an actionable perspective. For example, we can use an ABM to *explain* a phenomenon in order to *discuss obstacles* in the policy development.

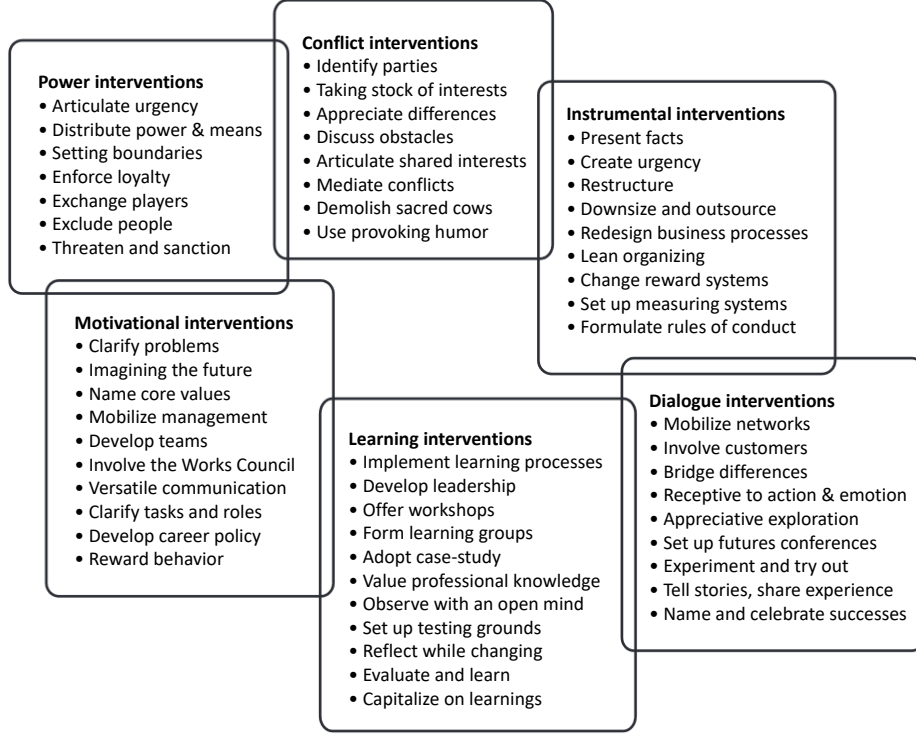


Fig. 4: An overview of interventions. Translation of Figure 6.5 from [13]. Lost in translation: “Verschillen waarderen” can be both “appreciate differences” as “value differences”.

4 Discussion and Conclusion

With this paper we aim to enrich the discussion on modelling for policy by offering modelling opportunities that are not policy modelling. We identified phases in the policy process where different types of modelling can be useful by separating the policy cycle and the problem cycle, which are both part of the policy process. The mapping of various modelling goals to policy cycle phases in Table 1 helps modellers to better focus their efforts when modelling for or with policy. Table 2 adds to this by providing four perspectives in which we can interpret the content of Table 1 and make it more actionable in the policy process

practice. We introduced actionable perspectives to make it easier to formulate results in a way that is more useful to policy developers.

This would also be a good place to underline the effort it takes to work with or for policy as modeller. Making a connection with policy people and opening the door to access each other is no simple feat. It takes time to listen to them, understand what their issues are and what they see as added value for their policy process. This might ask for a change of approach of modellers who are less used to this. Nel and Taeihagh [3] illustrates this needed change neatly. The gist of their suggestions seem to be that policy developers are at fault and should change how they work to enable the modellers to model the right models. This way of thinking and communicating immediately removes a modeller from consideration by policy developers, totally ignoring how useful their work might be for the policy process. The only thing that modellers can control is their own actions, presentation and how they make a connection with others. So we strongly advise to focus on that part of this relationship.

We discussed the problem cycle and the modelling of complex systems with other policy developers. These discussions noted that the problem cycle is a good way to look at parts of the policy process. At the same time the relevance of a problem cycle depends on the policy context. The importance of providing actionable perspectives and respect for one another was stressed if scientists want to be useful in policy processes.

The discussion on the topics addressed in this paper is far from done. Many things that we put forward could use improvement in clarity, be better explained with striking examples or change in even more drastic ways. We take the same approach as many policy processes: small steps forward. A small improvement on the current situation is still an improvement. If it broadens the conversation from policy modelling to modelling for policy in even a small way, we are successful. And also something to take from the policy world: having the right conversation is a result in itself.

On a final note we would like to recommend Rosewell’s story [14] on her experiences in policy development as modeller. It is a great examples of missing the bigger picture, asking the wrong questions and the difficulty of changing this. Our experiences are not as extreme as Rosewell describes, but it provides valuable insights to understand policy contexts.

References

1. Edmonds, B., ní Aodha, L.: Using agent-based modelling to inform policy—what could possibly go wrong? In: Multi-Agent-Based Simulation XIX: 19th International Workshop, MABS 2018, Stockholm, Sweden, July 14, 2018, Revised Selected Papers 19, Springer (2019) 1–16
2. Gilbert, N., Ahrweiler, P., Barbrook-Johnson, P., Narasimhan, K.P., Wilkinson, H.: Computational modelling of public policy: Reflections on practice. *Journal of Artificial Societies and Social Simulation* **21**(1) (2018) 14
3. Nel, D., Taeihagh, A.: The soft underbelly of complexity science adoption in policymaking: Towards addressing frequently overlooked non-technical challenges. *Policy Sciences* (April 2024)

4. Nespeca, V., Comes, T., Brazier, F.: A methodology to develop agent-based models for policy support via qualitative inquiry. *Journal of Artificial Societies and Social Simulation* **26**(1) (2023) 10
5. Epstein, J.M.: Why model? *Journal of Artificial Societies and Social Simulation* **11**(4) (2008) 12
6. Melchior, A.: Beyond the results of models: additional purposes for modelling in the policy process. In: 2021 EU Conference on modelling for policy support: collaborating across disciplines to tackle key policy challenges. 20–21
7. Melchior, A., Dignum, F., Ruiz, M.: A closer look at dutch policy development. In Ahrweiler, P., Neumann, M., eds.: *Advances in Social Simulation*, Cham, Springer International Publishing (2021) 383–395
8. Melchior, A., Dignum, F., Yolum, P.: Policy development for societal challenges: The collaborative agent based modelling policy framework. In Elsenbroich, C., Verhagen, H., eds.: *Advances in Social Simulation*, Cham, Springer Nature Switzerland (2024) 235–248
9. Faber, A.: Transitietheorie in de beleidspraktijk. *Beleid en Maatschappij* **4** (2021) 367–386
10. Kenniscentrum voor beleid en regelgeving, Dutch Ministry of Justice and Security: *Beleidskompas* (3 2023)
11. Étienne, M.: *Companion modelling: a participatory approach to support sustainable development*. Springer (2013)
12. Johnson, P.G.: Agent-based models as “interested amateurs”. *Land* **4**(2) (2015) 281–299
13. Boonstra, J., de Bruijn, H., Burger, Y., van Es, R., van Twist, M., Vermaak, H.: *Veranderen van maatschappelijke organisaties*. Business Contact (2017)
14. Rosewell, B. In: *Complexity Science and the Art of Policy Making*. Springer International Publishing, Cham (2017) 159–178