Patterns in joint knowledge production projects for regional climate change adaptation – lessons for project and program design

Dr. Ir. D.L.T. Hegger*
Environmental Governance; Copernicus Institute of Sustainable Development
Faculty of Geosciences
Utrecht University
PO Box 80115
3508 TC Utrecht, The Netherlands
Telephone: ++31 (0)30 2537829
Fax: ++31 (0)30 2532746
E-mail: d.l.t.hegger@uu.nl

Dr. C. Dieperink†
Environmental Governance; Copernicus Institute of Sustainable Development
Faculty of Geosciences
Utrecht University
PO Box 80115
3508 TC Utrecht, The Netherlands

Keywords: typology; joint knowledge production; knowledge production for sustainable development; regional climate change adaptation; design principles

Total word count: 7,948

* Postdoctoral researcher
† Assistant professor
Abstract
In the domain of global change adaptation and sustainability, various efforts are made to arrive at joint knowledge production through intensive cooperation between scientists and policymakers. Regional climate change adaptation projects in The Netherlands form prominent examples of this. Joint knowledge production is expected to lead to better, more policy relevant or more useful knowledge. However, there is a lack of systematic empirical studies on how to successfully ‘do’ joint knowledge production in regional climate change adaptation projects. Existing research on the topic is restricted to conceptual analyses and fragmented empirical studies. This paper aims to provide some building blocks for an empirically scrutinized design framework for joint knowledge production projects. In this paper we will compare six Dutch adaptation projects with the help of a previously developed assessment framework. Data was collected through document analysis combined with 30 semi-structured interviews with researchers, policymakers and project financiers. Based on this comparison and subsequent categorization, the paper develops a typology of joint knowledge production in regional climate change adaptation projects, consisting of two variables: the type of knowledge produced in projects (knowledge vs. policy oriented), and the organizational positioning of the joint knowledge production project vis-à-vis science and public policy (policy project vs. innovation project). The paper concludes by discussing the implications of the typology for a design-oriented framework for joint knowledge production and identifying next steps for developing an empirical knowledge base for the analysis, evaluation and design of joint knowledge production projects.
1. Introduction

In several Western European countries, large programs have been carried out supporting or addressing climate change adaptation. Some of these programs, for instance the Dutch programs ‘Climate Changes Spatial Planning’, ‘Living with Water’ and ‘Knowledge for Climate’ or the German ‘Klimzug’ program, include regional projects in which scientists and policymakers cooperate directly. Such efforts at direct science-policy cooperation are often referred to as knowledge co-production (Pohl et al., 2010); knowledge co-creation (Regeer and Bunders, 2009) or joint knowledge production (Edelenbos et al., 2010; Hegger et al., 2012; Van Buuren and Edelenbos, 2004). A frequently-mentioned reason for endorsing joint knowledge production is ‘that it leads to better, more policy relevant or more socially robust knowledge’ (Climate Changes Spatial Planning, Arcadis, Brinkman Climate change, 2006; Climate Changes Spatial Planning and Knowledge for climate, 2009).

Previous research suggests that joint knowledge production efforts are indeed relevant, since joint knowledge production can lead to knowledge which actors could only arrive at through direct cooperation (Climate Changes Spatial Planning and Knowledge for Climate, 2009; Hegger et al., in preparation). However, as literature from the sociology of knowledge (Funtowicz and Ravetz, 1993; Gibbons et al., 1994; Gieryn, 1983; Nowotny et al., 2001; Scholz and Marks, 2001), science policy studies (Guston, 2001; Hisschemöller and Hoppe, 2001; Hoppe, 2005; McNie, 2007; Sarewitz and Pielke, 2007) and environmental governance (Bäckstrand et al., 2010; Biesbroek et al., 2010) shows, various factors can complicate fruitful science-policy cooperation: research-based knowledge may fail to match expectations of policymakers; it may be used differently than was expected or intended; science is fragmented across disciplines and the interaction between science and policy is complex due to differences in timeframes, reward structures, goals, process cycles and epistemologies (Herrick and Sarewitz, 2000; Sarewitz, 2004; Van den Hove, 2007; Weichselgartner and Kasperson, 2010). The value pluralities and uncertainties associated with global change and sustainability problems complicate things further (Hisschemöller and Hoppe, 2001; Kemp and Martens, 2007). Hence, joint knowledge production projects risk becoming merely strategic or symbolic processes without intentions to arrive at deliberation of the benefit of society (Cash et al., 2003; Edelenbos et al., 2011). Some projects will be more successful than others in meeting actors’ demands for credible and salient knowledge that has been produced through a legitimate process (Hegger et al., 2012).

This paper aims to contribute to the identification of science policy ‘design principles’, levers for action to be used by actors at the level of projects, programs and program financiers (see also Hegger et al., 2012; Lang et al., 2012). The paper’s starting point is that blueprints for ‘how to do joint knowledge production’ do not exist (Ostrom et al., 2007). It is, however, expected that a comparative assessment of empirical cases leads to the identification of measures and approaches that are relevant for – and can be
translated to – different contexts. We assume that the ‘success of joint knowledge production’ can in part be explained by the way in which knowledge production processes in the projects are structured, although some explanatory factors will be context-specific and highly contingent.

In a previous paper (Hegger et al., 2012) we have identified seven potential success factors for joint knowledge production projects, divided over four analytical dimensions (actors, discourses, rules, resources). This framework will be used to perform a comparative analysis of six Dutch adaptation projects within two recently finalized research programs, Climate Changes Spatial Planning (CCSP) and Living with Water (LWW). These will be characterized with the help of the above-mentioned success conditions. Our empirical material was collected through desk research combined with 27 semi-structured interviews with researchers, policymakers and program managers involved in the projects and programs. Based on the analysis, different contexts for joint knowledge production have been distinguished. We expect that the identification of these different contexts enables the development of more specific science policy design principles.

The outline of this paper is as follows. First, in section 2, we will introduce our analytical framework, specifying the success of joint knowledge production projects as well as seven tentative success factors derived from literature. In section 3, the researched programs and projects are briefly introduced. Section 4 gives a characterization of the relative success of each project. Next, in section 5, each project is characterised in terms of the seven success conditions and a typology of joint knowledge production projects based on two variables is derived from this. Section 6 provides reflection on the usefulness of the typology. Finally, section 7 concludes on where we stand in developing a design framework for joint knowledge production projects and identifies next research steps.

2. Conceptualising joint knowledge production, its success and success factors

Recognizing joint knowledge production: conceptual clarification

Joint knowledge production constitutes a specific way of structuring the science-policy interface (Van Den Hove, 2007) through direct cooperation between scientists, public policymakers (and sometimes other societal actors) in projects. This type of joint knowledge production can be seen as a manifestation of both Mode 2 knowledge production (Gibbons et al., 1994; Nowotny et al., 2001) and Post Normal Science (Funtowicz and Ravetz, 1993). It can also be portrayed as part of a broader deliberative turn in environmental governance (Bäckstrand et al., 2010).

It is important to note that interaction between science and policy also takes place outside joint knowledge production projects. Literature, amongst others from the STS field, emphasizes that models portraying science-policy interactions in terms of two worlds separated by a gap are inadequate, since sharp
distinctions between science and power do not exist (Andresen et al., 2000; Jasanoff, 2004; Jasanoff and Martello, 2004; Latour, 1987; Wehrens et al., 2011). Hence, joint knowledge production should be seen as a more direct and recognizable form of something that always takes place at least to some extent: co-evolution or co-production of science and society.

**Evaluating the success of joint knowledge production**

In this paper, we will draw on a previously developed definition of successful joint knowledge production, it being: ‘A process in which the actors involved have managed to maximize synergy and minimize tradeoffs between the salience and credibility of the knowledge produced as well as the legitimacy of the process’ (Hegger et al., 2012: 54).

This definition departs from the viewpoint that actors in joint knowledge production projects differ in their knowledge interests. Scientists may, for instance, be interested in knowledge which meets scientific standards and constitutes material fit for publication, while they may also require that they can report unwelcome findings to policymakers. Policymakers may be interested in plausible knowledge (credibility) that meets the demands of decision makers, while they hope that something is in it for them (legitimacy). They may not wish to serve purposes of scientific curiosity only. Another assumption underlying the definition is that, given the value pluralities inherent in joint knowledge production projects, a constructivist evaluation of the success of joint knowledge production projects is in order. De facto, this presupposes a focus on process rather than outcome evaluation, although one can logically assume that a successful process forms a positive contribution to project outcomes (Hegger et al., 2012).

The notions of credibility, salience and legitimacy were originally coined by Cash et al., (2002; 2003), who found that successful science-policy collaboration entails that criteria for salience, credibility and legitimacy can be met simultaneously for all actors involved. Actors’ evaluation of the degree to which the criteria were met can be determined by asking them for their opinion on the process as well as the content of joint knowledge production projects (Hegger et al., in preparation).

**Success factors for joint knowledge production**

To enable a comprehensive analysis of joint knowledge production projects, insight is needed in potential success conditions. Hegger et al. (2012) have derived such conditions from existing literature. Inspired by the policy arrangements approach (Arts et al., 2006; Liefferink, 2006; Van Tatenhove et al., 2000; Wiering and Immink, 2006) they distinguished between four analytical dimensions of joint knowledge production processes: actors, discourses, rules and resources. Within each dimension, they denominated one or more
success conditions, expecting each of them to increase the chance for success as defined in the previous subsection. Table 1 provides an overview of the four dimensions and the seven success conditions.

Table 1: Seven expected success conditions for joint knowledge production projects (based on Hegger et al., 2012)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Success conditions</th>
</tr>
</thead>
</table>
| Actors       | 1) *Who participates*  
  The success of joint knowledge production is enhanced in cases in which the broadest possible coalition of actors is formed, within the practical and strategic limits present. This likely entails both in- and exclusion of actors. |
| Discourses   | 2) *The process of defining the problem*  
  The chance that joint knowledge production is successful is enhanced in cases in which participating actors deliberate on the nature and denomination of the policy problem (un-, badly-, moderately- or well-structured) and on the type of outcome (ideas, closure on problem definition, concepts, arguments or solutions) to be expected.  
  3) *Recognition of differences in actor perspectives*  
  Actors in joint knowledge production projects can be expected to have diverging and implicit perspectives on the world around them. The success of joint knowledge production will be enhanced if the different perspectives of stakeholders are recognised and taken into account. In this, boundary objects can play a mediating role. |
| Rules        | 4) *Division of responsibilities*  
  The chance that joint knowledge production is successful is enhanced if actors decide, consciously and reflexively, which role to pursue in a project, how to define their identity in relation to these other actors and to make these choices known to them.  
  5) *Roles of researchers and of research-based knowledge*  
  The chance that joint knowledge production is successful is enhanced in cases in which the role of researchers and their knowledge is clear.  
  6) *Reward structures*  
  The chance that joint knowledge production is successful could be enhanced through novel forms of reward structure, but more experience with such examples is needed. |
| Resources    | 7) *Specific resources*  
  The chance that joint knowledge production is successful is enhanced through the availability of specific resources (boundary objects, organizational forms and competences). |
The framework can be considered comprehensive in terms of the explanatory factors included. The four analytical dimensions would, in principle, encompass all explanatory factors for the success of joint knowledge production. However, the specified success conditions still have a fairly high level of abstraction, and empirical confrontation of the success conditions is still in its infancy (but see Hegger et al., in preparation). We expect empirical confrontation to lead to refinement of the success conditions. Furthermore, it may lead to insight into the relationship between the conditions. In the remainder of this paper, we will make a next step in this respect. The seven success conditions will be used in an exploratory way, as sensitizing concepts. For each empirical case, we will try to characterize whether, to what extent and how each success condition played a role. It is expected that we will come across, on the one hand, context specific factors and, on the other hand, more generic patterns in how joint knowledge production in projects can take shape. We are predominantly interested in the latter, because we expect that these more generic patterns can form important building blocks for a design-oriented framework for joint knowledge production.

3. Introducing the projects and programs

Both 'Living With Water' (LWW, running between 2005-2010) and 'Climate Changes Spatial Planning' (CCSP, running between 2004-2011) were co-financed through the 'Economic Structure Enhancing Fund' (FES) of the Dutch government. LWW aimed i) to contribute to a transition from 'keeping down water' to 'accommodating water'; ii) to intensify collaboration between technical and social scientists and iii) to strengthen knowledge infrastructures. In all projects, researchers collaborated with policymakers and/or practitioners. The program's budget was € 50 million (€ 22 million was covered by the FES; the consortium partners co-financed the rest).

Together with Knowledge for Climate, CCSP focused on 'climate proofing'. This notion (Kabat et al., 2005) refers to developing and mainstreaming climate adaptation and mitigation measures; social innovation in risk management and coping strategies; and other technological, institutional and social innovations (Climate Changes Spatial Planning and Knowledge for Climate, 2009). The program included fundamental research projects (on climate scenarios, mitigation, and adaption); knowledge integration and communication activities; and so-called hotspots. In the hotspots, scientists, policymakers and practitioners collaborated in practice-oriented research on climate-proofing specific areas (Zuidplaspolder, Groningen and Tilburg). The program received € 40 million from the FES. The participating organizations and stakeholders contributed an additional € 50 million.

1 In a recent paper, Lang et al. (2012) discuss similar success conditions, in the framework of transdisciplinary research in sustainability science. These authors identify the same knowledge gap as Hegger et al. (2012) do (limited empirical evidence for ‘how to do’ transdisciplinary research) and respond to this knowledge gap similarly by deriving potential success conditions from literature and workshops.
To enable an exploration of differences in knowledge production dynamics, we used the following case selection criteria:

- The projects should be recently finalized in order to enable a retrospective analysis of the full project;
- At least scientists and public policymakers should participate in the project as partner.
- No small projects (budget less than approximately 50,000 Euros) were selected to ensure that partners had a substantial financial interest in the project. Thus, we aimed to maximize the chance that opportunities and pitfalls of joint knowledge production – like the ones hinted at in the introduction section – would actually be present;
- We selected projects in two programs to be able to explore the extent to which differences in knowledge production patterns are attributable to factors at project or program level.

Table 2 provides an overview of the selected projects.

<table>
<thead>
<tr>
<th>Project, duration, budget (if publicly available)</th>
<th>Participants</th>
<th>Stated goals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What's the future of low-lying peat land?</strong> (Waarheen met het Veen?); 2005-2009; € 3,250,000</td>
<td>Utrecht University; Wageningen University and Research Centre; Free University Amsterdam; three Ministries; three provinces; three Water Boards; various stakeholders, consultants and other actors.</td>
<td>Mapping out the ecological, economic and social consequences of water management strategies in low-lying peat areas; developing new strategies and governance arrangements</td>
</tr>
<tr>
<td><strong>Co-valuation of water</strong> (Waardering in coproductie); 2006-2009; € 925,000</td>
<td>Erasmus University Rotterdam; Municipality of Middelburg; Province of Zeeland; local Water Board; Inhabitants of Arnemuiden; TAUW consultancy; research institute TNO.</td>
<td>Development of two integrated visions – supported by inhabitants – on the future of an area near the small village of Arnemuiden, in which water played a profound role</td>
</tr>
<tr>
<td><strong>Transitions Sustainable Urban Water management (SUW)</strong> (Transities Duurzaam)</td>
<td>Erasmus University Rotterdam; regional Water Board; municipalities of Heerhugowaard and Rotterdam; research institutes</td>
<td>Assessing the feasibility of various concepts for more sustainable urban water management; analyzing the (potential for) socio-technical transitions</td>
</tr>
</tbody>
</table>
Stedelijk Waterbeheer | for water and wastewater management (KWR/STOWA); TAUW consultancy | for water and wastewater management (KWR/STOWA); TAUW consultancy
---|---|---
Hotspot Zuidplaspolder | Province of Zuid-Holland, local Water Board; Wageningen University and Research Centre; VU University Amsterdam; several consulting companies. | Assessing how 'climate proof' development plans in Zuidplaspolder are; developing climate proof designs; assessing the costs and benefits of specific adaptation options
---|---|---
Hotspot Groningen | Province of Groningen; experts from many different organizations (Water Board; various universities and research institutes; landscape architects). | Providing input to make the regional plan 'climate proof', involving new actors in climate change adaptation issues.
---|---|---
Routeplanner (co-executed by LWW and Habiforum) | University researchers from CCSP; LWW and Habiforum; Ministries of Economic Affairs; Housing, Spatial Planning and the Environment; Traffic and Water Management. | Providing policymakers at the national level with a state of the art of insights from the three participating programs, to get input for the national climate-change adaptation strategy (ARK)
---|---|---

In *Waarheen met het Veen* two PhD researchers were part of a broad consortium. In *Co-valuation of Water and Transitions SUW*, PhD researchers were the main executors of the project and the PhDs devoted their whole research to the project. In *Hotspot ZPP* two PhD researchers were involved for whom the hotspot study was 'a case'. In *Hotspot Groningen*, various – mostly senior – researchers participated in workshops (making the commitment of each individual researcher relatively small). In *Routeplanner*, different researchers dealt with the knowledge needs of the ministries.

The selected projects were more often initiated by the ‘demand side’ than by the ‘supply side’, contrary to the observation of Talwar et al. (2011), who found that, in Swiss sustainability research, virtually all transdisciplinary projects are science-driven. Nevertheless, issues were put on the agenda and projects were planned via various mutual interactions between scientists, policymakers and program managers. *Routeplanner* was the only ‘purely policy-driven’ project. The establishment of *Waarheen met het Veen* by applied researchers was a reaction to knowledge needs articulated by national and regional policymakers. The *CCSP Hotspots* were set-up and coordinated by provinces but their participation was a reaction to the
research program's funding opportunities. There were two more ‘science-driven’ projects. In Transitions SUW, scientists initiated research and sought collaboration with two municipalities (Rotterdam and Heerhugowaard) providing case studies. Both municipalities initially saw their role as 'facilitators of research'. At least in the case of Rotterdam, this changed when it was found out that the researched concepts could provide for economic opportunities. Co-valuation of Water was initiated by the Dutch applied research organization TNO and Erasmus University Rotterdam. These institutes sought collaboration with local stakeholders and applied for funding from LWW.

### 4. Comparing the success of the projects

This section explores how the analysed projects 'score' in terms of actors' perceived credibility, salience and legitimacy of the outcomes.

#### 4.1 Credibility

In most projects, credibility did not seem to be an issue of great concern (Hotspot ZPP, Waarheen met het Veen, Transitions SUW and Routeplanner). Actors’ remarks on credibility were general in nature. For instance, it was frequently mentioned ‘that practical knowledge enables researchers to do more credible research’. In Co-valuation of Water and Hotspot Groningen, however, serious criticisms were raised which can be interpreted as a lack of credibility. In Co-valuation of Water, an interviewee mentions ‘that the developed visions were unrealistic and not well-supported’. In Hotspot Groningen, some interviewees criticize the project leader, describing him as a visionary person who – although he was officially a policy officer – was seen as a ‘representative of science’. Two general observations can be made on the basis of this comparison. First, credibility only became an issue in cases in which there were ‘dissidents’ in the projects (value pluralities). Second, actors sometimes coupled (lack of) credibility of knowledge to the credibility of persons.

#### 4.2 Salience

Actors had different criteria for the salience of knowledge. As we will show in this section, the projects differ widely in terms of the type of knowledge produced. What mattered, however, were not these differences as such, but the extent to which actors succeeded in reconciling their diverging knowledge interests. The interviewed researchers liked being involved in a practice-oriented project and deemed the implementation of sustainable concepts and visions important. However, they unanimously indicated that their main interest was to be able to publish. For most researchers, their project yielded enough publishable material. The only exceptions were one of the PhDs in Hotspot ZPP (no publications on the project) and one of the researchers
in Routeplanner (who had wanted to publish more). For the researcher interviewed in Hotspot Groningen, the project’s relative importance (in terms of time investment) was small, so it could only provide a small contribution to one publication. Most researchers were young and untenured. For them it was important that the project provided job opportunities. We came across two examples in which job opportunities were generated. One researcher in Waarheen met het Veen found a new job through the project network. Transitions SUW resulted in the establishment of a spin-off company, Deltasync, specialized in floating urbanization. Although it was not their primary interest, researchers in several projects (Waarheen met het Veen; Hotspot ZPP; Routeplanner) indicated that they valued the acquisition of practical knowledge. They learned about terminologies and about how policymaking works. One interviewee (Routeplanner) – with a natural science background – also learned ‘to think in terms of actors rather than processes’.

Policymakers and program managers deemed the applicability of the knowledge most important. The projects differed widely in the types of knowledge deemed applicable and actually produced. A first type of knowledge production observed is agenda setting knowledge. Policymakers in Hotspot ZPP became more aware of the importance of desiccation for the area. Various policymakers in Groningen started to think about the consequences of climate change for the province. A reported result of Waarheen met het Veen was ‘that it is no longer possible to deny the existence of soil subsidence’. Second, some projects focused on the development of concepts for practical use. Policymakers portrayed Routeplanner as a knowledge dissemination project, familiarizing national level policymakers with such concepts as 'climate proofing', 'climate scenarios', 'uncertainties' and 'resilience'. The project also provided policymakers with a state-of-the-art of climate change knowledge. Third, some policymakers referred to the generation of insights and ideas. A policymaker in Transitions SUW claims to have learned most from the project’s ‘transitions part’ which made him familiar with the role of actors in transitions, long-term thinking and thinking in terms of opportunities. According to several interviewees, Waarheen met het Veen contributed to the development of a nuanced and pragmatic plan for implementing a new policy concept 'Functie volgt peil' (in which land-use functions depend upon the water level in certain areas rather than the other way round). Amongst others, knowledge was developed on the strengths and weaknesses of underwater-drainage, a mitigation technology. Fourth, several projects provided arguments supporting and legitimizing ongoing planning processes. In Hotspot ZPP, scientific underpinning of existing plans and approaches – a.o. the so-called ‘layer approach’, a relatively new Dutch spatial planning principle – was generated, reducing controversies. The project also legitimized the plans for building in Zuidplaspolder. Fifth, policymakers referred to the identification of economic opportunities. This was the case in Transitions SUW (Rotterdam municipality). Sixth, especially actors at program level deem the development of process-related knowledge important (e.g. in Hotspot ZPP, CCSP’s first hotspot).
Two projects differ negatively from the others: *Co-valuation of Water* and *Hotspot Groningen*. Actors involved perceived the quantity of ‘relevant knowledge’ produced to be relatively low. Worse, actors did not manage to reconcile their different views on ‘relevance’. Actors in *Co-valuation of Water* had different views on whether implementing the developed visions was desirable, and whether this was a goal of the project. In *Hotspot Groningen* we see a distinction between people who found that input should be given to the provincial plan, including the board of CCSP (which was dissatisfied about the project outcomes) and others who emphasized ‘awareness raising’ and ‘having scenarios available for future use’. In these two projects some actors’ thresholds for ‘salience’ were not met.

### 4.3 Legitimacy

There were two projects in which actors referred to a perceived ‘lack of legitimacy’: *Co-valuation of Water* and *Hotspot Groningen*. In the former project, a civil servant believes ‘that the local population was fooled’. Inhabitants were asked to participate in the development of plans, while ‘it was clear from the outset that these would not be executed’. Also, several interviewees claimed that the position of experts in the project was problematic. They were not familiar with the ‘subordinate’ role they were expected to play, providing feedback on, rather than making plans (see also: Edelenbos et al., 2011). A PhD researcher in *Co-valuation of Water* learned that commitment of organizations is largely dependent on individuals. After a civil servant and the responsible alderman left, the municipality turned out to be no longer committed. The same researcher mentions ‘that scientists are wrong in assuming that practitioners know everything about ‘integrated water management’, ‘stakeholder involvement’ and ‘making room for water’’. The fact that the project leader of *Hotspot Groningen*, a policy officer, was seen by some as ‘a representative of science’ was claimed to be a crucial factor complicating the internal acceptance of his work within the province. An employee of one of the participating water authorities tells that he believes that he was ‘merely facilitating science’. This employee indicated that ‘if the local water authority had been the principal, the current project results would not have been sufficient’.

In some of the other projects, statements were made which can be linked to a lack of legitimacy; although the issues addressed seem to be less serious ones (‘slight disadvantages’ or ‘points of attention’ rather than ‘severe shortcomings’). The PhD researcher within *Transitions SUW* found working at the intersection of science, policy and practice exiting and instructive. It resulted, however, in a high workload since policymakers were interested in easily accessible reports, while his supervisors were interested in journal articles. This could be interpreted as a lack of legitimacy in the eyes of the PhD researcher, although this researcher himself does not use the term.
Some interviewees in *Waarheen met het Veen* referred to the – according to them theoretical – possibility that actors would prematurely use intermediary products. Farmers could have an interest in claiming ‘that underwater drainage is a solution for continuing agricultural activities in low-lying peat areas’. Claiming more than science justifies can be interpreted as a lack of legitimacy. However, at the time of writing, such premature use had not taken place.

5. **Patterns in joint knowledge production – an exploration of the cases**

Although all researched projects are regional projects dealing with water- and climate-related issues, they are diverse in terms of the precise topics dealt with as well as their 'degree of success' according to our definition. One can logically assume that many differences between project and their relative success or failure are context-specific and highly contingent. Still, we expect there to be underlying more generic patterns which are attributable to differences in knowledge production, exchange and use. This section makes the effort to identify such differences between the projects. Table 3 on the next page gives a characterization as to whether, to what extent and how each success condition has been taken into account in the projects.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Actors</strong></td>
<td>1) Who participates?</td>
<td>Universities, research institutes, regional governments (provinces, water boards), consultants.</td>
<td>University, municipality, province, water board, local inhabitants, consultant, research institute.</td>
<td>University, Water Board, two municipalities, research institutes, consultant.</td>
<td>Province, Water Board, two universities, various consulting companies.</td>
<td>Province, experts from many different organizations (Water Board, various universities and research institutes, landscape architects.</td>
<td>University researchers from three participating research programs; two ministries.</td>
</tr>
<tr>
<td><strong>Discourses</strong></td>
<td>2) The process of defining 'the problem'</td>
<td>Largely defined at the beginning of the project, through the process of writing the project plan and defining the project.</td>
<td>Largely defined at the beginning of the project, through the process of writing the project plan and defining the project.</td>
<td>Project largely defined at the beginning. Research approach was refined through project team meetings.</td>
<td>In an early stage of the project, the three main research steps were identified.</td>
<td>Official goal of the project was defined at the beginning of the project.</td>
<td>Official goal of the project was defined at the beginning of the project.</td>
</tr>
<tr>
<td><strong>3) Recognition of differences in actor perspectives</strong></td>
<td>No indication that reflexivity was built in as such.</td>
<td>Continuously, much explicit attention was paid to the project's design as well as the roles of participants.</td>
<td>No indications for 'built-in reflexivity' were found. There was, however, probably much exchange of tacit knowledge through physical presence of PhD researcher in case study municipalities.</td>
<td>In the project much attention was paid to sharing of tacit knowledge (guided tours, physical proximity of researchers and policymakers).</td>
<td>No examples found.</td>
<td>Knowledge brokers acted as spokesmen for scientists and policymakers.</td>
<td></td>
</tr>
<tr>
<td><strong>Rules</strong></td>
<td>4) Division of responsibilities</td>
<td>Knowledge development and policymaking remained two parallel tracks. Frequent exchange took place via consortium meetings and the professional network of the project leader.</td>
<td>Social scientists facilitated and researched the process of developing local visions.</td>
<td>PhD researcher carried out the majority of the work. Feedback was given by a broad project team consisting of all stakeholders.</td>
<td>Project was deliberately put on a distance of the regular planning process. Knowledge exchange took place through key persons.</td>
<td>Project was coordinated by the province. Many researchers were involved, but involvement per researcher was limited.</td>
<td>Science and policy remained two clearly distinct domains. Exchange took place via knowledge brokers.</td>
</tr>
<tr>
<td><strong>5) Role of researchers and of research-based knowledge</strong></td>
<td>Scientific research was mainly carried out by two PhD researchers. Research institutes carried out more applied research.</td>
<td>Researchers were process facilitators as well as process evaluators.</td>
<td>PhD researcher produced both scientific output as well as input for municipal policymaking processes.</td>
<td>Rational set-up with clearly identifiable steps and sub-projects.</td>
<td>Workshop format was used: researchers gave specific input based on the themes on the agenda.</td>
<td>Knowledge brokers defined sub-projects on the basis of sub-research questions.</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td><strong>6) Innovations in reward structures</strong></td>
<td>Societal actors were allowed to use 5% of the project budget to 'extract' knowledge from the project. This budget was occasionally used to ask researchers to present their findings to governors (e.g. of Water Boards).</td>
<td>No.</td>
<td>No.</td>
<td>No.</td>
<td>No examples found.</td>
<td>No. Some researchers found the scientific prestige of the project limited.</td>
<td></td>
</tr>
<tr>
<td><strong>Resources</strong></td>
<td>See the previous point.</td>
<td>Involvement of local actors.</td>
<td>Local support in case study municipalities. Project was carried out by a very active PhD researcher.</td>
<td>Specific entities and facilities (e.g. Xplorelab) and boundary objects (meeting tables in the shape of a map of the province) were used. Specific competences were present (e.g. bridge-builders with expertise both in science and public policy).</td>
<td>Meetings were held at special locations (e.g. old factories). The project leader was said to have a large scientific network, but limited secretarial support.</td>
<td>Competences of knowledge brokers.</td>
<td></td>
</tr>
<tr>
<td><strong>7) Specific resources</strong></td>
<td>See the previous point.</td>
<td>Local support in case study municipalities. Project was carried out by a very active PhD researcher.</td>
<td>Local support in case study municipalities. Project was carried out by a very active PhD researcher.</td>
<td>Specific entities and facilities (e.g. Xplorelab) and boundary objects (meeting tables in the shape of a map of the province) were used. Specific competences were present (e.g. bridge-builders with expertise both in science and public policy).</td>
<td>Meetings were held at special locations (e.g. old factories). The project leader was said to have a large scientific network, but limited secretarial support.</td>
<td>Competences of knowledge brokers.</td>
<td></td>
</tr>
</tbody>
</table>
The available space does not allow for more than a preliminary characterization of the cases. Nevertheless, we think table 3 allows us to bring some order in the heterogeneous set of factors influencing the course of affairs in projects. First, we distinguish a set of factors upon which the projects show many similarities. All projects received special funding from research programs (resources). We also see patterns in the reward structures created within the projects. A general feature seems to be that working at the science-policy interface, as it was structured in the projects, is highly demanding. Actors needed to invest more time, energy and effort compared to projects without direct science-policy cooperation. This is also exemplified by the fact that all interviewed researchers found it difficult (and sometimes impossible) to produce practically applicable results which would also provide useful input for scientific publications. Factors like this come close to what could be termed *defining characteristics* of joint knowledge production in regional climate change adaptation projects.

Second, some factors come close to the other extreme of being context-specific and contingent. For instance, actors can influence only to a limited extent if they find the right persons for the job. If another PhD researcher was recruited for the Transitions SUW project, would this person have been capable of living up to the expectations of both his scientific supervisors and the other project team members? In the case of Co-valuation of Water, two key persons within the participating municipality left the project unplanned. According to some interviewees, the fact that these key persons left was to be considered a critical event, compromising the municipality's support for the project.

We also discern a third category of factors, which seem to point at elemental differences between projects in terms of how knowledge is produced, exchanged and put to use. Hence, these factors could be useful elements of a joint knowledge production typology. We group these factors according to the following two variables:

- **Type of organization.** As a first variable, we discern differences in how projects were organizationally embedded, most typically exemplified by condition 1 (who participates), 4 (division of responsibilities) and 5 (roles of researchers and of research-based knowledge). In some cases, people within provincial governments played an important coordinating role (for instance in the two CCSP hotspots) while most other participants were researchers. In the Routeplanner project, coordination was done by knowledge brokers, whereas in the Transitions SUW project a PhD researcher was at the core of the project network. Depending on 'which actor was at the core of the project', the projects can be placed on a continuum. On the one extreme, there are *innovation projects* in which researchers played an important coordinating role in the set-up and execution. In our comparison, we also came across projects with were closer to the other extreme. They had a strong embedding in the domain of policymaking, because those coordinating the project and recruiting participants were officially policymakers (albeit sometimes very knowledge-driven
policymakers, as in the case of the CCSP hotspots). In our comparison, however, we did not come across the theoretical extreme in which researchers became part of ongoing spatial planning processes. In all projects, at least some organizational distance was created between the joint knowledge production project and ongoing policy processes (with varying degrees of knowledge exchange between the two).

- **Type of knowledge.** Projects differed in terms of the explicit knowledge goal pursued. The goals of Hotspot Groningen and Routeplanner, for instance, were largely formulated in terms of concrete policy that should result from the project (a provincial plan and a national adaptation strategy, respectively). Scientific publications as such were not a goal of the project. The goal of 'Transitions SUW' on the other hand, was formulated in more generic terms. However, if we look at what de facto happened in the project, a distinction between 'decision-oriented' and 'knowledge oriented' projects would be too simple. For instance, on paper the hotspots were quite decision-oriented, but participating researchers expected to obtain scientifically relevant information from the project. On the other hand, the municipal officers participating in the Transitions SUW project did put demands (albeit knowledge demands) on the PhD researcher carrying out the project.

6. **Reflection on the usefulness of the typology**

In the previous sections, we have compared six projects in order to derive building blocks for a design framework for joint knowledge production projects. We hope to have illustrated how these projects differed in terms of the extent to which justice was done to the interests of actors regarding their criteria for the credibility and salience of the knowledge produced as well as the legitimacy of the processes. Based on our assessment framework, we have also compared the projects' set-up and dominating rationalities. On the basis of this analysis, we have identified two variables which seem to be promising candidates to become elements of a joint knowledge production typology. The projects differ in terms of their organizational embedding (policymaking projects vs. innovation projects) and in terms of the type of knowledge the project is directed at (decision making projects vs. knowledge-oriented projects).

For the latter variable, we have evidence suggesting its potential value for explaining the (lack of) project success. In the Co valuation of water and Hotspot Groningen projects, for instance, actors disagreed on what the project should lead to. Formally, both projects were rather policy-oriented. There was, however, discordance as to whether the visions developed within the former project should have been implemented as part of the project, and whether the latter project should have provided input to the provincial plan. The formulated knowledge aims raised expectations which were difficult to meet in practice.

We have no indication that the other variable type of organization in itself explains the success (or lack thereof) of projects. We have indications, however, that the type of organization has a very large
influence on other project dynamics. Hence, we believe that the positioning of a project on the continuum between *policy project* and *innovation project* puts requirements on how certain elements of the project are filled in. For instance, to make a project that is quite strongly positioned in the scientific domain (Transitions SUW) policy relevant, the researcher(s) involved probably need to have an inherent practical orientation (as was the case in this particular project). If, on the other hand, a project is positioned closely to policy, it will probably be more difficult *but still possible* to derive generic recommendations from the project, or to stimulate out of the box thinking of participants. To do so, may require a knowledge-driven project leader.

As the discussion hitherto suggests, we deem it worthwhile to make some next research steps based on the distinction between *type of knowledge* (decision oriented or knowledge oriented) and *type of organization* (policy project or innovation project). Thinking in terms of this typology may help, to some extent, to predict project success. If a project can be positioned close to an extreme on one or both variables, it is likely that primacy lies with either science or public policy. It will then be difficult to meet the knowledge interests of the group with which primacy does not lie. In all cases, it may be important that project expectations do not differ widely amongst participants (e.g. Hotspot Groningen). The typology could play a role in revealing such differences in expectations by using the variables as a tool for participatory reflection in projects.

### 7 Concluding remarks and next steps

We believe our comparative analysis of joint knowledge production projects has led to three building blocks for a design framework. First of all, we have developed a typology of such projects. Theoretically, this typology defines four quadrants, hence four potential contexts for joint knowledge production. Relevant design principles for joint knowledge production will differ per quadrant. For instance, in a policy-oriented project, it will probably be more important to take into account the formal decision making procedures of regular policy processes than in knowledge-oriented projects. On the other hand, in such knowledge-oriented projects, it may be important that policy actors do not have too high expectations about the direct short-term policy relevance of the knowledge produced (they should instead value 'softer' project outcomes like the establishment of networks, or the acquisition of insights and ideas).

As we discussed in section 5 and 6, we believe the typology to have value for explaining dynamics in projects, and explaining how these dynamics lead to relative success or failure of projects. However, we have also shown that many factors cannot be explained with the typology, for instance because they are context-specific, contingent, or hard to influence. This points us to a second building block for a design framework, being that projects should allow for making and learning from mistakes. Program managers and financiers should accept that some projects fail.
Our analysis also provides indication for the importance of the leadership of key persons in projects. As we indicated in section 4, interviewees often related positive and negative project experiences to the person of the project leader. This points us to a third building block of a design framework. Actors financing and setting up projects should pay explicit attention to the issue of leadership, for instance by specifying in advance what kind of leadership a certain project requires.

We conclude that the current study has provided some lessons for project and program design. To come up with specific design principles, however, additional empirical studies will be needed. Two routes seem especially useful in this respect. On the one hand, we deem forms of participatory action research (for instance in the climate change adaptation domain) useful. In such research, the developed typology – but also the seven success conditions from the assessment framework – may be used as a tool for participatory reflection. Another way to extend the empirical basis for research into joint knowledge production would be to look for contrasting cases in the same and other empirical domains, identifying more empirical examples of how the theoretical success conditions can be met.

References


